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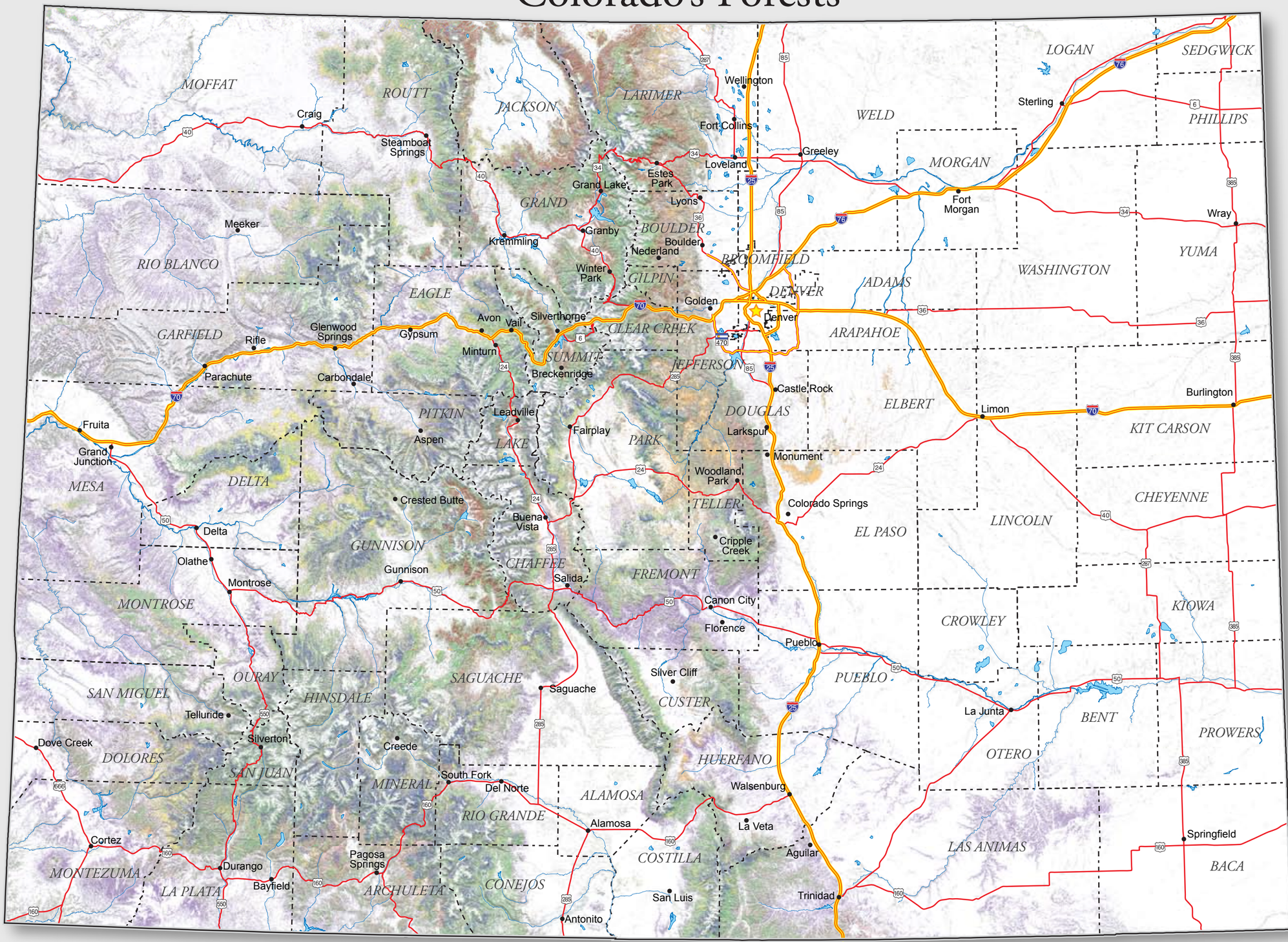
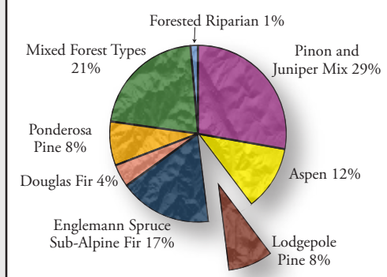
Colorado's Forests



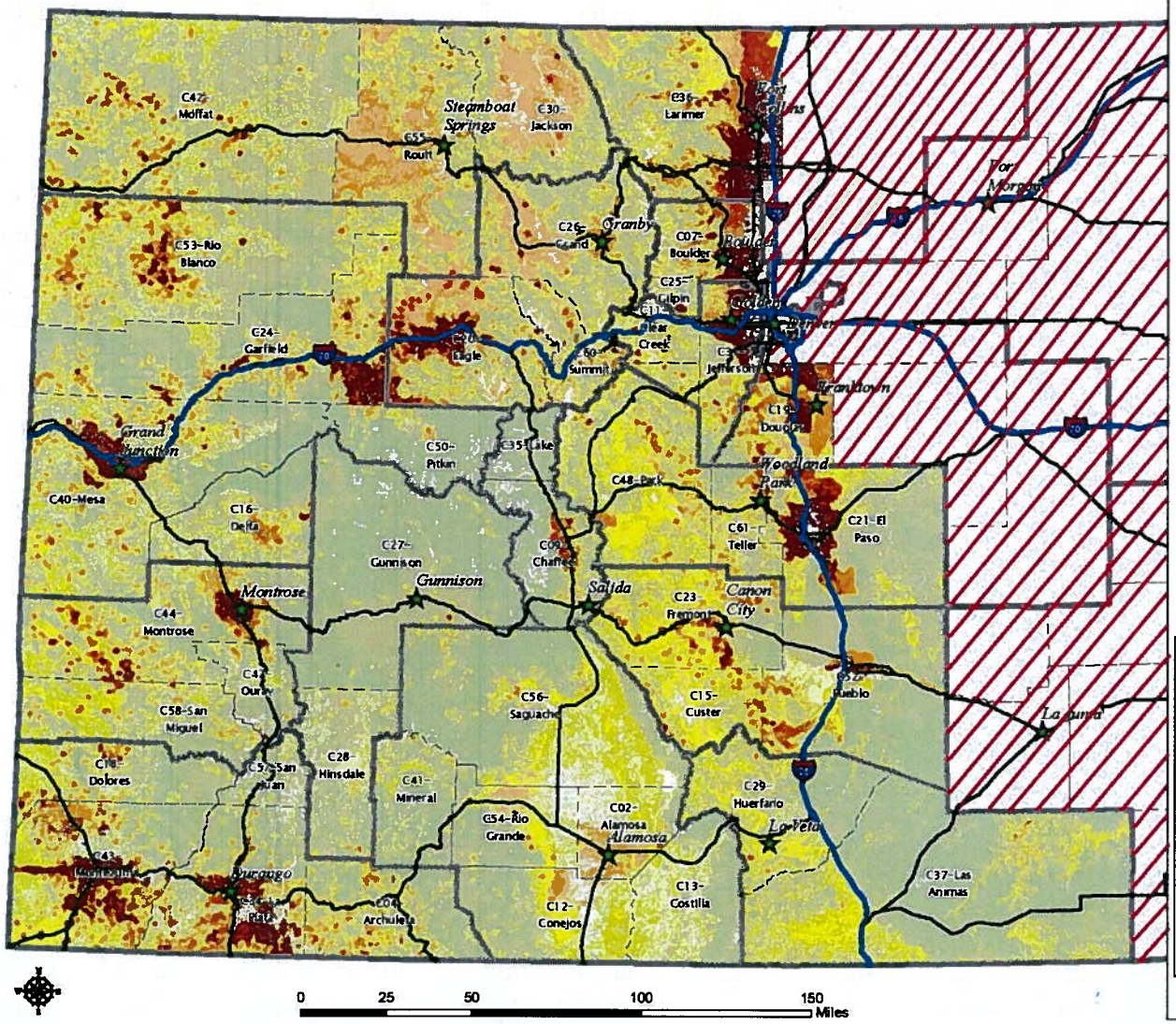
- Pinon and Juniper Mix 5,313,000 Acres
- Aspen 2,244,000 Acres
- Ponderosa Pine 1,568,000 Acres
- Engelman Spruce and Sub-Alpine Fir 3,208,000 Acres
- Douglas Fir 825,000 Acres
- Lodgepole Pine 1,517,000 Acres
- Mixed Forest Types 4,045,000 Acres
- Forested Riparian 232,000 Acres



- Interstate
- US Highway
- County
- Cities
- Lakes
- Streams

Map created by the Colorado State Forest Service, December 2006. Vegetation data from "Colorado Vegetation Classification Project," produced January 2004 by Colorado Division of Wildlife and U.S. Bureau of Land Management.

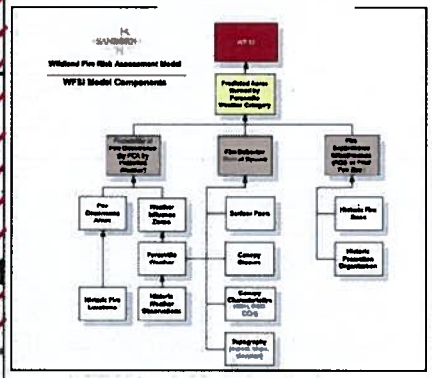
Colorado Wildfire Risk Assessment 2008



WFSI

- 0 (non-burnable)
- 0 - 0.0002 (very low)
- 0.0003 - 0.0008 (very low)
- 0.0009 - 0.001 (low)
- 0.0011 - 0.0016 (low)
- 0.0017 - 0.0023 (moderate)
- 0.0024 - 0.0041 (moderate)
- 0.0042 - 0.0089 (high)
- 0.0090 - 0.0185 (high)
- 0.0186 - 1 (very high)
- Counties
- CSFS District Office
- Interstates
- US Highway
- District Boundary

Area not Assessed



WFSI data created by Sanborn Map Company for the Colorado State Forest Service June, 2008

2012 Colorado Wildfire Preparedness Plan

AUTHORIZATION: COLORADO REVISED STATUTE 23-31-309

The Wildfire Preparedness Fund in Colorado was authorized by the 2006 Legislature through Senate Bill 06-096, which also appropriated funding for state fiscal years 2006 through 2010 to support implementation of the actions directed by the legislation.

Extension of the Wildfire Preparedness Fund – Governor Hickenlooper signed into law SB11-238 on June 8, 2011. The bill extends the annual transfer of $3.25 million by the Department of Local Affairs to the Colorado State Forest Service for two years beginning July 1, 2012.

DIRECTION OF STATUTE: 23-31-309 directs the Colorado State Forest Service (CSFS) to specifically address the following areas:

(I) The amount of aerial firefighting resources necessary for the State of Colorado at times of high and low wildfire risk;

(II) The availability of appropriate aerial firefighting equipment and personnel to respond to a wildfire at times of high fire risk;

(III) The availability of state wildfire engines and staffing of the engines at different levels of wildfire risk;

(IV) The availability of state inmate wildfire hand crews at different levels of wildfire risk; and

(V) A process for ordering and dispatching aerial firefighting equipment and personnel that is consistent with, and supportive of, the statewide mobilization plan prepared pursuant to section 24-33.5-1210, C.R.S.

SITUATION

Wildfires occur as unscheduled emergency events in wildland fuels (prairie or forest vegetation) and in fuels that include a combination of wildland and human introduced fuels such as houses and improvements. Wildfires involve or threaten human life, residential housing, other improvements, and natural resources. Due to natural fuels build-up and increased population in wildland-urban interface areas, wildfires that exceed the control efforts of local and county resources are becoming more common and more complex. Wildland firefighting in Colorado is interagency in nature involving state, county, local, federal, and tribal partners. The Colorado State Forest Service is the lead state agency for wildland fire as identified in ESF 4a, Colorado State Emergency Operations Plan.

WILDFIRE PREPAREDNESS PLAN:

COOPERATIVE INTERAGENCY FIRE PROTECTION

Wildland-Urban Interface

Single Engine Air Tanker

State Wildland Inmate Fire Team

State Wildland Engine

Cooperation in the Interface

Interagency Incident Management Teams

PREPAREDNESS PLANNING ASSUMPTIONS

Public, homeowner, and firefighter safety is the priority.

Wildfires that exceed the capabilities of local and county resources will occur.

Wildfires will threaten lives, property, and natural resources.

No single entity or jurisdiction alone can suppress every wildfire.

Successful suppression and extinguishment of catastrophic wildfires require organized interagency cooperation at all levels of government.

Ensuring that state wildfire resources are identified, staffed, and positioned to respond will prevent some wildfires from becoming large catastrophic events and will assist in the containment and suppression of those wildfires that do escape initial attack.

CONCEPT OF OPERATIONS

Agreements are executed that clearly define authorities, roles, and expectations, and provide the framework for cooperation.

The CSFS coordinates agreements and operating plans with local, county, state, and federal partners allowing cooperation across jurisdictions.

Initial attack responsibility rests with local fire departments, counties, and federal land management agencies.

Ordering and tracking of resources is accomplished through six (6) Interagency Dispatch Centers and one (1) Interagency Regional Coordination Center.

IMPLEMENTATION OF DIRECTION

I. The amount of aerial firefighting resources necessary for the State of Colorado at times of high and low wildfire risk.

- The CSFS will maintain and manage an exclusive use single engine air tanker contract.
- The CSFS will coordinate Colorado wildfire air resources with partners while considering current wildfire risk.

COLORADO WILDFIRE COOPERATION:

- *Success engages Colorado State Forest Service, Colorado Division of Emergency Management. Colorado Division of Fire Safety, Federal Land Management Agencies, Colorado Department of Corrections, Colorado Department of Military and Veterans Affairs, County Government, Fire Departments and Protection Districts.*
- *CSFS facilitates and is signatory to 64 County Cooperative Fire Protection Agreements .*
- *CSFS is signatory to the Interagency Cooperative Fire Management Agreement with the Federal Land Management Agencies.*
- *64 County Annual Operating Plans are updated prior to each fire season.*
- *441 volunteer, combination, and paid Fire departments, Fire Protection Districts, and County Sheriffs and Emergency Managers form the nucleus of local response.*
- *Cooperative Resource Rate Forms catalog wildfire resources from over 227 state, county, and fire departments in Colorado. This information is provided to the six interagency dispatch centers located in Colorado.*

II. The availability of appropriate aerial firefighting equipment and personnel at times of high fire risk to respond to a wildfire.

- The CSFS will coordinate and execute cooperative wildfire management agreements with appropriate local, state, county and federal jurisdictions.
- The CSFS will facilitate the development of Annual Operating Plans with each County and jurisdictions within the counties.

III. The availability of state wildfire engines and staffing of the engines at different levels of wildfire risk.

- The CSFS will maintain a core of four fully staffed wildland engines year round and an addition 12 state owned engines staffed seasonally.
- The CSFS will manage up to 140 wildland engines on loan to local and county fire departments.

IV. The availability of state inmate wildfire hand crews at different levels of wildfire risk.

- The CSFS will support inmate hand crews through training, protective gear, and equipment as needed.

V. A process for ordering and dispatching aerial firefighting equipment and personnel that is consistent with, and supportive of, the statewide mobilization plan prepared pursuant to section 24-33.5-1210, C.R.S.

- The CSFS will provide the technical assistance and program management that identifies local, county, and state resources; their qualification to national standards; and their listing in interagency zone dispatch centers.

Preparedness means having the appropriate resources available to respond when needed. For that to successfully occur, a framework of agreements, plans, processes, lists, standards, and relationships must exist, be clearly understood, and be supported.

Since 2006, the Colorado Wildfire Preparedness Fund has provided that support.

COLORADO FIRE FACTS: STATE AND PRIVATE LAND

- *An average of 2,440 wildfires occur on state and private land each year.*
- *98 percent of wildfires are contained at less than 100 acres.*
- *County sheriffs and Fire Protection Districts are responsible for the control or extinguishment of wildfires.*
- *17 percent of wildfires are caused by lightning.*
- *More than 400 fire departments, counties, state, tribal, and federal agencies cooperate in wildfire protection.*
- *Wildfire response is supported through six interagency dispatch centers.*
- *Large wildfire costs can exceed $1 million per day.*
- *Colorado counties contribute $1 million annually for wildfire suppression.*
- *The State of Colorado has contributed, on average, $2.7 million annually for wildfire suppression that has exceeded county capabilities (five-year average).*

2012 COLORADO PREPAREDNESS [skilled technical support, services, equipment]

Preparedness Management (Framework, structure, organization, technical expertise)

- Fuels Mitigation and Prescribed Fire Manager
- Northern Front Range Fire Management Officer (FMO) - Fort Collins Dispatch Area
- Southern Front Range FMO - Pueblo Dispatch Area
- Southwest FMO - Durango and Montrose Dispatch Areas
- Northwest FMO - Grand Junction and Craig Dispatch Areas
- Seasonal dispatch support for Pueblo and Fort Collins Zones and Rocky Mountain Regional Coordination Center. Operational support for Pueblo, Fort Collins, Craig, Montrose, Grand Junction, and Durango Zone Dispatch Centers.
- Emergency Fire Fund (EFF) agreements updated and assessments received
- County agreements reviewed
- Annual Operating Plans completed
- Federal/State Interagency Cooperative Fire Protection Agreement reviewed and updated
- FEMA/State Agreement and Administrative Plan updated and executed
- Interaction with Colorado State Fire Chiefs Association; County Sheriffs of Colorado; Colorado Counties, Inc.; Rocky Mountain Coordinating Group; Federal Emergency Management Agency.

State Engines (includes personnel, upgrades, and operating expense)

- 4 state permanent staffed engines
- 3 state seasonal staffed engines
- 6 state engines with cooperator staffing
- 2 lowboy transport trailers for maintenance
- Fire Equipment Shop support for equipment maintenance and repair.
- Replacement and/or upgrade of state engines

Air Resources (includes exclusive use contracts, encumbered contingency accounts, state personnel and equipment to manage the resources)

- Bid a new 2 year Exclusive Use SEAT contract
- 3 Single Engine Air Tankers (SEATs) Primary Season
- 1 Single Engine Air Tanker Secondary Season
- Call when needed contingency for additional SEATs or Helicopters
- National Guard Air Resource
- Maintenance and support of SEAT
- Interagency coordination of air resources
- Administrative Support

Preparedness Services (equipment, materials, supplies, technical services)

- Satellite phone service and maintenance
- High band and 800 Mhz radio service and maintenance
- Personal protective gear/fire shelter program for fire departments
- Equipment support for regional Incident Management Teams (IMTs)
- RMCG Operations Committee Team management software
- Prescribed fire equipment and training for fuels mitigation purposes
- Fuels mitigation equipment
- Training scholarships from IMA donation

State Inmate Crews (includes training, equipment, mitigation projects, technical services)

- 3 Juniper Valley Crews - existing
- 1 Juniper Valley Crew – pending Department of Corrections review
- Supervision - backup supervision
- Hazardous fuel reduction projects

Planned Budget

The budget below reflects funding specifically authorized and appropriated from CRS 23-31-309 and is based on the Colorado State Fiscal Year runs July 1 through June 30. Work planning within the wildfire community typically follows a Calendar Year. Other funding sources available to support wildfire protection may align with County Fiscal Year (Calendar Year) or Federal Fiscal Year (October 1 through September 30).

2012/2013 Fiscal Year	Resource	Cost (Expense)	Funding	Running Totals
Beginning Balance			$4,250,000	
Air Resources	3 SEATs, Primary	$1,300,000		$2,950,000
	1 SEAT, Secondary	200,000		2,750,000
	CWN contingency	200,000		2,550,000
	NG contingency	200,000		2,350,000
	Admin Support	60,000		2,290,000
State Engines	15 Engines	1,000,000		1,290,000
Inmate Crews	Crew Support	200,000		1,090,000
Management	Managers	779,000		311,000
Services	Equipment	197,499		113,501
Carry Forward to 2013/2014		113,501		0

REPORT ON THE WILDFIRE PREPAREDNESS FUND
December 2011

INTRODUCTION

The Wildfire Preparedness Fund in Colorado was authorized by the 2006 Legislature through Senate Bill 06-096, which also appropriated funding for state fiscal years 2006 through 2010 to support implementation of the actions directed by the legislation.

The 2011 General Assembly reauthorized the Wildfire Preparedness Fund for state fiscal years 2011 through 2013 and appropriated funding for fiscal years 2012 and 2013. The preparedness fund provides consistency in funding over time that allows for efficiencies of scale when contracting for resources and providing technical assistance and operational support. The flexibility afforded in the statutory language for rolling over unused portions of the annual fund allotment allows program managers to plan for worst-case scenarios, but implement only what is immediately necessary to address the current fire season. The Wildfire Preparedness Fund provides for consistent funding that supports state owned and operated resources.

For state fiscal year 2011, wildfire preparedness was supported by carry forward funds from the previous 5 years.

WILDFIRE PREPAREDNESS AND WILDFIRE ACTIVITY IN 2011

Wildfire management is based on calendar year (January 1 to December 31). Within this year, wildfire management planning is parsed into three time periods determined by historical reference: January through March; April through October; November through December.
April through October is the most active period and considered the primary fire season in Colorado.
The other two periods are considered secondary (or off season) periods where wildfire frequency is lower than during the primary wildfire season.

2011 Fire Season Summary

Colorado experienced dry conditions in the fall of 2010 which carried through the first half of 2011. The southern tier of counties experienced below normal precipitation and the front range of Colorado experienced below normal snowpack below 8500 feet in elevation. Southeastern Colorado was in drought conditions going into 2011. These areas, and a portion of Northwest Colorado, were identified as having a high potential for fire activity and large wildfires. Actual fire activity reflected this with large fires occurring in Boulder County and Jefferson County in March, Larimer County in April, Las

Animas County in May, and Teller, Las Animas, Custer, and Fremont counties in June. Periodic precipitation in the form of rain from late June tempered large fire activity for the remainder of the year.

2011 Fires that Exceeded County Capacity

Fire Name	County	Date of Fire	Structures Threatened	Structures Lost	Size	Cause
Lefthand Canyon	Boulder	March	400	0	622	Man
Indian Gulch	Jefferson	March	287	0	1570	undtm
Crystal	Larimer	April	500	13	2940	man
Bear	Las Animas	May	6	2	6885	lightning
Purgatoire	Las Animas	May	4	0	6140	undtm
Navajo	Teller	June	230	0	57	undtm
Shell	Las Animas	June	350	7	27792	lightning
Brice	Las Animas	June	In Shell #	0	4690	lightning
Mesa DaMaya	Las Animas	June	In Shell #	0	13312	lightning
Duckett	Custer/Fremont	June	200	0	156	undtm
Track	Las Animas	June	31	8	329	man

Wildfire Preparedness Resources

Colorado preparedness resources were in place and available during the 2011 fire season. The Preparedness Fund operated in 2011 with carry-over funding from the 2010 fire season.

Single Engine Air Tankers

Four Single Engine Air Tankers were under exclusive use contract with the Colorado State Forest Service in 2011. They were available to all jurisdictions and flew on 58 separate fires.

2011 SEAT Summary	
# SEATs	**4**
Total # Incidents	**58**
Total # Loads	**366**
Total Flight Time (hrs)	**261.52**
Total # Gallons Delivered	**242,144**
# Days available during fire season	**351**
# Days available during off season	**152**
# Fires > 100 ac	**6**
# Fires < 100 ac	**52**

2011 SEAT Use by Jurisdiction			
Incident By Agency	**# Incidents**	**Total Flight Hours and percent of total**	**Total Gallons Delivered**
Colorado State, County	**11**	**21.85 – 9.01%**	**23,650**
BIA	**5**	**22.96 – 9.47%**	**38,633**
BLM	**14**	**34.83 – 14.36%**	**32,228**
DOD	**1**	**39.03 – 16.09%**	**27,304**
USFS	**22**	**102.05 – 42.07%**	**106,708**
Out of State (Region)	**5**	**21.82 – 9.00%**	**13,621**
TOTAL	**58**	**242.54 – 100%**	**242,144**

State Wildfire Engines

13 State Wildland Engines are available as single resources or strike teams for in state or out of state assignments. CSFS staffs 4 of the engines with permanent engine crews assigned to CSFS Districts along the Front Range. The other 8 engines are pre-positioned at CSFS Districts or Fire Departments. The Type 6 engines are staffed by crews of three and the Type 4 engines are staffed with crews of four. Ordering is through the applicable interagency dispatch zone protocol. One additional engine was added to the fleet in late 2010. This engine serves as a reserve engine and is made available to a crew if a regular engine is in the shop and unavailable.

Significant events: State Engine crews assisted in treating over 5000 acres with prescribed fire and mechanical treatments. For the third year, four CSU interns from the Warner College of Natural Resources worked with the Fort Collins full time engine crew on mitigation and wildfire projects in Saguache, Las Animas, Boulder and Larimer Counties, and included two out of state assignments in Georgia and Northeastern Wyoming.

State wildland engines responded to 85 wildfire assignments in Colorado

The engine crews participated in 48 Prescribed Fire assignments and other hazard fuels mitigation projects.

In addition, with the crew's fire experience and background they were able to greatly expand the capacity of CSFS to provide crucial wildland fire training to fire protection districts, fire departments and college students across the state. Courses taught include the following NWCG "S" courses: 130, 190, 211,212, 410 as well as "L" Leadership courses and mentoring fire department personnel in various red card positions.

2011 State Engine Summary (December 1, 2010 – November 30, 2011)										
Engine # Lic Plate #	CSFS District	Engine Location	Type	In State Fires	Out of State Fires	Rx Fire Assists	Rx Acres	Other	Other Acres	False Alarms
612 344 DHS	AL	Alamosa	T-6	2	2	0	0	0	0	0
611 037 DHS	AL	Monte Vista Fed Ad. Site	T-6	12	0	3	2500	1	50	0
621 341 DHS	BO	Boulder	T-6	10	6	7	197	1	11	0
461 343 DHS	CC	Canon City	T-6	4	2	5	400	5	100	0
622 342 DHS	FC	Fort Collins	T-6	9	4	5	200	4	20	0
44 340 DHS	FC	Ft.Collins	T-4	6	1	0	0	5	20	0
623 554 TTX	FC	Reserve	T-6	1	1	2	200	1	2	0
841 339 DHS	GO	Golden	T-4	6	1	2	50	1	10	0
741 337 DHS	GO	Littleton Franktown	T-4	5	2	1	30	0	0	0
619	GR/SS	Granby	T-6	0	1	2	141	0	0	0
6131 572 A80	LJ	Hasty/ McClave	T-6	18	0	0	0	0	0	0
2061 3147 345DHS	WP	El Pas Colorado Springs	T-6	12	0	3	1150	0	0	4
2041 338DHS	WP	NE Teller Woodland Park	T-4	0	0	0	0	0	0	0
TOTALS				**85**	**20**	**30**	**4868 acres**	**18**	**213 acres**	**4**

State Wildfire Inmate Firefighting Team

A total of over 100 offenders were gainfully engaged in protecting Colorado's resources and of those offenders almost 80 have already released to parole or have transitioned into Community Corrections.

Assignments - total	Fires	Other	Days on Assignment	Days assigned to local/ county fires
35	31	4	156	89

Since 2002, a total of 10 Fire Seasons, Colorado Correctional Industries crews have had over 900 days on fire with a total cost savings of over $3.3m. (Cost savings is calculated by adding savings created due to additional earned time awarded to the offenders that accelerates their release date plus the estimated savings due to our lower cost)

In addition to fire assignments, crews completed numerous forest management projects for the CSFS, the new Parks & Wildlife, the USFS and various other County and local entities.

CSFS Technical Support and Coordination

- Fire Management Officers who facilitated Annual Operating Plans with 45 counties;
- Entry of fire department resources into the interagency Resource Ordering and Statusing System (ROSS);
- Interagency Wildland Fire Dispatch Centers supported by state seasonal dispatchers;
- New generation fire shelters for Wildland Inmate Fire Crews;
- Conversion by the CSFS of 140 Federal Excess Property Program (FEPP) vehicles to wildland engines that are on loan to fire departments;
- Computer kits and other equipment to Interagency Incident Management Teams;
- Wildland fire training for Volunteer Fire Departments and Fire Protection Districts;
- Protective equipment; and
- Coordination of wildfire protection with counties, states, and federal agencies; county, state, federal, and interstate agreements provided the framework for cooperative, coordinated response.

COLORADO FIRE FACTS

- *An average of 2,440 wildfires occur on state and private land each year.*
- *98 percent of wildfires are contained at less than 100 acres.*
- *County sheriffs and Fire Protection Districts are responsible for the control or extinguishment of wildfires.*
- *15 percent of wildfires are caused by lightning.*
- *More than 400 fire departments, counties, state, tribal, and federal agencies cooperate in wildfire protection.*
- *Wildfire response is supported through 6 interagency dispatch centers.*
- *Large wildfire costs can exceed $1 million per day.*
- *Colorado counties contribute $1 million annually for wildfire suppression.*
- *The State of Colorado has contributed, on average, $2.7 million annually for wildfire suppression that has exceeded county capabilities (five-year average).*

For more information, contact:

Richard Homann
Fire Division Supervisor
Colorado State Forest Service
Richard.Homann@Colostate.edu

National Guard: Helicopters:

National Guard Aviation and Ground resources were ready and available for use but due to the relatively light fire season were not used in 2011. National Guard conducted and hosted a multi-state training session and conducted proficiency missions for their heavy and medium water dropping helicopters (Chinooks and Blackhawks).

THE VALUE OF WILDFIRE PREPAREDNESS TO COLORADO

Wildfires do not recognize political boundaries. When conditions are right, wildfires burn with equal intensity and destructive power on private, state, tribal, and federal land.

Wildfires require that the resources of all public sectors be prepared to respond when the alarm sounds.

The Wildfire Preparedness Fund provides for consistent coordination, resource availability, and framework for volunteer fire departments, fire protection districts, county sheriffs and emergency managers, state resources, and federal agencies to obtain the resources necessary to battle wildfires.

High Profile Fires — Numerous wildland fires have occurred in Colorado during the past several years that illustrate the trend toward larger, more destructive fires. The Fourmile Canyon Fire in Boulder County in September 2010; the 2004 Picnic Rock in Larimer County; the 2009 Grammar Fire in Montrose County; the 2008 Ordway Fire in Crowley County; the 2007 New Castle Fire in Garfield County; and the 2006 Mato Vega Fire in Costilla and Huerfano counties are a few examples of large wildland fires in Colorado in recent years. It is important to note that some of these fires occurred in months not historically associated with high fire danger.

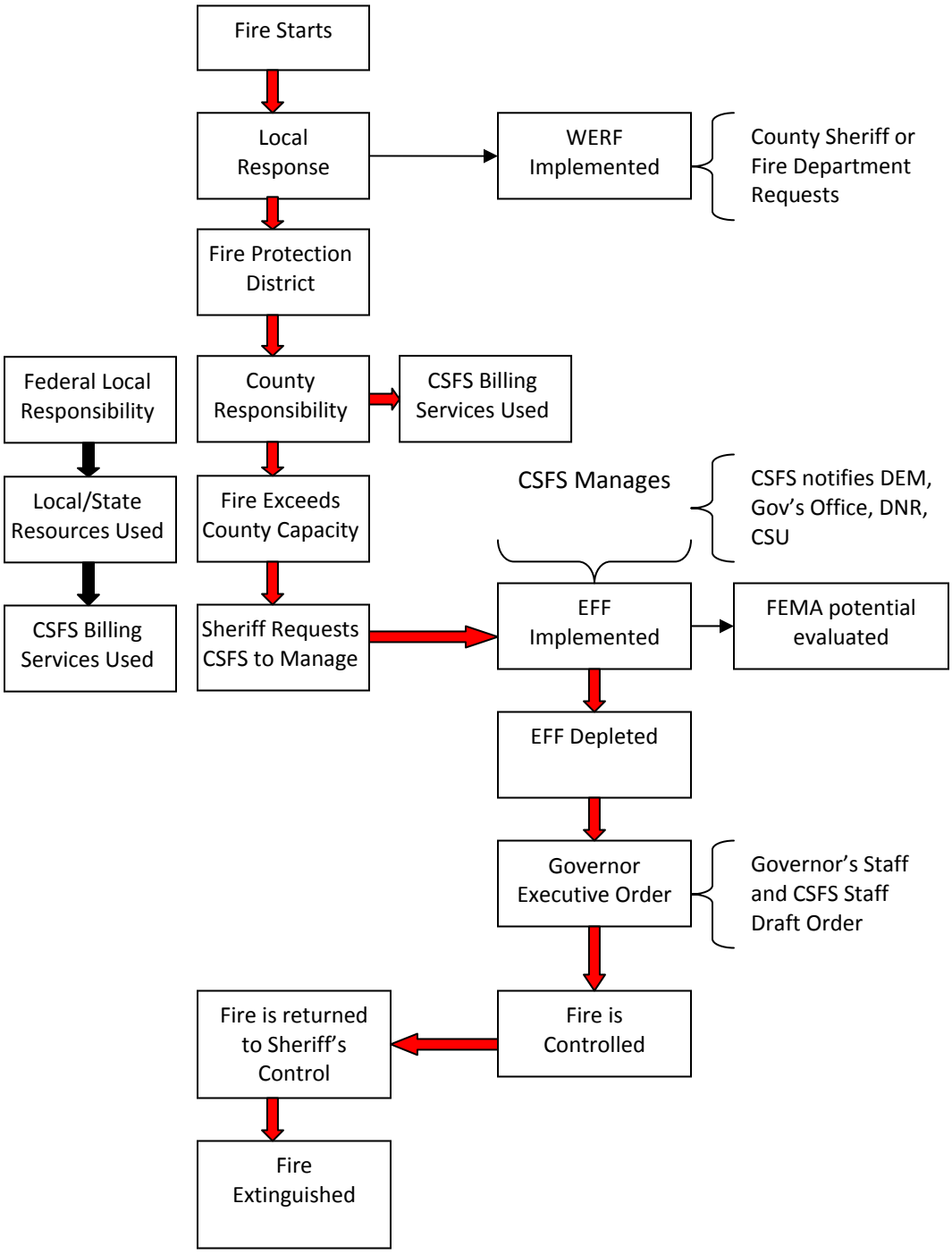
These high-profile fires are a small part of the story, as they reflect only 2 percent of wildfires that escaped extended attack and grew to exceed more than 100 acres. The communities, landowners, natural resources, and other values at risk affected by such fires benefit significantly from the coordination of resources across jurisdictions; such coordination is made possible by the Wildfire Preparedness Fund. The story these fires don't tell is that 98 percent of fires are contained or controlled before they exceed 100 acres because state resources, including engines and single engine air tankers (SEATs), National Guard ground and aviation resources, state correctional wildfire crews, and state fire management officers provided the means by which resources were prepared and readily available to respond across jurisdictional boundaries.

During the past 10 years, Colorado has experienced an average of 2,440 fires on private and state land per year with 38 of those fires exceeding 100 acres. (See tables on page 10 and 11)

The Wildfire Preparedness Fund enables the Colorado State Forest Service to secure and manage the availability of aerial fire resources, hire wildland engine crews, train and equip inmate handcrews, support National Guard resources, coordinate non-federal resources in the national interagency dispatch system, train volunteer fire departments and fire protection districts, and support interagency Incident Command Teams.

Wildfire Response in Colorado

Wildfires occur as unscheduled emergency events. The role of the state is to provide technical advice and assistance to local government, assume the management of wildfires that exceed the capacity of local governments upon the request of the sheriff or when wildfires threaten to become state emergencies or disasters, and at all times, provide for the safety of firefighters and the public.



Initial response comes from local fire departments; fire protection districts; sheriffs offices; USFS, BLM, NPS, FWS, BIA.

CSFS may provide technical assistance during initial response and will provide state resources upon request.

Agreements between CSFS, federal agencies, and counties provide a path for local fire departments to participate in fire response outside their local jurisdiction.

Wildland fire response is implemented through 6 Interagency Dispatch Centers.

Annual Operating Plans established with all responding agencies in a County facilitate coordinated response.

CSFS is the lead state agency for wildland fire management (Colorado Emergency Operating Plan

Brief Overview of Wildfire Suppression in Colorado

1973 Colorado Revised Statue, as amended: 23-31-202 Powers and duties of State Board of Agriculture; 23-31-203 Cooperation with governmental units; 23-31-204 Forest fires 23-31-206 Cooperative agreements; 23-31-304 State responsibility determined.

Local and County Responsibilities:

Fire Protection District Responsibilities: The 2009 Legislature passed SB09-020 which became **CRS 29-22.5.101 – 104**. Section 103 of this statute describes the general authority and responsibilities of Fire Protection Districts and County Sheriffs.

Sheriff Responsibilities: Colorado law identifies the sheriff as the fire warden for the county and the individual ultimately responsible for controlling or extinguishing prairie and forest fires on private & state lands within that county. **(CRS 30-10-513)** The state forestry role is to aid and assist the sheriff and county fire departments with this responsibility. The Colorado State Forest Service (CSFS) fulfills this role by providing training, equipment, technical assistance, and funding; and facilitating interagency mutual aid agreements and annual operating plans.

County Fire Planning - CSFS may assist County Commissioners and the County Sheriff in their role to prepare, adopt, and implement a county fire management plan **(CRS 30-11-124)** that details individual county policies on fire management for prescribed burns, fuels management, or natural ignition burns on lands owned by the state or county.

Cooperative Agreements – CSFS establishes and maintains cooperative agreements with federal agencies and counties in Colorado. These agreements provide the framework and basis for the various levels of government to cooperate in wildfire prevention, preparedness, mitigation, response, and administration.

The two Primary Agreements are:

1) **The Cooperative Fire Management Agreement** between the Colorado State Forest Service; the USDA Forest Service; the DOI agencies that include the Bureau of Land Management, the National Park Service, the Fish and Wildlife Service, the Bureau of Indian Affairs, and the Bureau of Reclamation. [1 Agreement]
2) **The Cooperative Fire (Watershed) Protection Agreement** between the Colorado State Forest Service and each of the individual counties. [64 individual agreements]

Secondary Agreements – CSFS establishes and maintains agreements with FEMA, counties, and fire departments for the purpose of access to federal assistance, administering county funds, providing equipment.

1) **FEMA /State Agreement.** CSFS is authorized by the Governor as the primary point of contact with FEMA when wildfires pose an imminent threat to life and property. CSFS requests and, if awarded, administers FEMA Fire Management Assistance Grants (FMAG). FMAGs provide for reimbursement of up to 75% of eligible costs in the suppression of catastrophic wildfires. No F&A (indirect) is assessed. [1 agreement]

2) **EFF Agreement** between CSFS and participating counties. [45 individual agreements]

3) **FEPP Equipment Agreement** between counties and/or fire departments. [140 individual agreements]

Mutual Aid Agreements & Annual Operating Plans - Each year, federal land fire agencies, state forestry, and counties meet to reach agreement on the sharing of firefighters and equipment if wildfires exceed a particular jurisdiction's resources. The intent of mutual aid is for all fire suppression agencies to work as a team, avoid duplication, and suppress wildfires efficiently. The Annual Operating Plan defines the limits of interagency cooperation, and contains a mobilization plan that identifies the location and availability of firefighters and equipment. [50 individual agreements]

Interagency Incident Management Teams - Once a wildland fire burns beyond the initial and extended attack capabilities of local forces, the local responsible agency often requests management assistance in the form of a local Incident Management Group or a Type II or Type I Incident Management Team. These teams are available across the nation; the Rocky Mountain Area currently has one Type I team, three Type II teams, and one Fire Use team. Rocky Mountain area teams are interagency, consisting of individuals from the private sector, local fire departments, counties, state and federal agencies.

Emergency Fire Fund (EFF) - This fund was established in 1967 by Counties that recognized that some wildfires may exceed the counties resources and ability to manage. - Participation in the EFF is voluntary. A 9 person committee comprised of county commissioners, sheriffs, fire chiefs, and the state forester oversees the administration of the fund. 43 Colorado counties and the Denver Water Board contribute to EFF. A county's annual assessment for EFF is calculated using a formula based on the acreage of private watershed and the annual property tax valuation. Counties with large amounts of private watershed land and a high assessed valuation pay more into the fund than rural counties with large acreage of federal lands and low assessed valuation. Emergency funding requests must originate from the county sheriff and State Forester approval is required. Once accepted, an EFF fire is managed under the direction of CSFS. No F&A (indirect) is assessed.

Wildfire Emergency Response Fund (WERF) **CRS 23-31-309** This State of Colorado fund was first designated and funded by the state legislature in 2002 reimburses a fire department or county for the first retardant load on state & private land initial attack fires at the request of the County Sheriff, Municipal Fire Chief, or Fire Protection District. In 2006 the legislature expanded authorities in the WERF to include reimbursement of 2 days of handcrew use with preference to state inmate crews. The goal is reduced suppression cost by attacking fires quickly to keep them small. No F&A (indirect) is assessed.

The Wildfire Preparedness Fund (WPF) and the Wildfire Emergency Response Fund (WERF) are authorized in Colorado Revised Statute 23-31-309.

WPF provides for the *availability and management* of resources. Those resources include Single Engine Air Tankers, state wildland fire engines, inmate hand crews, and National Guard resources when needed. WPF also supports Fire Management Officers, Fire Program Managers, CSFS Equipment Shop Operations, shelters for fire departments, interagency dispatch centers, state wildfire communication, prescribed fire management, and hazard fuels reduction. WPF was established in 2006 and operates on an annual budget of $3.25 million.

The value of WPF is the ability to have resources available through contract or agreement on a consistent basis and manage them responsibly based on current and predicted wildfire activity.

Cooperative Resource Rate Forms (Agreement)

CRRFs allow Counties, Fire Protection Districts, Fire Departments, and other State Agencies the means to list wildfire resources that they will make available within the state and nationally. CSFS manages the collection and entry of these resources into the National Resource Ordering and Statusing System. (252 individual agreements listing over 1500 pieces of equipment).

2001 thru 2010
WILDFIRE STATISTICS SUMMARY TABLE
NON-FEDERAL LANDS ONLY

		15%	3%	4%	13%	8%	6%	1%	3%	47%		
YEAR	Cause	Lightning	Campfire	Smoking	Debris	Arson	Equipment	railroad	Children	Misc	Total	
2010	number	309	138	178	220	27	227	33	74	2276	3482	Fires
	Acre	3067	1489	11	1483	880	13202	1585	148	44254	66119	Acres
2009	number	139	109	282	176	469	96	17	59	1626	2973	Fires
	Acre	758	3835	343	2656	5279	12877	109	75	15498	41430	Acres
2008	number	562	225	152	143	6	613	18	13	410	2142	Fires
	Acre	42725	1113	86	3078	80	13806	334	123	14226	75571	Acres
2007	number	870	110	65	87	192	173	18	114	455	2084	Fires
	Acre	8135	164	32	435	383	1123	179	158	4575	15184	Acres
2006	number	7	14	19	746	588	81	10	26	74	1565	Fires
	Acre	32	40	68	4322	9203	378	44	103	323	14513	Acres
2005	number	324	85	45	331	87	61	30	66	985	2014	Fires
	Acre	7686	105	25	1630	176	741	439	29	3615	14446	Acres
2004	number	229	34	43	300	73	42	27	56	1022	1826	Fires
	Acre	4553	9	20	7764	997	211	91	17	1631	15293	Acres
2003	number	435	15	58	276	80	66	13	39	1428	2410	Fires
	Acre	10126	9	79	2569	2585	2147	5	70	5686	23276	Acres
2002	number	334	30	91	454	234	45	25	66	1666	2945	Fires
	Acre	149453	12	2432	6899	1420	307	184	106	65693	226506	Acres
2001	number	521	51	76	384	234	88	17	104	1491	2966	Fires
	Acre	38479	30	205	1257	345	2014	10	153	3323	45816	Acres
10 year average	number	373	81.1	100.9	311.7	199	149.2	20.8	61.7	1143.3	2440.7	
	Acre	26501.4	680.6	330.1	3209	2135	4680.6	298	98.2	15882	53815	
	Percentage	15%	3%	4%	13%	8%	6%	1%	3%	47%	100%	

2001 thru 2010
WILDFIRE STATISTICS SUMMARY TABLE
NON-FEDERAL LANDS ONLY

Year	Size	Class A	Class B	Class C	Class D	Class E	Class F	Class G	Total			
2010	number	2748	531	146	25	16	13	3	3482	Fires		
	Acre	43	1020	3996	3746	8881	22252	26181	66119	Acres		
2009	number	2319	480	131	24	12	5	2	2973	Fires		
	Acre	43	988	3020	3307	5672	12400	16000	41430	Acres		
2008	number	1336	653	95	32	10	13	3	2142	Fires		
	Acre	103	1974	2681	5748	4393	23672	37000	75571	Acres		
2007	number	1404	553	106	12	7	2	0	2084	Fires		
	Acre	146	931	5113	3094	3134	2766	0	15184	Acres		
2006	number	226	1060	258	19	1	1	0	1565	Fires		
	Acre	30	2627	6937	3119	449	1351	0	14513	Acres		
2005	number	1345	558	75	23	11	2	0	2014	Fires		
	Acre	114	929	2040	4025	4338	3000	0	14446	Acres		
2004	number	1209	514	82	13	6	1	1	1826	Fires		
	Acre	81	758	2120	1716	1820	2400	6398	15293	Acres	Class A	0.0 to .25
2003	number	1708	590	88	10	8	6	0	2410	Fires	Class B	.26 to 9.9
	Acre	110	1006	2600	1630	4280	13650	0	23276	Acres	Class C	10 to 99
2002	number	1902	799	176	24	16	15	13	2945	Fires	Class D	100 to 299
	Acre	113	1398	5229	3623	8284	36879	170980	226506	Acres	Class E	300 to 999
2001	number	2055	789	97	13	7	4	1	2966	Fires	Class F	1000 to 4999
	Acre	190	1173	2655	1669	3129	7000	30000	45816	Acres	Class G	5000 +
10 year	number	1625.2	652.7	125.4	19.5	9.4	6.2	2.3	2440.7	98.47%		under 100 acres
average	Acre	0.06	1.96	29.02	162.5	472	2022.1	12459	22.05	93.33%		under 10 acres

Front Range Fuels Treatment Partnership
2010 Annual Report

Introduction

In 2010, Front Range Fuels Treatment Partnership (FRFTP) agencies treated 40,086 acres, bringing our seven-year total to 227,308 acres.

Agency	Acres Treated
CSFS	16,398
NPS	812
USFS	22,876
Total	40,086

In September 2010, the Fourmile Canyon Fire, approximately six miles west of Boulder, burned more than 6,000 acres over six days. The fire destroyed or damaged 168 homes and cost $217 million in insured loss, making it the most destructive wildfire in Colorado's recorded history. Days after the fire started, Sen. Mark Udall requested that then Gov. Bill Ritter and U.S. Department of Agriculture Secreatry Tom Vilsack conduct a comprehensive assessment of the fire. Gov. Ritter appointed the Colorado State Forest Service as the lead state agency for the assessment, in concert with the U.S. Forest Service. The U.S. Forest Service, Rocky Mountain Research Station, was chartered to produce an assessment that could be used to inform decision-makers, land-management agencies, homeowners and other interested stakeholders about lessons learned from the fire. The final assessment will be available in early 2012.

Although the Partnership has treated significant acres to reduce hazardous fuels in the wildland-urban interface, the destructive effects of the Fourmile Canyon Fire reinforce the need for considerable fuels mitigation efforts in the coming years.

In 2010, Partnership agencies treated 40,086 acres of hazardous fuels on the Front Range, using a variety of funding mechanisms, including American Recovery and Reinvestment Act (ARRA) grants for forestry-related jobs. The grants helped engage more people in fuels treatment projects along the Front Range.

Colorado State Forest Service

Statewide Forest Resource Assessment and Strategy

In 2010, the Colorado State Forest Service (CSFS), with input from stakeholders throughout Colorado, completed the Colorado Statewide Forest Resource Assessment and Colorado Statewide Forest Resource Strategy. The assessment is the first geospatial analysis of forest conditions completed by the CSFS and provides an overview of Colorado's important forest landscapes. The strategy, which accompanies and builds on the assessment, provides information on how to address threats to our forests and identifies opportunities to effectively leverage additional resources.

Community Wildfire Protection Plans

The passage of the Healthy Forests Restoration Act in 2003 expanded benefits for communities that create a Community Wildfire Protection Plan (CWPP) to help reduce wildfire hazards in the wildland-urban interface (WUI). In 2010, Colorado had more than 150 CWPPs in place, half of which apply to communities along the Front Range. In addition to providing technical assistance to communities during the development of CWPPs, the CSFS also reviews each CWPP to ensure that it meets development guidelines and minimum standards before giving it final approval.

2010 Forestry-Related Legislation

In 2010, the Colorado General Assembly passed eight bills that address forest health, fuels mitigation and public safety. The passage of these bills shows the importance and value Coloradans place on the state's forests. The legislation is aimed at promoting healthier, more diverse forests that are resilient to insect and disease epidemics for the benefit of present and future generations. For more information about the bills, visit www.csfs.colostate.edu.

American Recovery And Reinvestment Act

In addition, projects along the Front Range were implemented with American Recovery and Reinvestment Act of 2009 (ARRA) funding from the U.S. Forest Service. Nearly $5 million of the total $10.7 million received was awarded for projects along the Front Range. The following organizations were selected to receive ARRA funds to implement projects on the Front Range: Anchor Point Group, Boulder County, Coalition for the Upper South Platte, Colorado Youth Corps Association, Denver Mountain Parks, El Paso County Sheriff's Office, Perry Park Metropolitan District and the Town of Winter Park.

ARRA funds created and retained forestry-related jobs that helped implement high-priority forest restoration and fuels mitigation projects, as well as jobs affiliated with local wood products industries and CWPP development and planning projects. During the peak of the 2010 field season, ARRA-funded fuels treatment projects on 934 acres, supporting 173 jobs on the Front Range.

CSFS District Treatment Accomplishments

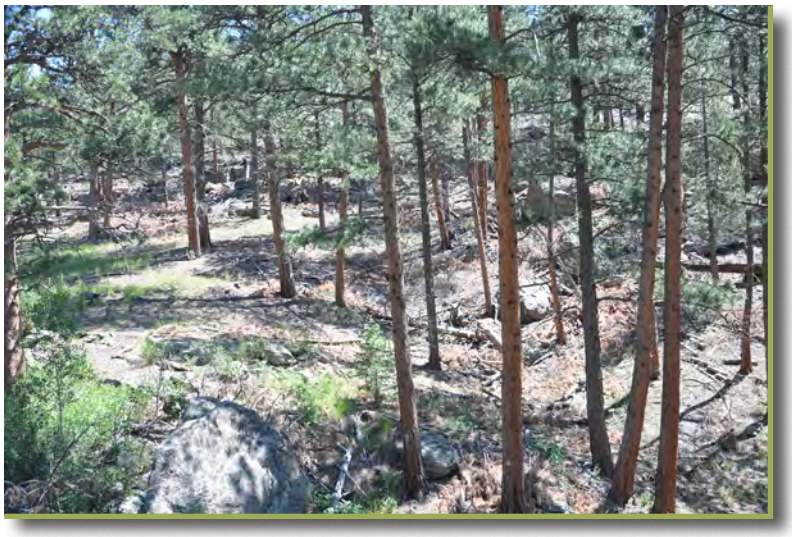
In 2010, the six Colorado State Forest Service districts participating in the Front Range Fuels Treatment Partnership – Boulder, Fort Collins, Franktown, Golden, Granby and Woodland Park – actively treated a total of 16,398 acres on state and private land along the Front Range. Of the total acres treated to help reduce wildfire hazards, 14,720 were completed with mechanical and non-mechanical methods (including ARRA-funded fuels treatment projects on 934 acres) and 1,678 acres with prescribed burns. Following are highlights of on-the-ground accomplishments for the six Front Range CSFS districts.

CSFS District	Thinning	Prescribed Fire	Total Acres
Boulder	806	0	806
Fort Collins	1,426	81	1,507
Franktown	843	0	843
Golden	4,181	139	4,320
Granby	4,505	825	5,330
Woodland Park	2,959	633	3,592

Boulder District Highlighted Projects

The cities of Boulder and Longmont used funding available through the district to thin vegetation on city-owned properties. Boulder Open Space and Mountain Park (OSMP) completed two projects that reduced the amount of hazardous fuels on 120 acres adjacent to populated forestland. The work was performed by the OSMP fire mitigation crew.

Longmont follows a forest stewardship plan for the Button Rock Preserve west of the city. The preserve surrounds Ralph Price Reservoir, a Longmont water source, and an overabundance of trees has made the forest more susceptible to wildfire, insect outbreaks and diseases. To protect its water source, the city is reducing tree densities. In 2010, private contractors and city employees thinned 146 acres. Four private landowners adjacent to the preserve also have forest stewardship plans and actively manage their land for fire resiliency and overall forest health.



Button Rock Preserve

Fort Collins District Highlighted Project

The Ben Delatour Scout Ranch is located 45 miles northwest of Fort Collins near the community of Red Feather Lakes. The forestry merit badge is one of 30 badges a scout can work toward while staying at the ranch.

In 2010, an 80-acre fuels reduction project was completed. In addition to reducing the amount of burnable material available to a fire, the project improved forest health, met forest management plan and CWPP objectives, and provided training and learning experiences for Boy Scouts, Colorado State University forestry students and citizen volunteers.

After receiving training, CSU students thinned trees with chainsaws and had an opportunity to gain hands-on experience with timber harvesting and wood processing equipment. The Larimer County Wildfire Mitigation crew cut the remainder of the 80 acres. Two local contractors assisted in large tree removal and site cleanup, and CSFS volunteers chipped the branches. Boy Scouts and volunteers removed the firewood, and when weather permitted, Boy Scouts and CSU students safely burned piles.

Treated area at Ben Delatour Scout Ranch

CSU student operates portable saw

Franktown District Highlighted Project

The residents of Deerfield and Pinewood Knolls subdivisions are motivated after completing a 218-acre fuels reduction and forest health improvement project. The adjacent subdivisions are south of State Highway 86 and east of State Highway 83 in the northern reaches of the Black Forest.

Sixty-seven landowners each treated the required two-acre minimum. The goal was to remove all oak thickets and small trees less than eight inches in diameter that have replaced native grasses over the decades, increasing wildfire risks. To complement the work on private land, Douglas County included an 18-acre open space parcel between the subdivisions in the fuels mitigation project.

An Elizabeth contractor masticated vegetation smaller than 8 inches in diameter. Trees larger than 8 inches in diameter were manually or mechanically thinned and utilized by a local furniture and firewood company in Elizabeth.

The interest generated by the project has prompted discussion about implementing a similar project in 2011 that would include additional landowners in the two subdivisions, as well as two neighboring subdivisions.

Before treatment

After treatment

Golden District Highlighted Project

Located north of Conifer, Staunton State Park is not yet open to the public. The planned visitor center and campground are in an area with large ponderosa pine, interspersed with Douglas-fir, aspen and Rocky Mountain juniper. Young Douglas-fir and ponderosa pine trees grow in the understory.

Partnering with Colorado State Parks, the Golden District has implemented several forest improvement projects at Staunton. In 2010, the district completed a 66-acre fuels reduction project in the future visitor center and campground area. The project emphasized removal of vegetation that could potentially help fire move from the ground into the tree tops. Canopy spacing between mature trees was increased, and tree species diversity was improved. A mechanical masticator completed the work.

Staunton State Park project in progress

Staunton State Park after treatment

Granby District Highlighted Projects

The Granby District worked with three landowners near the town of Tabernash to clear 37 acres of dead lodgepole pine and create a fuelbreak for homes in the area. A local contractor cut the trees. The large trees will be milled, while smaller trees will be used as firewood, fencing material, wood pellets and biomass. The tree branches were piled for future burning.

Project near Tabernash

Just below Lake Granby along the Upper Colorado River spillway, several fuels mitigation projects are underway that, together, will help protect water quality below the lake. The district worked with two of the landowners and consulted with the Northern Colorado Water Conservancy District to ensure that no work was occurring on the project when spring water released from the lake could inundate part of the project area. In 2010, a Grand County contractor, cut and removed more than 76 acres of dead lodgepole pine on the two properties. Wood was utilized as saw logs, post and pole, and pellet/biomass raw material. The remaining nine acres will be completed in 2011.

Project below Lake Granby

Woodland Park Highlighted Project

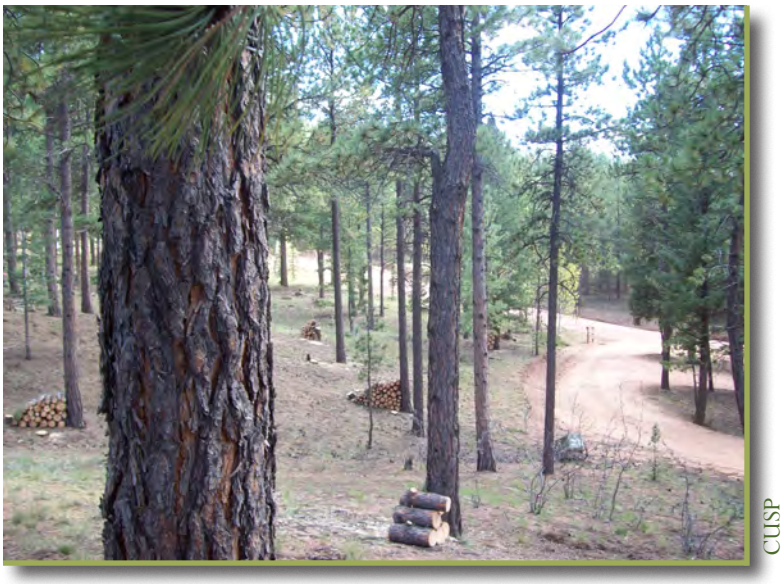
The Ridgewood subdivision in Teller County was evacuated eight days during the 2002 Hayman Fire. Back in their homes, residents began conversing about how to protect the subdivision from the next wildfire. In 2008, the community's efforts and plans were officially documented in a CWPP, which was revised in 2010.

Twice during 2010, residents gathered to chip slash collected from work conducted on individual properties. Slash was collected on 14 properties, resulting in 205 hours of accrued volunteer labor. In addition, the CWPP committee completed a two-acre fire mitigation project in a day, adding to their volunteer labor.

The Coalition for the Upper South Platte crew joined the effort, initiating a 26-acre project across nine contiguous properties (one property is outside the subdivision). The project, which was scheduled for completion in spring 2011, is in the vicinity of a 1,090-acre U.S. Forest Service mitigation project.

The National Firewise Program recognized the efforts of Ridgewood residents by naming them the first National Firewise Community in Teller County.

Back side of Ridgewood subdivision



CUSP

A closer look at work in Ridgewood subdivision

Broomfield Office

In 2010, the CSFS Broomfield Office staff of the Colorado State Forest Service continued to provide co-leadership in FRFTP operations, and management of FRFTP grants. Staff also were involved in joint efforts to protect Front Range watersheds from severe wildfires. The staff have an ongoing partnership with Colorado State Parks to provide support for fuels treatment projects on park land. FRFTP funds, primarily provided through State Fire Assistance (SFA) grants, along with a Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant and Great Outdoors Colorado (GOCO) funds, enhance the effectiveness of treatments on state parks along the Front Range.

National Park Service

During 2010, the fire and fuels management crew completed several fuels reduction projects in the wildland-urban interface at Rocky Mountain National Park (ROMO), Great Sand Dunes National Park and Preserve (GRSA) and Florissant Fossil Beds National Monument (FLFO). A total of 812 acres were treated on all park units, including 23 acres of broadcast burning.

2010 Hazardous Fuels Reduction Projects

Manual Fuels Reduction (Contracted): 166 acres

- Completed 130 acres of manual fuels reduction work along the US Highway 34 corridor near the Kawuneeche Visitor Center (ROMO)
- Completed an additional 36 acres of manual fuels reduction work along the park boundary adjacent to the Columbine subdivision (ROMO)

Manual Fuels Reduction (Park Staff): 8 acres

- Treated eight acres along the Aspen Trail (GRSA)

Broadcast Burning: 23 acres

- Burned 21 acres near South Lateral Moraine adjacent to Bear Lake Road and the YMCA of the Rockies (ROMO)
- Treated two acres of beetle-killed lodgepolepine in a pilot project utilizing prescribed fire to remove red needles from beetle-impacted trees northeast of Deer Ridge Junction (ROMO)

Piles ready for winter burning in Rocky Mountain National Park

Small Pile Burns: 101 acres

- Completed 60 acres of small pile burning on Deer Mountain (ROMO)
- Completed eight acres of small pile burning along the park boundary near Grand Lake (ROMO)
- Burned 33 acres of small piles at Florissant Fossil Beds National Monument during the winter 2010

Broadcast Burn Prep: 194 acres

- Park staff treated 25 acres in preparation for broadcast burning on North Lateral Moraine (ROMO)
- Treated 169 acres in and adjacent to the Liberty burn unit south of the community of Crestone (GRSA)

Structure Defense Treatment: 42 acres

- Completed 32 acres of structure defense treatment in Wild Basin (ROMO)
- Completed 10 acres of structure defense treatment in the Great Sand Dunes National Park and Preserve Headquarters area

Chemical Treatment: 278 acres

- Completed 150 acres of chemical spraying for cheatgrass control in Beaver Meadows (ROMO)
- Sprayed 58 acres for cheatgrass control on South Lateral Moraine (ROMO)
- Sprayed 70 acres for cheatgrass control on North Lateral Moraine (ROMO)

Rural Fire Assistance Grants

Fiscal Year 2010 – $27,000 in grant funding was distributed to local volunteer fire departments for basic wildland fire safety equipment, tools, supplies and training

- $9,000 to the Allenspark Fire Protection District
- $7,000 to the Estes Park Volunteer Fire Department
- $3,800 to the Glen Haven Volunteer Fire Department
- $7,200 to the Grand Lake Fire Protection District

Community Fire Assistance Grants

Fiscal Year 2010 – $15,000

- $10,000 to the community of Allenspark for continued development of a CWPP and community education efforts
- $5,000 to the Estes Park Volunteer Fire Department for implementation of property risk assessments and community education efforts

Community Outreach and Education

The park conducts an active fire education program that seeks to raise awareness among the general public, and facilitates collaborative efforts with adjoining private landowners and local municipal, county and state governments.

U.S. Forest Service

Arapaho And Roosevelt National Forests

The Arapaho and Roosevelt National Forests (ARNF) treated a total of 17,232 acres. Of the total, 14,107 acres were accomplished through mechanical thinning and 3,125 through prescribed fire. The Stimulus Bill (American Recovery and Reinvestment Act of 2009 [ARRA]) authorized funds for a number of purposes, including wildland fire management projects, and was signed by President Obama in 2009. In 2010, the ARNF received more than $2.7 million in funding related to this bill, which allowed a substantial increase in acreage treated to reduce hazardous fuels. Personnel from the ARNF and the Pike National Forest continued implementation of a 10-year Long-Term Stewardship Contract (LTSC), which was awarded to West Range Reclamation in July 2009. The contract has enhanced efforts to reduce hazardous fuels, especially in facilitating biomass removal. Forest personnel continued to assist local communities and the Colorado State Forest Service in developing Community Wildfire Protection Plans. Planning was completed for nearly 6,000 acres of hazardous fuels reduction treatments.

The ARNF, along with the White River and Routt National Forests and numerous other cooperators, continued efforts associated with the Colorado Bark Beetle Cooperative to address the mountain pine beetle epidemic occurring in north central Colorado. Treatments on the Sulphur Ranger District are being planned in an integrated manner to support the goals and objectives of both the Front Range Fuels Treatment Partnership and the Northern Front Range Mountain Pine Beetle Working Group. In 2010, mountain pine beetle continued to expand substantially east of the Continental Divide. Through the Northern Front Range Mountain Pine Beetle Working Group, ARNF personnel are collaborating with personnel from Boulder, Clear Creek, Gilpin, Jefferson, and Larimer counties, the Colorado State Forest Service and Rocky Mountain National Park to coordinate treatment efforts.

In August 2010, the ARNF and Pike and San Isabel National Forests, in cooperation with the Front Range Roundtable, developed a successful Collaborative Forested Landscape Restoration (CFLR) Project proposal. The project received $1 million in funding in 2010. The ARNF received $428,000 for implementation of the Taylor Restoration and Hazardous Fuels Reduction Project. In addition, the Miller Restoration and Hazardous Fuels Reduction Project was implemented with ARRA funds. The project also accomplishes the objective of the CFLR project. The CFLR also requires a multi-party monitoring effort. The ARNF and Pike and San Isabel National Forests entered into an agreement with the Colorado Forest Restoration Institute to facilitate development of a monitoring program.

More than $2.7 million in ARRA funds allowed a substantial increase in acreage treated to reduce hazardous fuels.

South Zone Fuels Program (Boulder & Clear Creek Ranger Districts)

In 2010, hazardous fuels reduction treatment was accomplished on 7,012 acres within the wildland-urban interface. Of these acres, 6,203 were accomplished through mechanical thinning and 809 through prescribed fire.

Sugarloaf Fuels Reduction Project – The Sugarloaf Fuels Reduction Project covers approximately 5,000 acres. The project decision notice was signed in January of 2004. Located just west of Boulder, the Peak-to-Peak Scenic Byway defines the western boundary of the project area. In 2010, crews continued operations in the project area and 356 acres were treated or are under contract to be treated. Treatments include forest thinning and piling, and prescribed burning.

James Creek Fuels Reduction Project – The decision notice for this project was signed in September 2004 and includes 6,402 acres of treatment. Treatment on approximately 3,285 acres was accomplished in 2010.

Evergreen Fuels Project – The project decision notice was signed on this 1,000-acre project in 2004; the project is located in the Yankee Creek area within the Elk Creek Fire Protection District near Evergreen. In 2010, crews continued operations in the Evergreen project area and approximately 258 acres were treated or are under contract to be treated.

St. Vrain Project – This Healthy Forest Restoration Act (HFRA) project decision identified approximately 2,650 acres of proposed treatment. The project gives priority to community and neighborhood protection with some emphasis on wildlife habitat and forest restoration in specific areas. Treatment was accomplished on more than 2,600 acres in 2010.

Yankee Hill Project – The project is an Integrated Landscape Design to Maximize Fuel Treatment Effectiveness Pilot Project. The team formulated areas consisting of 1,000 to 3,000 acres for potential treatment that focused on neighborhood/community protection, with special attention on watershed and recreation resource protection. The planning effort was completed in 2007 and identified nearly 1,500 acres for treatment. Implementation continued in 2010 with treatment of 18 acres.

Lump Gulch Project – The decision to treat 1,642 acres in this project area located just south of Nederland was signed in 2009. Implementation began in 2010 with the treatment of 78 acres.

Taylor Park in Roosevelt National Forest

Canyon Lakes Ranger District

In 2010, hazardous fuels reduction treatment was completed on 7,130 acres, and more than 90 percent occurred within the wildland-urban interface. Of these acres, 5,213 were treated through mechanical thinning and 1,917 acres through prescribed fire. In addition, decisions were made to reduce hazardous fuels on nearly 5,400 acres.

Crystal Lakes Fuels Reduction Project – Located north and west of the community of Red Feather Lakes, the Crystal Lakes subdivision has been recognized as a Firewise Community/USA. The decision document

was signed in 2004, and treatment areas were completely laid out. Treatments include forest thinning, prescribed burning and biomass removal. In 2010, 23 acres were treated to reduce hazardous fuels.

Sheep Creek 1 – The last portion of this project was implemented with the award of the Front Range Long-Term Stewardship Contract. A task order for treatment of 788 acres was issued in 2010.

Sheep Creek 2 – The project area plan decision notice was signed in 2004. The project includes mechanical treatment and prescribed fire on 4,200 acres. In 2010, 1,961 acres were treated, including 1,027 acres of mechanical treatment and 934 acres using prescribed fire. The prescribed fire was implemented in cooperation with the Colorado Division of Wildlife.

Stringtown West Fuels Reduction Project – At approximately 4,062 acres, this project was analyzed with a categorical exclusion (CE). The project complements previous projects that were completed in the area on National Forest System land and extends work being done by the Colorado State Forest Service in conjunction with homeowners in the area. A decision on this project was made in 2006. A lawsuit in a California District court challenging the use of categorical exclusions on these types of projects required that this project be re-analyzed in 2009. In 2009, a new decision was made and in 2010, 861 acres were treated with the LTSC.

Lone Tree Fuels Reduction Project – The project involves approximately 2,400 acres. A decision on this project was made in 2006. A lawsuit in a California District court challenging the use of categorical exclusions on these types of projects required that this project be re-analyzed in 2009. No additional acres were treated in 2010.

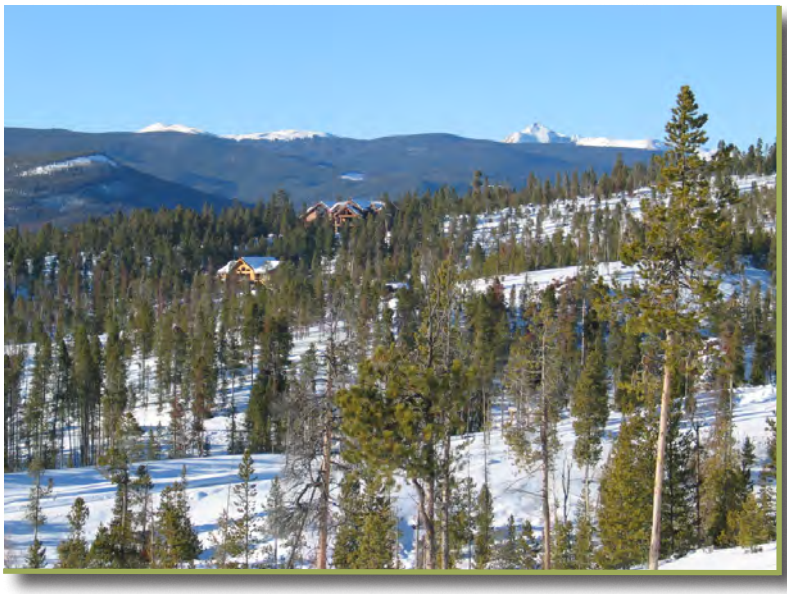
Pingree Hill Fuels Reduction Project – The project involves approximately 2,400 acres and is a wildland-urban interface project that includes numerous acres of private land. A decision on this project was made in 2007. A lawsuit in a California District court challenging the use of categorical exclusions on these types of projects required that this project be re-analyzed in 2009. A new decision was made in 2009 and, in 2010, 87 acres were treated.

Estes Valley Fuels Reduction Project – This project surrounds the community of Estes Park and is a Healthy Forests Restoration Act (HFRA) project. A decision was made in 2005 to treat more than 7,500 acres to reduce hazardous fuels. This wildland-urban interface project includes numerous acres of private land. Many private landowners are engaged in fuels reduction activities guided by the Colorado State Forest Service. Treatment on private land is being integrated into the planning of this project on National Forest System lands. Implementation continued in 2010 with treatment on approximately 1,051 acres.

Wood awaiting removal from Taylor Park

Browns Park Beetle Salvage Project – The project involves treatment of approximately 249 acres to reduce hazardous fuels and hazard trees resulting from tree mortality associated with the mountain pine beetle epidemic. This project is a result of significant tree mortality caused by mountain pine beetles in the Laramie RiverValley. A decision on this project was made in 2008. No additional treatment was implemented in 2010.

Red Feather Fuels Reduction Project – Planning was completed on this project in 2008. Several CWPPs have been approved in the project area. More than 23,000 acres of National Forest System lands were analyzed for treatment, and hazardous fuels reduction treatments were identified on more than 15,800 acres. Implementation continued in 2010 with 24 acres treated.



Arapaho National Forest, Green Ridge

Sulfur Ranger District

In 2010, hazardous fuels reduction treatment was accomplished on 3,090 acres to reduce the adverse effects of the mountain pine beetle epidemic. Of these acres, 2,691 were accomplished through mechanical treatments and 399 through prescribed fire. In addition, a decision was made to reduce hazardous fuels on more than 1,500 acres. The ongoing mountain pine beetle epidemic continues to increase the hazardous fuels workload.

Willow Creek Salvage/Fuels Reduction Project – The project area, located northwest of Granby and north of Hot Sulphur Springs, will reduce hazardous fuels and treat the effects of an ongoing mountain pine beetle epidemic. The project, initiated in 2007, analyzed the need for treatment on 70,000 acres. A decision was signed in 2009 to treat more than 2,400 acres. In 2010, implementation began with 1,800 acres included in a timber sale contract and 223 acres in the LTSC. A second decision to treat several thousand acres with prescribed fire is pending.

Arapaho National Forest, near Mountain Shadow Reservoir

Arapaho National Recreation Area Forest Health Project – Located within the Arapaho National Recreation Area, the project will reduce hazardous fuels and treat the effects of an ongoing mountain pine beetle epidemic. A record of decision (ROD) addressing areas outside of inventoried roadless areas was signed in 2004. In 2005, a ROD addressing treatment within inventoried roadless areas also was signed. Implementation of this project continued in 2010 with treatment of 369 acres of hazardous fuels.

Upper Fraser Valley Forest Health Project – The project area is located west of the Winter Park Ski Area and includes portions of the Fraser Experimental Forest. This project was completed under HFRA authorities. The project will reduce hazardous fuels and treat the effects of an ongoing mountain pine beetle epidemic. A decision was made in fall 2005 to treat nearly 3,700 acres. In 2010, approximately 289 of these acres were treated or under contract to be treated.

Developed Sites Hazard Mitigation – The ongoing mountain pine beetle epidemic has killed numerous trees in high-value recreation sites. The number of dead trees created circumstances that increase windthrow risk of green trees. This resulted in the need for large-scale hazard mitigation in a number of high-value recreation sites. In 2010, more than 103 acres were treated to remove the wildland fire and safety hazards created by the mountain pine beetle.

Winter Park Vegetation Management Project – In 2010, a decision was made to implement hazardous fuels reduction and hazard tree mitigation on more than 1,500 acres in the Winter Park Ski Area, and treatment was completed on 306 acres.

Pike National Forest

The Pike National Forest collaborates with land managers, fire managers, emergency managers, community groups and private landowners throughout the Front Range to reduce wildfire risk. The administrative unit encourages strategic planning to identify the most appropriate methods for reducing wildfire risk and engaging diverse stakeholders in the planning process.

In 2010, 5,644 acres were treated on the forest. Following is the breakdown of accomplishments by ranger district:

Pikes Peak Ranger District

In 2008, the Roundtable launched the Woodland Park Healthy Forest Initiative (WPHFI) in an effort to demonstrate the effectiveness of focusing the attention and resources of multiple organizations on achieving community protection and ecological restoration across boundaries in a high priority landscape. The initiative has become a model for landscape-scale forest management that improves community protection; restores watershed, wildlife and other ecological values; and provides economic opportunities for local residents and businesses. Some notable accomplishments include treating two times the number of acres treated in a one-year period (from about 2,000 across public and private lands in 2008 to more than 5,156 acres on National Forest System lands in 2009).

Pike National Forest, Harris Park before treatment

Pike National Forest, Harris Park after treatment

Following is a summary of the acres treated on projects within the Pikes Peak Ranger District. ARRA funded the Stone Gulch and Ryan Quinland projects; CFLR funded the Phantom 1 Project.

Project	Acres
Trout West	*650
Ryan Quinland	100
Stone Gulch	380
Phantom 1	600
Total Acres	1,730

* includes 400 acres of prescribed fire

In 2011, the district will work on an Environmental Impact Statement (EIS) for Catamount (approximately 122,000 acres). In addition, an Environmental Assessment (EA) for Trout West Phase II (approximately 4,000 acres) has an estimated completion date of July 2011.

South Park Ranger District

In 2010, the South Park Ranger District treated a total of 2,418 acres. Of the total, 1,333 acres were accomplished through prescribed fire (FS crews) and 1,085 acres through mechanical treatments – 437 acres with FS crews and 648 acres through the Long-Term Stewardship Contract.

All work was completed in wildland-urban interface areas of the Sledgehammer and Rocky Messenger project area southwest of Lake George. The project includes a critical South Platte River watershed, one of only two remaining areas in the montane zone on the South Platte River that has not been burned in a wildfire. The heavily used Eleven Mile Canyon Recreation Area and numerous subdivisions are located throughout the area.

In addition, the district laid out more than 2,000 acres for treatment through future stewardship contracts in the Rocky Messenger Project area just outside Lake George and on the South Platte and Pikes Peak Ranger districts. The district dozer completed numerous roller-chopping, crushing and piling projects across the Pike and San Isabel National Forests.

Pike National Forest, Harris Park before treatment

Pike National Forest, Harris Park after treatment

South Platte Ranger District

In 2010, the South Platte Ranger District accomplished 1,496 acres of hazardous fuels reduction treatments, primarily within the wildland-urban interface. The district, along with adjacent administrative units, secured a five-year agreement with Denver Water to expedite treatments within the greater Upper South Platte Watershed.

The Denver Water agreement will facilitate restoration of fire-adapted ecosystems, protect critical watershed attributes and water provider infrastructure, improve community safety, enhance training and education opportunities, and increase overall fire management capacity. To match Denver Water's commitment, the U.S. Forest Service is required to utilize appropriated funds to:

- Complete all applicable agency planning requirements prior to project implementation, including NEPA requirements, burn plan preparations and other planning documents
- Provide expertise, resources and assistance for the purposes of fuels management, per agreements identified in individual task orders and entered into by the parties under this Agreement
- Prepare monitoring plans to include pre- and post-treatment monitoring and evaluation activities as articulated in individual task orders and entered into by the parties under this Agreement
- Complete access and permission agreements with third parties for cooperative projects on non-federal lands
- Complete jointly agreed upon matching projects within the term of the agreement, resulting in a $2 million investment annually for the next five years

The South Platte Ranger District committed to a substantial effort to define the scope of treatments that will be implemented over the five-year partnership agreement with Denver Water. Within Denver Water's Zones of Concern, 8,600 acres were identified for treatment over the five years of the partnership. During Fiscal Year 2010, layout, pre-treatment monitoring and other preparatory work was completed on 1,700 acres of treatment units that will be part of the FY2011 and FY2012 programs of work. Biological surveys were completed on more than 6,000 acres that are part of the FY2010 through FY2012 programs of work. Cultural resource surveys were contracted on 2,500 acres that are part of the FY2012 and FY2013 programs of work.

After treatment in Harris Park

Living with Fire in Colorado

Patricia Champ, USDA Forest Service, Rocky Mountain Research Station
Hannah Brenkert-Smith, University of Colorado, Institute of Behavioral Sciences

In 2011, an article was published in Fire Management Today (Volume 71, No. 2) that characterized the residents in the Fourmile evacuation zone based on responses to a 2007 survey of homeowners in the wildland-urban interface; the survey was funded by Larimer and Boulder Counties. Homeowners in the Fourmile evacuation zone were 'somewhat' or 'very aware' of wildfire risk when they purchased their property. These respondents also reported a high level of concern about their home being damaged in the event of a wildfire. Likewise, most of the respondents had completed some wildfire risk mitigation activities. The full results are described in the Fire Management Today article.

Homeowners in the Fourmile evacuation zone were 'somewhat' or 'very aware' of wildfire risk when they purchased their property.

Following major wildfires that occurred in Boulder and Larimer counties in 2010, a revised version of the 2007 survey was administered to homeowners living in the wildland-urban interface areas of the two counties who had responded to the original survey. The 2010 data will allow for an assessment of whether and how attitudes, expectations and wildfire risk mitigation behaviors change after major wildfire events. Preliminary results suggest the 2010 survey respondents have been affected by wildfire, as almost 86 percent said that they had a wildfire less than 10 miles from their property (8 percent reported that a wildfire had been on their property). Likewise, 59 percent of the respondents reported smoke and/or fire damage at their current residence.

Rehabilitating Slash Pile Burn Scars in Colorado Front Range Forests

Paula Fornwalt and Chuck Rhoades, USDA Forest Service, Rocky Mountain Research Station

Slash pile burning is a widespread fuels reduction treatment because of its practicality and cost-effectiveness, yet it often has undesirable impacts on soils and plants within the burned area. Simple slash pile scar rehabilitation treatments may be sufficient to alter soil properties in favor of native species establishment. Here, we report on two related projects that are examining the impacts of slash pile burning on plants and soils and the effectiveness of rehabilitation treatments at reestablishing plants and restoring soil properties within scars.

Control slash pile burn scar

The first project was initiated in 2008 to examine the influence of slash pile burning on soils and plants in three lodgepole pine-dominated stands on the Colorado Front Range, and to compare the relative effectiveness of mulching, scarifying and seeding at rehabilitating slash pile burn scars. Sampling occurred near Nederland, Colo., on lands owned and managed by Boulder County Parks and Open Space (BCPOS). Stands were thinned and piled by hand in the summer of 2005 or 2006, and the piles were

burned in the winter of 2006-7 or 2007-8. In June 2008, three surface treatments – woodchip mulch, soil scarification and untreated control – were applied to burn scars (Figure 1). Half of each scar also was seeded with a mix of three native perennial grasses. Plants and soils data were collected in late summer 2008 and again in late summer 2009. We found that pile burning diminished native richness and cover, and increased soil nitrogen, particularly in the interior of burn scars where fire severity was greatest. Rehabilitation treatments appear to be useful tools for reversing pile burning impacts on soil and plants. Mulching dampened the post-fire increase in soil N, and scarifying, scarifying plus seeding and mulching plus seeding were effective at encouraging native plant development, while simultaneously minimizing exotic plant colonization. For more information on this project, see our article in Natural Areas Journal titled "Rehabilitating slash pile burn scars in upper montane forests of the Colorado Front Range" (Volume 31(2), pages 177-182).

In 2009, a second project was initiated to expand the scope of our initial work. This project utilizes 20 sites distributed throughout ponderosa pine-dominated and lodgepole pine-dominated forests of Larimer and Boulder counties. Three sites are located on BCPOS land and 17 are located on U.S. Forest Service land. In October to November 2009, four surface treatments (untreated, scarified, slash mulched by layering woody branches on the scar surface and mulched with wood chips) combined with two seeding treatments (unseeded and seeded with a diverse mix of native grasses and forbs) were installed at all 20 sites. Plants and soils data collection occurred in 2010; sampling also will occur in 2011. As results from this study become available in the next few years, further insight into the effects of slash pile burning and the effectiveness of rehabilitation treatments will be gained.

Scarifying a pile scar

Mulch applied to a pile scar

Front Range Roundtable

In 2004, the Front Range Roundtable formed to "serve as a focal point for diverse stakeholder input into efforts to reduce wildland fire risks and improve forest health through sustained fuels treatment along the Colorado Front Range."

The Roundtable is a coalition of representatives from state and federal agencies, local governments, environmental and conservation organizations, academic and scientific communities, and industry and user groups, all with a commitment to forest health and wildland fire risk mitigation on the Front Range. The Roundtable's focus area encompasses 10 Front Range counties – Boulder, Clear Creek, Douglas, El Paso, Gilpin, Grand, Jefferson, Larimer, Park and Teller.

In 2010, the Front Range Roundtable made significant progress in several areas as recommended in its report titled Living with Fire: Protecting Communities and Restoring Forests (2006). The Roundtable completed most of the goals set for 2010. Among its successes, the Roundtable:

- helped submit a winning grant to the Collaborative Forest Landscape Restoration Program;
- worked with the Northern Front Range Mountain Pine Beetle Working Group and Watershed Wildfire Protection Work Group to define terms and definitions and collaborate on communications;
- held six events for elected officials from local, county, state and federal government to inform and encourage discussion on Front Range forest health and fire risks;
- brought industry and agency biomass utilization experts together to develop communication on the state of biomass utilization on the Front Range, and advocated for policy changes to encourage biomass use;
- updated priority treatment areas and identified three landscape-scale focus areas on the Front Range;
- invited communities in those focus areas to apply for a long-term partnership with the Roundtable to demonstrate forest restoration and wildfire mitigation; and
- considered its organizational structure and partnered with the Arapaho-Roosevelt National Forest Foundation to act as the Roundtable's fiscal agent.

To implement these accomplishments, the Roundtable convened four quarterly meetings in 2010. During the year, 100 different people, representing 48 organizations from 13 stakeholder groups, participated in at least one quarterly meeting.

In addition to quarterly Roundtable meetings, the executive team and the four working teams held another 85 meetings and conference calls that focused on the 2010 goals; 80 team members participated in these discussions. Since 2006, the Roundtable has worked or communicated with (via its email distribution list) more than 250 people from at least 90 organizations.

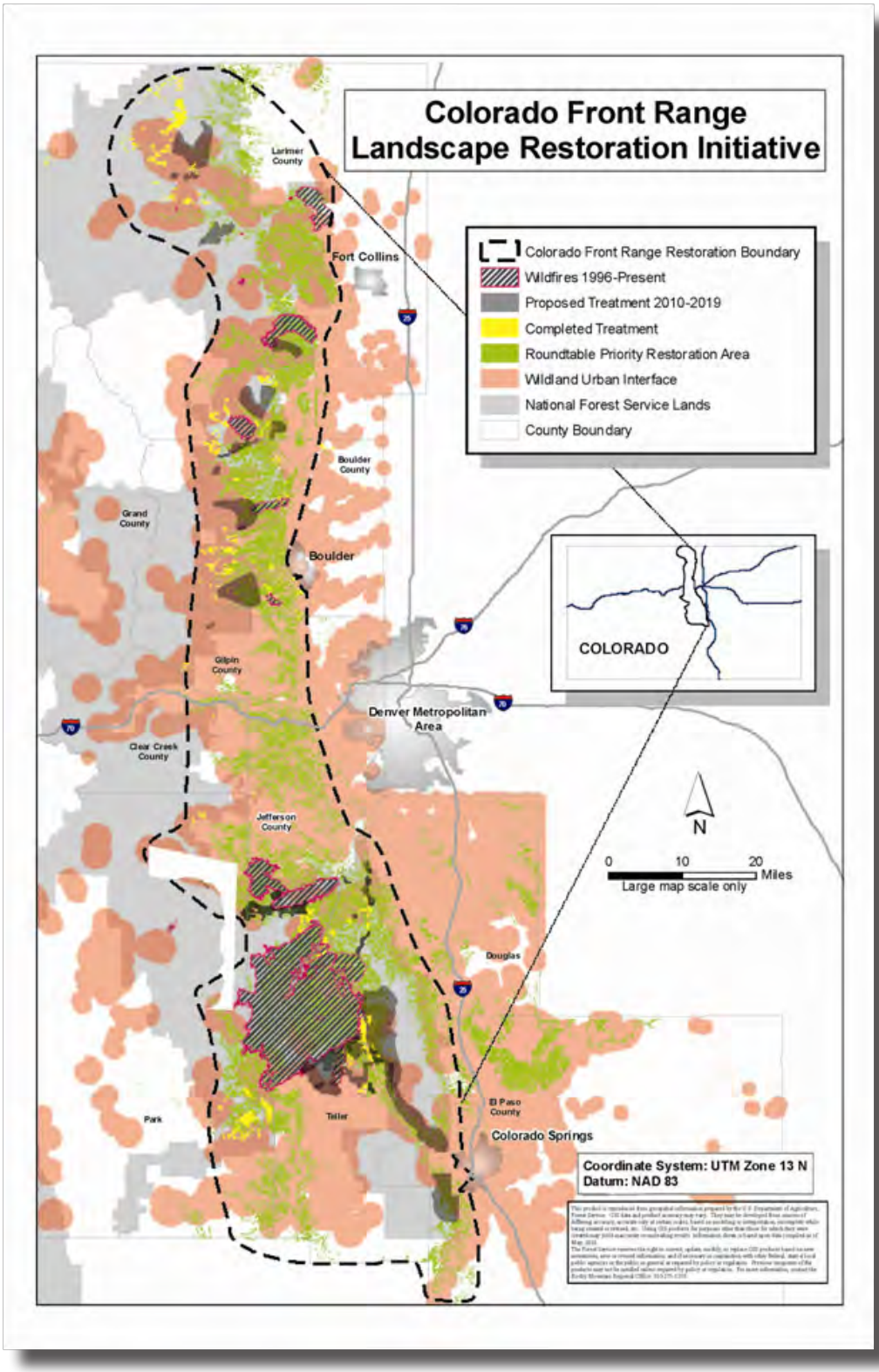
The Roundtable thanks its members, guests, funders and teams for helping us achieve many of our 2010 goals.

Progress Against 2006 Roundtable Recommendations

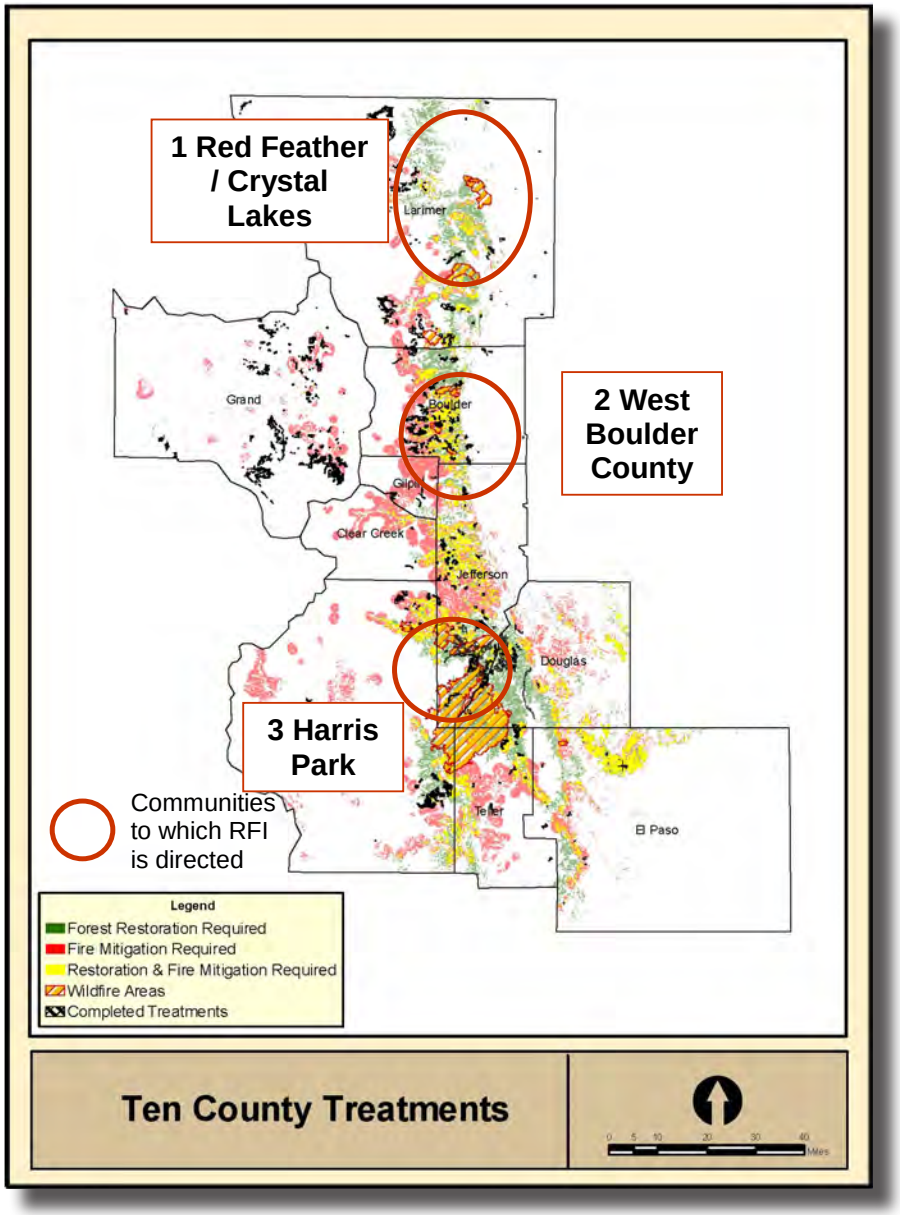
- G — Significant progress made
- B — Some progress made
- Y — Initial progress made
- P — Needs attention

2006 Roundtable goals	Recommended initiatives	Roundtable consensus
Increase funding for forest treatments	1. Identify new state and local funding sources for treatments on state and private land.	B
	2. Increase forest treatment incentives for private landowners.	B
	3. Advocate for additional federal funding for Front Range forest treatments.	Y → B
Reduce the cost of forest treatments	4. Increase appropriate application of prescribed fire and wildland fire use as a management tool.	Y
	5. Increase utilization of woody biomass for facility heating.	P → Y
	6. Increase contract sizes and durations with stewardship contracts on federal land.	Y → B
Ensure local leadership and planning	7. Change local policy to limit the growth of fire risk in the Wildland-Urban Interface.	P
	8. Promote the development of Community Wildfire Protection Plans for Front Range communities-at-risk.	B
Set clear priorities and ensure progress against common goals	9. Adopt a clear and common framework for prioritizing treatments.	B
	10. Convene follow-on Roundtable to ensure implementation of recommended initiatives.	G

Source: Results of straw poll from September 18, 2009 Quarterly Roundtable meeting of 37 attendees from 24 organizations representing 11 stakeholder groups.

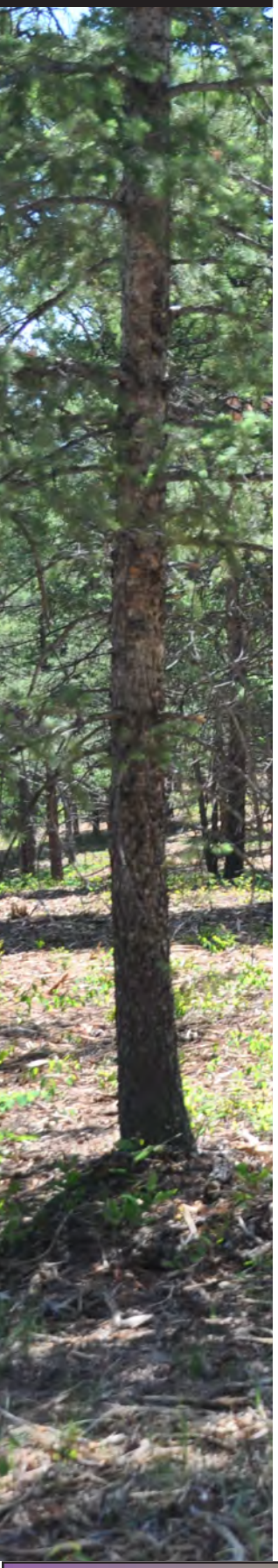


The Collaborative Forest Landscape Restoration Program map of national forests on the Front Range



Map of overlapping priorities of three Front Range groups – the Roundtable's Request for Information (RFI) targeted communities in the three red circles

Acknowledgements



The 2010 FRFTP Annual Report was developed and produced by the Front Range Fuels Treatment Partnership. Special thanks to the staff of these agencies for their contributions to this report.

Colorado State Forest Service

National Park Service

Rocky Mountain Research Station

USDA Forest Service

For more information, please visit the website at:

www.frftp.org

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- **Wildland Fire**
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- **Wildfire History in Colorado**
- **Wildfire Season Summaries by Year 2009 – 2000**
- **Wildfire Risk and Hazard**
- **Assessments**
- **MITIGATING THREAT, SUSCEPTABILITY, AND IMPACTS OF WILDLAND FIRE**
- **Legislation**
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Wildfire in Colorado

Warm winters, hot, dry summers, severe drought, insect and disease infestations, years of fire suppression, and growth in the wildland-urban interface continue to increase wildfire risk and the potential for catastrophic wildland fires in Colorado.

Over the past two decades, Colorado has experienced an increase in insect infestations that have left vast areas of forest vulnerable to wildfire. These infestations, coupled with the increasing number of people who live in the wildland-urban interface, where humans and human-made structures abut vegetation, make Colorado increasingly susceptible to large-scale fires that threaten human lives, communities, power lines, roads, domestic water supplies, wildlife habitat, and other important resources.

From 1990-2009, 43,283 wildfires were reported in Colorado, burning 1,069,994 acres. In 2002, the Hayman Fire alone burned 137,760 acres and destroyed 600 structures. Tragically, that fire also resulted in five deaths and 16 injuries. In 2007, the Ordway Fire burned 8,900 acres, and destroyed 14 homes and 10 structures. The Ordway Fire also claimed three lives.

Although wildfires in recent years have not been as dramatic, the challenge of addressing fire-related impacts remains. Large fire incidents, such as the Hayman Fire, can leave critical watersheds in need of emergency and long-term rehabilitation. Since 2002, Denver Water has spent millions to restore Strontia Springs Reservoir, which was severely impacted by runoff caused by the Hayman Fire.

Since the 2002 wildfire season, the worst in Colorado's recorded history, state and federal land-management agencies have increased their efforts to work with communities and private landowners to help inform them about the risks associated with living in the wildland-urban interface and to identify opportunities to implement cross-boundary wildfire mitigation projects. In addition, numerous place-based forestry collaboratives are working at the local level to help inform and educate communities about the importance of mitigating wildfire risk and restoring forests so that they are more resilient to insect and disease epidemics and wildland fire.

To support these efforts, the Colorado General Assembly and Colorado Congressional Delegation have passed legislation in recent years to address wildfire prevention, mitigation, and suppression challenges.

One of the most significant challenges Colorado faces is the cost to implement fire mitigation projects on a landscape scale. For example, a 2006 report by the Front Range Roundtable indicates that it would cost approximately $6 million, excluding overhead and planning costs, to treat roughly 800,000 acres in lower montane ponderosa pine forests on the Front Range where human lives, communities, natural resources, and other values are most at risk from wildfire.

Another significant challenge is the cost to suppress wildland fires. Consider, for example, that the total estimated cost (direct and indirect) to fight the Hayman Fire was approximately $237.8 million.

Protecting the wildland-urban interface is the nation's fastest-growing firefighting expense. In 2007, suppressing wildfires in the WUI accounted for 85 percent of firefighting costs in the United States. Protecting life and property in these areas is costly because fire managers must take an aggressive stand on the ground and from the air.

Wildland Fire is defined as an unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.

Wildfire Facts

Three main factors influence wildfire behavior – topography, fuel, and weather.

Wildfires are divided into four categories:

- Wildland fire – fuel consists mainly of natural vegetation
- Interface or intermix fire – urban/wildland fires that consist of vegetation and manmade fuel
- Catastrophic Fire – a very intense event that makes suppression very difficult and negatively impacts human values.
- Prescribed fire – Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition.

Other hazards can contribute to the potential for wildfires or can influence wildfire behavior. High winds can down power lines; earthquakes can crack gas lines; lightning can spark fires. Drought conditions increase wildfire potential by decreasing fuel moisture.

Forest insect epidemics and forest parasites contribute to wildfire potential by increasing fuel loading.

Wildfires have post fire impacts that may contribute to the susceptibility of mudslides, landslides, and floods in areas where fire has burned off vegetation In recent years, roads, residential structures and outbuildings have suffered prolonged damaging impacts from flood, mudslides, and siltation of municipal water sources in areas scarred by wildfires.

Lightning is a major cause of structural fires and wildfires. In 1997, a lightning-caused warehouse fire in Denver resulted in a $70 million loss.

The 2002 Colorado wildfire season was the most expensive in the state's recorded history. The overall estimated cost of insured losses related to the Iron Mountain, Coal Seam, Missionary Ridge and Hayman Fires is $70.3 million ($78.8 million in 2006 dollars). Insurance companies

paid an estimated $56.4 million for 1,236 claims related to the Hayman and Missionary Ridge fires alone.

Catastrophic fires account for 2.3 percent of insurance losses.

WILDFIRE HISTORY IN COLORADO

Wildfires play a significant role in the development of Colorado's diverse ecosystems. Through time, wildfires have been both beneficial and destructive. That relationship is measured, in part, by the number and frequency of wildfires, how they were ignited, the cost of suppression, the dollar value of what was burned, the negative impact on the environment and the related costs to infrastructure, air and water quality, and human values/benefits.

NOTABLE FIRE EVENTS IN COLORADO		
YEAR	LOCATION/NAME	COSTS/LOSSES
1937	Roosevelt NF	1 death
1976	Battlement Mesa, Grand Junction	3 deaths, 880 acres
1985	Columbia	1 death
1986	Montrose	4 deaths
1988	Lefthand Canyon, BoulderCo.	2,500 acres
1989	Black Tiger, Boulder Co.	$10,000,000, 44 structures, 1,778 acres
1989	Panorama, Garfield & Eagle Counties	Unknown
1990	Olde Stage, Boulder Co.	10 structures, 3,000 acres
1991	Routt NF	1 death
1992	Glenwood Springs	1 death
1994	Hourglass (Pingree Park)	13 structures, $2,200,000
1994	Wake, Delta Co.	$2,675,000, 3 structures, 4,000 acres
1994	South Canyon, Garfield Co.	14 deaths, 2,115 acres
1994	Roxborough, Jefferson Co.	100 acres
1996	Buffalo Creek, Jefferson Co.	$3,835,000, 10 structures, 12,000 acres
1999	Battlement Mesa	9 structures
2000	Eldorado, Boulder Co.	$2,000,000
2000	Bobcat, Larimer Co.	18 structures, 10,600 acres
2000	Hi Meadow, Jefferson Co.	51 structures, 10,800 acres
2000	Pony Fire	4 structures, 5,240 acres
2000	Eldorado Fire-Walker Ranch	1,061 acres
2000	Bircher (Mesa Verde)	19,709 acres
2001	Larkspur	1 death
2001	Armageddon-Carter Lake	1,216 acres
2002	Snaking Fire	2,590 acres, 2 structures
2002	Cuerno Verde Fire	388 acres, 2 structures, 2 deaths
2002	Black Mountain Fire	200 acres, 1 injury

2002	Schoonover Fire	3,862 acres, 12 structures, 1 bridge, 2 injuries
2002	Iron Mountain Fire	4,440 acres, 200+ structures, 3 injuries
2002	Spring & James John/Fisher (Trinidad Complex)	17,295 acres, 6 injuries
2002	Ute Pass Fire	
2002	Coal Seam Fire	12,209 acres, 99 structures & 14 outbuildings
2002	Hayman Fire	137,760 acres, 5 deaths, 16 injuries, 600 structures
2002	Dierich Creek/Long Canyon (Miracle Complex)	3,951 acres, 1 injury
2002	Missionary Ridge Fire	70,485 acres, 56 structures, 52 injuries, 1 death
2002	Million Fire	9,346 acres, 11 structures
2002	Mt. Zirkel Complex	31,016 acres
2002	Wiley Ridge Fire	1,084.5 acres
2002	Valley Fire	400 acres, a few homes
2002	Burn Canyon Fire	31,300 acres, 9 injuries
2002	Big Elk Fire	4,413 acres, 1 airtanker, 3 deaths
2002	Big Fish	17,056 acres, 1 logde, 7 cabins
2002	Long Mesa	2,601 acres, 3 homes
2002	Panorama Fire	1,700 acres, 4 homes
2003	Brush Mountain	5,292 acres
2003	Overland	3,439 acres, 12 homes
2003	Cherokee Fire	1,200 acres, 2 homes
2004	Picnic Rock	8,908 acres, 1 home
2005	Mason	11,357 acres
2006	Mauricio Canyon	3,825 acres
2006	Yuma County	23,000 acres
2006	Thomas	3,347 acres
2006	Mato Vega	13,820 acres
2007	Newcastle	1420 acres
2007	Bear	1526 acres, 1 home, 2 structures
2007	Wolf Park	150 acres
2007	Holms Mesa	180 acres
2008	Ordway	8900 acres, 14 homes, 10 structures, 3 Fatalities
2008	Incline	30 acres
2008	Bridger	45,800 acres
2008	Nash Ranch	1115 acres, 2 structures
2008	Ferguson	190 acres
2008	Housetop	143 acres
2009	Olde Stage	1300 acres, 3 homes, 2 structures
2009	Newlin Creek	142 acres
2009	Grammar	801 acres
2009	Spring Creek	1,340 acres
2010	Parkdale	628 acres, 1 home, 1 structure
2010	Fourmile Canyon	628 0 acres, 169 homes, 5+ structure
2010	Parkdale	710 acres, 2 homes, 3 structure3

Sources: Teie & Weatherford 2000, Wildfire Hazard Mitigation Plan 2007, CSFS 2009 Fire Report

The table below shows statistics provided by the Colorado State Forest Service. In the period from 1990 through 2009, more than 43,000 fires were reported on state and private lands resulting in over one million acres burned.

FIRES IN COLORADO ON STATE AND PRIVATE LANDS BY YEAR FROM 1990 TO 2009		
YEAR	NUMBER	ACRES
2009	2,973	41,430
2008	2,142	75,571
2007	2,084	151,184
2006	3,294	201,809
2005	2,014	14,446
2004	1,826	15,239
2003	2,471	23,308
2002	3,409	244,252
2001	2,966	45,816
2000	2,043	76,288
1999	1,987	33,256
1998	1,349	10,282
1997	1,605	16,703
1996	2,499	49,498
1995	2,224	32,011
1994	3,158	52,125
1993	1,267	3,526
1992	1,048	4,158
1991	1,449	6,576
1990	1,475	9,825
Totals	43,283	1,107,303
Colorado State Forest Service 2009		

The 2009 Wildfire Season Summary

Colorado experienced dry conditions in the first quarter of 2009. Fire activity reflected this with large fires occurring in Boulder County, commencing on January 7. Periodic precipitation in the form of rain and snowfall from March through June tempered fire activity during the spring months. Fire activity picked up on the western slope and southern front range in July with large fires in Montrose County, Fremont County and Rio Blanco County.

The 2008 Wildfire Season Summary

During the first part of 2008, Colorado experienced dry conditions in the southeast quarter of the state, resulting in large fires in Crowley, Fremont, El Paso, and Park counties during April, May, and June. Fire activity increased on the Western Slope in July.

The early season fires brought tragedy to the Colorado firefighting community with the deaths of 2 volunteer firefighters on the Ordway Fire in Crowley County and the death of a Single Engine Air Tanker pilot on the TA-25 Fire in El Paso County.

The 2007 Wildfire Season Summary

Contrary to conditions in most other Western States including California, Utah, Nevada, Wyoming and Montana, Colorado's 2007 fire season was relatively mild – exhibiting significantly less activity than the 10 year average in both numbers of firs and total acres burned. State responsibility fires included 5 separate incidents, one of which qualified for a FEMA Fire Management Assistance Grant. Most Colorado fire activity occurred prior to mid-July, after which time, Colorado experienced favorably moist weather (monsoonal) conditions that significantly reduced the ignition and spread of wildfires within the state.

The resulting benefit for preparedness actions included reductions in need, as resources were placed into the lower-cost "on-call" status rather than the more costly "ready stand-by" . Also, fewer resources were retained (by using flexible contracting) and some, including Single Engine Air Tankers (SEAT's) were released from obligation to Colorado (and subsequently re-directed to aid other states). Additional secondary support and National Guard Air aircraft were not needed at all this season, nor were Call When Needed (CWN) air resources. In more active wildfire seasons these resources will be activated and pre-positioned.

The 2006 Wildfire Season Summary

Three Fire Management Assistance declarations were received during the 2006 Colorado wildfire season: Red Apple, Mato Vega, and Mauricio Canyon. Red Apple, south of Rifle, started on August 31 and was declared September 1. It burned approximately 800 acres. It was human-caused. Local landowners, Natural Resources Conservation Service, Bookcliffs Conservation District and Williams Production had grass seed sown in the burn area from an airplane in the fall. In the Spring of 2007, juniper and pinon trees were planted. The Mato Vega Fire, in the Sangre de Cristo Mountains in southern Colorado burned in June 2006. The fire burned 13,820 acres in grass, timber, and logging debris. The Mauricio Canyon fire, human caused, burned 3,825 acres near Aguilar in Las Animas and Huerfano Counties.

The 2005 Wildfire Season Summary

One Fire Management Assistance declaration was received during 2005 for the Mason Fire, that burned south of Wetmore, in Custer and Pueblo Counties.

The 2004 Wildfire Season Summary

Two Fire Management Assistance declarations were made during 2004: McGruder Fire and Picnic Rock Fire. Picnic Rock was declared April 1, 2004 and McGruder was declared July 3, 2004. McGruder was near Cedaredge in Delta County.

The 2003 Wildfire Season Summary

According to the "National Report of Wildland Fires and Acres Burned by State," in 2003 Colorado had a total of 2,180 fires reported and 53,412 acres burned. One hundred twenty-two fires were prescription burns for a total of 22,238 acres. Five Fire Management Assistance declarations were received during 2003: Buckhorn Creek, Cherokee Ranch, Overland, Lincoln Fire Complex, and Cloudy Pass.

The 2002 Wildfire Season Summary

The 2002 Colorado wildfire season was the worst in the state's recorded history. The season began in April and continued until early fall. At times, multiple large fires were burning simultaneously. Following are highlights of the 2002 wildfire season:

- 4,612 fires burned 619,030 acres (the 10-year average is 3,119 fires and 70,000 acres)

- 22 large fires (17 qualified for FEMA assistance) became state- responsibility fires with an estimated cost to the state of over $24 million
- The USDA released $14 million to the Natural Resources Conservation Service to restore burned watersheds in Colorado at a 75/25 match
- 13Type I and II Incident Management Teams were utilized
- 142 subdivisions were evacuated, displacing 81,435 people
- 384 homes and 624 other structures were destroyed
- 16,500 firefighters fought wildfires in Colorado (tragically, nine firefighters were killed, and one airtanker and one helicopter were lost, killing three people)
- One Presidential disaster declaration and 20 Fire Management Assistance declarations were received: Panorama, Big Elk, Burn Canyon, Again, Grizzly Gulch, Valley, Wiley Ridge, Million, Missionary Ridge, Dierich, Hayman, Coal Seam, Ute Pass, Janes John/Fisher, Spring, Iron Mountain, Schoonover, Black Mountain, Cuerna Verde, and Snaking

2002 Colorado Wildfire Insurance Costs

Hayman Fire: $38.7 million insured losses
Missionary Ridge Fires: $17.7 million in insured losses
Coal Seam Fire: $6.4 million in insured losses
Iron Mountain Fire: $7.5 million in insured losses

Suppression costs for 2002 exceeded $152 million.

While these numbers are dramatic, they are not surprising. A century of aggressive fire suppression, combined with cycles of drought and changing land management practices, has left many of Colorado's forests unnaturally dense and ready to burn. At the same time, the state's record setting growth has driven nearly a million people into the forested foothills of the Front Range and along the West Slope and central mountains – the same landscapes that are at highest risk for large-scale fire. This movement of urban and suburban residents into the wildland-urban interface (WUI) significantly increases the values-at-risk from wildland fire – the most critical of these being human life.

The 2001 Wildfire Season Summary

In October, 2001, a fire management assistance grant was awarded to the State of Colorado to support fire-fighting activities associated with containing the Armageddon Fire. The fire began on October 31, 2001. The fire was in the foothills along the Front Range.

Although the 2001 fire season in Colorado was not as severe as the 2000 fire season, at 4,022, the number of fires was higher than the total of 3,698 fires that occurred in 2000, but the acreage burned (72,210) was significantly less than the 249,976 acres burned in 2000. The Armageddon Fire was the only fire that met the criteria for a Fire Management Assistance Grant.

The human-caused Armageddon Fire was located in Larimer County and threatened approximately 100 homes in the Carter Lake area. The fire originated on private land and expanded quickly, fanned by high winds. Initial response to the fire focused on evacuation and structure protection. The complexity of the fire led to the order for an Interagency Type 2 Incident Management Team. The fire was returned to local management on November 3, 2001. The final size of the fire was calculated at 1,216 acres, all in private ownership. Like most large fires, the fire was weather driven. . The biggest concerns were high winds, light flashy fuels, narrow roads with congested urban traffic, and a private dump that contained unknown material. No dwellings were destroyed, no lives were lost, and no serious injuries were reported.

The 2000 Wildfire Season Summary

In June 2000, two fire management assistance grants were awarded to the State of Colorado to support firefighting activities associated with containing the Bobcat Gulch and Hi Meadow fires.

Both fires began on June 12, 2000. A third fire management assistance grant was awarded to Colorado for the Eldorado/Walker Ranch (Eldorado) Fire that began on September 15, 2000. All fires occurred in the foothills along the Front Range. . The Bobcat Gulch Fire was caused by human error – an escaped campfire. The fire was located in Larimer County approximately one mile north of the Town of Drake; the affected acreage was in Township 6 North and Ranges 70 and 71 West. The Bobcat Gulch Fire burned in the Arapahoe-Roosevelt National Forest. Fuels included brush, ponderosa pine, spruce-fir, and lodgepole pine at higher elevations. The fire impacted the Cedar Park subdivision where a total of 60 homes were evacuated. It also threatened structures in an area from Eden Valley to Buckhorn Creek. The fire consumed 10,599 acres of grass, brush, and timber, and destroyed 18 homes within the wildland interface out of a total of 25 sites that were reported as destroyed or damaged. An estimated 1,500 to 2,000 residences were within easy reach of the fire.

The Hi Meadow Fire, which began in Jefferson and Park counties, also started on June 12, 2000. The human-caused fire was located approximately 35 miles southwest of Denver. The Hi Meadow Fire affected federal, state, and private lands, resulting in the evacuation of approximately 600 residents from Pine and Buffalo Creek, as well as 19 subdivisions in the area. Three thousand structures located in the interface could have been affected by the Hi Meadow Fire. The fire was controlled on June 25, after burning 5,623 acres on federal land and 5,177 acres on state or private land. A total of 10,592 acres were in Jefferson County and 208 acres were in Park County. A total of 51 residences, six outbuildings, and one commercial building were destroyed.

The Eldorado Fire began on September 15, 2000, and was located approximately seven miles southwest of the City of Boulder. The fire was suspected to have been human-caused, and was started in Walker Ranch Park, which is county-administered open space. The fire affected county land, Denver Water Board land, and private land. The fire burned in mixed Douglas-fir and ponderosa pine, with interspersed open grasslands and shrubs. The blaze consumed 1,061 acres, posing a threat to residents in the Pine Notch, Lake Shores, and Juniper Heights subdivisions and forcing the evacuation of more than 200 residents from 125 homes. No residences or other structures were lost. In addition to the homes, utilities, park facilities, and historic structures, Denver Water Board lands with significant watersheds, and riparian and fisheries resources also were at risk.

Like most large fires, the three fires in 2000 were weather driven. A major problem was a high fuel load. The area's steep terrain and high altitude made firefighting difficult, and the state had only a limited number of resources.

WILDFIRE RISK AND HAZARD IN COLORADO

Assessments : IDENTIFYING AND DEFINING THE CHALLENGE

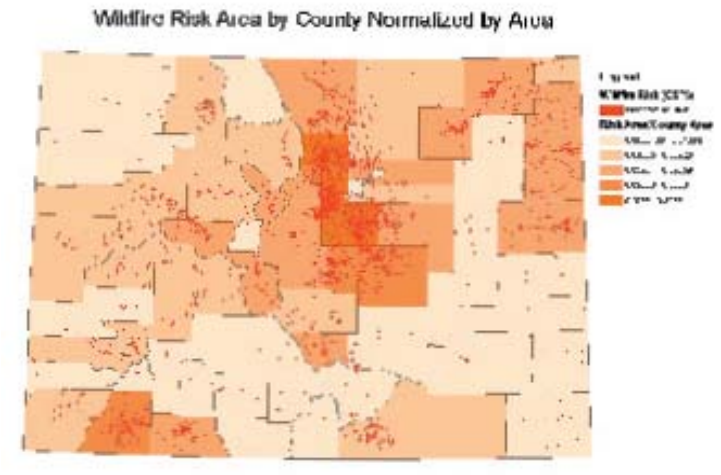
The Colorado State Forest Services has conducted several assessments that address wildfire hazard and risk. The assessments took place in 1999, 2002, and 2008. While slightly different methodologies were used in each assessment, the outcomes show very similar areas are susceptible to wildland fire in the terms of risk and hazard.

The resultant maps produced from data collected during the assessments have been made available to counties and fire departments as a tool in prioritizing fuel treatment areas and fire response planning.

The maps are available to review at: http://csfs.colostate.edu/pages/wf-wildland-map.html

The first assessment was completed by the Colorado State Forest Service and the Colorado Office of Emergency Management in March of 1999 known as the Midlevel Assessment. The table below represents data from that model. The wildfire risk is shown in acres and as the percent of the

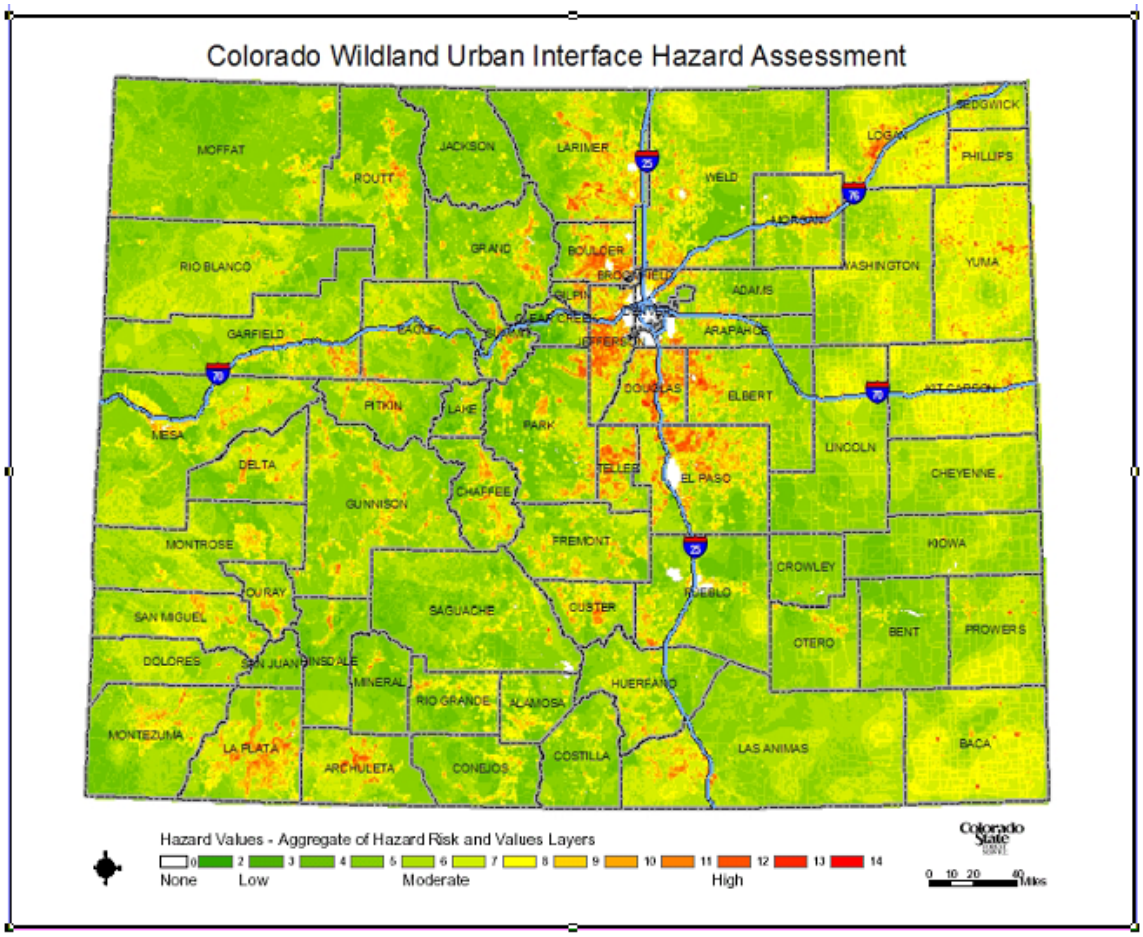
county with a moderate to high hazard. The layer was combined with the moderate to high hazard risk layer to create the map to the right.



Colorado Counties by Percent of Acres at Risk for Wildfire: 1999*							
% Area at Risk	County	Moderate to High Hazard (acres)	Total Acres	% Area at Risk	County	Moderate to High Hazard (acres)	Total Acres
0.06	Adams	497.78	768,098.50		Kit Carson		
2.65	Alamosa	12,233.72	462,496.20	9.33	Lake	22,870.38	245,001.80
1.12	Arapahoe	5,748.71	514,107.30	26.46	La Plata	287,983.31	1,088,385.00
26.36	Archuleta	228,558.66	867,207.00	21.91	Larimer	368,957.77	1,684,129.00
	Baca			7.09	Las Animas	216,392.35	3,053,720.00
	Bent				Lincoln		
19.80	Boulder	95,168.25	480,686.40		Logan		
	Broomfield			25.81	Mesa	552,686.56	2,141,740.00
19.80	Chaffee	128,559.50	649,452.80	5.49	Mineral	30,831.46	561,889.90
	Cheyenne			3.80	Moffat	115,639.59	3,042,580.00
29.21	Clear Creek	73,998.63	253,372.60	17.68	Montezuma	230,435.72	1,303,012.00
2.95	Conejos	24,337.81	826,095.90	24.45	Montrose	351,531.89	1,437,765.00
5.99	Costilla	47,137.33	787,009.30		Morgan		
	Crowley				Otero		
19.93	Custer	94,314.40	473,309.80	23.38	Ouray	81,149.07	347,072.30
21.15	Delta	155,555.62	735,609.50	14.47	Park	204,649.50	1,414,525.00
0.01	Denver	8.64	99,617.14		Phillips		
6.60	Dolores	45,495.34	689,285.80	21.01	Pitkin	130,464.21	621,026.90
35.97	Douglas	193,724.18	538,527.30		Prowers		
29.32	Eagle	319,184.56	1,088,545.00	3.07	Pueblo	47,180.53	1,534,410.00
0.80	Elbert	9,411.22	1,182,788.00	9.04	Rio Blanco	186,769.06	2,065,924.00
18.36	El Paso	250,229.55	1,362,591.00	6.03	Rio Grande	35,238.91	584,600.10
33.78	Fremont	331,266.29	980,558.00	17.55	Routt	265,245.90	1,511,680.00
39.93	Garfield	755,612.73	1,892,209.00	14.31	Saguache	290,135.10	2,027,853.00
20.50	Gilpin	19,728.13	96,212.98	0.34	San Juan	841.74	248,753.50
11.47	Grand	137,260.33	1,196,335.00	20.99	San Miguel	173,351.36	826,057.50
22.32	Gunnison	465,280.69	2,084,727.00		Sedgwick		
5.59	Hinsdale	40,199.48	719,278.60	13.10	Summit	51,892.21	396,124.60
15.09	Huerfano	153,756.32	1,019,181.00	32.06	Teller	114,669.95	357,724.60
2.29	Jackson	23,784.72	1,036,872.00		Washington		
56.84	Jefferson	282,540.56	497,076.60	0.05	Weld	1,403.47	2,570,639.00
	Kiowa				Yuma		

Based on the Mid-level wildfire assessment, March 1999 by the Colorado State Forest Service and Office of Emergency Management

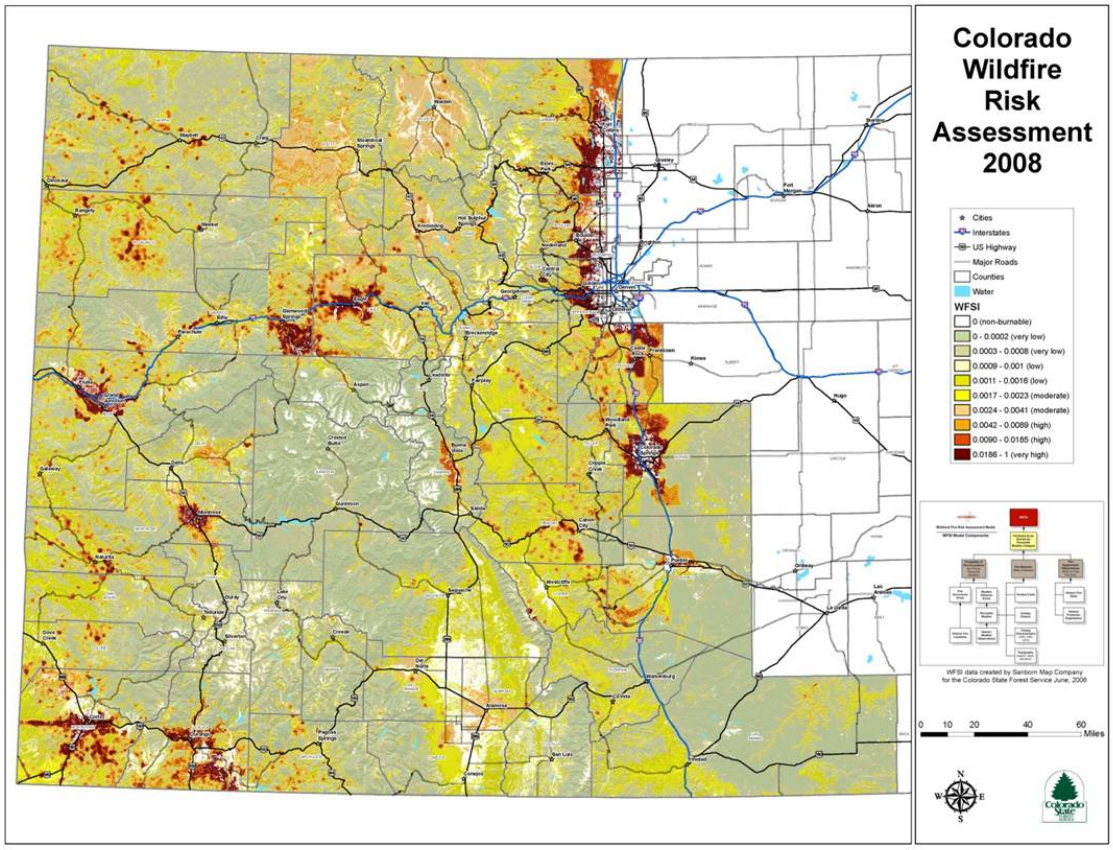
The second risk assessment was completed in 2002 by the Colorado State Forest Service. Full details of the risk assessment, including the methodology and digital layers used, are included in the appendices. The map below was generated as a product of the assessment and indicates the wildland urban interface hazard assessment for the state. In reviewing the map, it becomes obvious that every county has some area with at least a moderate interface wildfire hazard.



Potential Losses – Potential losses to wildfire were estimated by intersecting the high risk zones (values 10-15) from the 2002 hazard assessment with the building and contents values provided in the HAZUS-MH loss estimation software. The analysis was completed at the census block level then summarized by county. If a high risk zone intersected only part of any given census block, the area ratio was used to calculate the building and contents values assuming an equal distribution. While every county in the state has the potential for loss, Jefferson ($8.9 billion), Boulder ($6 billion), Douglas ($5.4 billion), El Paso ($5.4 billion), and Larimer ($4.1 billion) have the greatest potential for dollar losses in high risk zones. The results are summarized in the table to the left.

The Colorado Wildland Urban Interface Hazard Assessment built on the work of earlier hazard methodologies and provides new and updated data to further enhance accuracy and scale. A better, more accurate housing density surface was created to assist in ranking the Wildland Urban Interface hazard. This assessment also included all of the counties in Colorado, including the easter plains counties, which were previously omitted. The final outputs are a Risk, Hazard, and Value (RHV) map displaying areas of concern that are at risk of catastrophic wildland fire.

The third assessment was completed in the fall of 2008. This assessment focused on the susceptibility of wildfire risk in the western two thirds of Colorado. The eastern plains was not included in the assessment because national fuel typing had not been completed at the time of the assessment. CSFS with the assistance of the Division of Emergency Management cost share grant plans to complete an eastern plains assessment in early 2011.



The 2008 Wildfire Risk Assessment brought together the elements of fire occurrence, weather influence zones, and national standardized fuel models adjusted and ground truthed for Colorado. CSFS purchased license to the software developed for the assessment and will be able to update the assessment as new data is received. CSFS printed and distributed county susceptibility maps to each county in the assessment area.

BUILDING & CONTENTS VALUES IN HIGH RISK WILDFIRE ZONES			
COUNTY	EXPOSURE ($000s)	COUNTY	EXPOSURE ($000s)
Adams	$1,472,568	La Plata	$1,464,219
Alamosa	$113,532	Lake	$51,543
Arapahoe	$1,794,503	Larimer	$4,136,945
Archuleta	$628,988	Las Animas	$248,457

Baca	$128,792	Lincoln	$125,561
Bent	$2,539	Logan	$506,894
Boulder	$6,032,590	Mesa	$652,620
Chaffee	$346,101	Mineral	$82,619
Cheyenne	$87,084	Moffat	$81,019
Clear Creek	$852,894	Montezuma	$209,672
Conejos	$73,938	Montrose	$355,534
Costilla	$30,023	Morgan	$3,243,694
Crowley	$150,490	Otero	$238,909
Custer	$174,350	Ouray	$96,028
Delta	$544,192	Park	$891,563
Denver	$102,710	Phillips	$108,235
Dolores	$47,517	Pitkin	$748,445
Douglas	$5,445,250	Prowers	$192,966
Eagle	$1,742,943	Pueblo	$289,553
El Paso	$5,424,875	Rio Blanco	$60,842
Elbert	$1,067,531	Rio Grande	$156,854
Fremont	$261,257	Routt	$764,981
Garfield	$935,392	Saguache	$40,381
Gilpin	$319,242	San Juan	$28,952
Grand	$790,525	San Miguel	$318,370
Gunnison	$424,010	Sedgwick	$46,399
Hinsdale	$92,915	Summit	$1,223,161

Huerfano	$50,090	Teller	$1,145,128
Jackson	$8,855	Washington	$60,949
Jefferson	$8,937,700	Weld	$2,351,598
Kiowa	$9,782	Yuma	$208,443
Kit Carson	$213,296	**TOTAL**	**$58,437,008**

*Sources: CSFS 2002 WUI Hazard Assessment, HAZUS-MR2

MITIGATING THREAT, SUSCEPTABILITY, AND IMPACTS OF WILDLAND FIRE.

There are common themes to consider in wildfire mitigation:

- Wildfires will continue to happen.
- Wildfire does not respect political boundaries.
- No single jurisdiction or agency can suppress all wildfires in their jurisdiction by themselves.
- Mitigation actions are required before a wildfire starts to maximize response to keep fires small and minimize damage; and Mitigation actions are required after a wildfire to minimize impacts resulting from wildfire.

The purpose of wildfire mitigation is to:

- Lessen the risk of wildfire through prevention and outreach;
- Lessen the hazard of wildfire through preparedness;
- Lessen the size and potential damage through cooperative and coordinated response;
- Lessen the post fire damage through coordinated and cooperative recovery and restoration.

Many forestry collaboratives around the state have started conducting localized risk assessments. For example, the Front Range Roundtable has conducted a regional wildfire risk assessment across jurisdictional boundaries. Roundtable members formed four working groups to complete specific tasks within the process. The above chart depicts acres at highest risk for wildfire as defined by the Roundtable. In an effort to reduce the potentially devastating impacts of wildfire, wildfire mitigation councils, committees, and forums are being formed throughout the state.

The mountain pine beetle epidemic that has encompassed 1.02 million acres of the state's 1.5 million areas of lodgepole pine forests in Colorado has led to increasing concerns about wildfire risk. Fire suppression policies spanning several decades have affected natural processes and made large areas of forests unhealthy and vulnerable to catastrophic wildfire. In response to these concerns, the Colorado General Assembly has passed several pieces of state legislation over the past five years that focuses on wildfire mitigation and suppression.

Small- and large-scale wildfire mitigation projects are being completed throughout Colorado. The City of Colorado Springs' wildfire mitigation team has used many funding sources, including a FEMA Pre-Disaster Mitigation grant, to fund fuels mitigation projects. El Paso County bought a chipper with Hazard Mitigation Grant program funds and completed fuels mitigation in several neighborhoods within the Monument-Woodmoor area. Clear Creek County also bought a chipper with Project Impact funds and implemented mitigation projects throughout the county. Recently,

the Colorado State Forest Service, Colorado State Parks, and Colorado Division of Emergency Management pursued funds to continue fuels mitigation in the state park system.

A number of key reviews, reports, and assessments form the basis for wildfire mitigation in Colorado.

The 1995 Colorado Wildfire Mitigation Plan provided a comprehensive foundation by identifying roles, responsibilities, issues, challenges, and recommendations for wildfire mitigation. Recommendations were captured in a table and used by state, county, and local government to prioritize actions.

The 2001 Report to the Governor on Colorado Wildland Urban Interface anchored to the 1995 Plan, reported on success and reinforced recommendations across political boundaries that needed to be addressed.
A 2007 Update on the recommendations was included in the last State Hazard Mitigation Plan.

These reports can be reviewed at: http://csfs.colostate.edu/pages/wf-wildland-map.html

A Summary of Recommendations and their status is presented in table format below followed by a list of reference documents and a few examples of accomplishments.

Recommendation, Goal and Objective	Action	Potential Benefits	Status Update
Strengthen Local Capacity in Wildland Fire Preparedness, Suppression, and Mitigation	Provide state-supported technical and cost-sharing assistance to counties for the development and implementation of expanded Annual Operating Plans (AOP)**.**	Clear understanding of wildfire response in counties. Identification of values at risk within communities and of mitigation measures.	**CSFS facilitates Annual Operating Plans between 47 counties and the interagency wildland fire community. Community Wildfire Protection Plans are being developed.**
	Increase State Disaster Emergency Fund to provide for wildland-urban interface contingency needs and for a fuels mitigation cost-sharing program. Continue funding support for Wildfire Preparedness Plan	Resources will be available for wildlfire response, and mitigation.	**Contingency needs for preparedness resources were addressed by the 2006 Colorado General Assembly which passed SB 096 that provides for an Annual Wildfire Preparedness Plan, the formation of a state to state Wildfire Compact, and for hazard fuel mitigation work.**

	Develop state-level wildland-urban interface training program for local fire service personnel.	Increased public protection and safety. Increased effectiveness and interagency cooperation.	**The 2008 Colorado General Assembly passed SB 39 to provide WUI training to Fire Protection District Boards of Directors.**
	Institute state contribution to Emergency Fire Fund (EFF). Continued support for Healthy Forest Vibrant Communities Act.(HB 1199).	Less dependence on Disaster Emergency Executive Order funding. WERF increases initial attack success, keeping fires small and less costly.	**There has been no direct state contribution to the Emergency Fire Fund. Counties collectively contribute $1 million annually. The Colorado General Assembly has made available the Wildfire Emergency Response Fund.**
Enhance State Leadership and Coordination in Interagency Wildland Fire Response.	Coordinate and fund the development and implementation of a statewide, county-by-county wildfire risk assessment	Statewide assessment to aid decision making at the state and county level for mitigation and preparedness needs.	**CSFS supports Community Wildfire Protection Planning through technical and cost share assistance. Western Colorado Risk Assessment completed in 2008, Eastern Plains need to be done.**
	Provide statutory clarification of wildland fire roles and responsibilities held by County Sheriffs, Fire Protection Districts, and related local response personnel.	Local responsibilities defined, implementation driven by local determination.	Senate Bill 09-020 was passed. Implementation is in progress. SB 09-001 provides for county fire planning. CSFS provides technical assistance.
	Clarify in state Master Agreement interagency roles and responsibilities for wildfire protection in the wildland urban interface.	Clear understanding of Federal and State responsibilities in the WUI	**Master Agreement is scheduled for review and renewal in 2011.**

	Provide state-level support for expanded state participation in zone dispatch centers and in the extended attack phase of wildfire suppression.	Resources will be available for wildlfire response, and mitigation.	**CSFS has established Area Fire Management Officer positions that communicate with interagency zone dispatch centers. CSFS also provides all the dispatch centers operational support.**
	Investigate and identify statewide protocols for radio communication across local, state, and federal jurisdictions.	Interagency communications on wildland fire.	**State telecommunications is reviewing. Interoperability is being reviewed.**
	Coordinate interagency implementation and allocation of funds related to the National Fire Plan, the Ten Year Comprehensive Strategy, and related efforts	Efficiencies in prioritizing mitigation projects across boundaries. Leveraging of federal funds.	**Forest Health Advisory Council is active. CSFS Statewide Forest Resource Assessment has been completed.**
Improve Statewide Public Awareness Regarding the Role of Fire in Colorado Landscapes and Tools for Wildland Fire Prevention.	Provide state leadership in delivering coordinated interagency messages to homeowners, landowners, land management agencies.	Awareness leads to informed decision making and action to mitigate wildfire threats.	**Collaboratives have been formed around the state: ex: Front Range Fuel Treatment Partnership; Colorado Bark Beetle Coalition.**
	Encourage the development of a professional outreach and information campaign to targeted audiences within the state.	Informed decision making at the individual landowner and local level results in action towards hazard mitigation in wildland areas.	**CSFS technical support through District Offices; Rockymountianfire.info was established as a clearing house and reference source for fire information.**

LEGISLATION

2010 Forestry-related Legislation:

- **Boundaries of Forest Improvement Districts (SB10-046):** Allows for the creation of a forest improvement district whose boundaries do not necessarily coincide with a county or municipality. Further, the district boundary may consist of noncontiguous tracts or parcels of property.

- **State Forester Prescribed Fire Certification Standard (SB10-102):** Requires the Colorado State Forest Service to establish standards for training and for certification of prescribed fire users.

- **Promote Biomass Energy Development (SB10-177):** Requires biomass energy facilities to be valued for the purpose of property taxation in the same manner in which wind or solar energy facilities are valued. Exempts forestry equipment that is used in the production of woody biomass from property taxes. Agriculture includes silviculture.

- **Colorado Forest Products (SJR10-037):** Recognizes the economic and environmental importance of Colorado's forests.

- **Elimination of the Forestry Experience Requirement (HB10-1071):** Eliminates the requirement that persons employed in a technical forestry capacity by the board of governors of the Colorado State University system have at least 2 years experience in forest practice.

- **Colorado Kids Outdoors Grant Program (HB10-1131):** Provides grants for programs that allow Colorado youth to participate in outdoor activities in the state, including but not limited to programs that emphasize the environment and experiential, field-based learning.

- **Sunset Repeal Forestry Advisory Board (HB10-1223):** Allows for the repeal of the 7-member Forestry Advisory Board. In 2008, Governor Ritter created the 24-member Colorado Forest Health Advisory Council to provide input and guidance on Colorado forest policy, making the board redundant.

- **Bark Beetle Wood Industry Incentives (HJR10-1024):** Supports bark beetle mitigation efforts, developing marketing and incentive programs; encourages development of properly sized, sustainable wood industries.

2009 Forestry-related Legislation:

- **Intergovernmental Cooperation for the Purpose of Mitigating Wildfires:** Required each local government to enter into an intergovernmental agreement (IGA) if that local government owns any land area located inside the territorial boundaries of a county, and contains at least 50-percent forestland or land that constitutes a wildland area. The bill is effective on or before July 1, 2011. The purpose of the agreement is to mitigate forest land/wildland fires that affect the contiguous land areas of the local government and county (**HB09-1162).**

- **Colorado Healthy Forests and Vibrant Communities Act of 2009:** Increased efforts to address wildfire risk, provided resources to the Colorado State Forest

Service to augment its technical outreach capabilities, and provided loans and grants for market-based and forest treatment solutions to reduce wildfire risk (**HB09-1199).**

- **Community Wildfire Protection Plans:** Required the Colorado State Forest Service to establish guidelines and criteria for counties to consider in preparing Community Wildfire Protection Plans to address wildfires in fire hazard areas within the unincorporated portion of a county (**SB09-001).**

- **Civil Immunity to Persons Engaged in Emergency Response Activities:** Enacted the "Marc Mullenix Volunteer Firefighter Protection Act," which provides limited civil immunity for fire departments and other entities that donate surplus firefighting equipment for later use; immunity for volunteer firefighters, their commanders, and the organizations that employ them; and immunity for incident management teams, in connection with fires and other emergencies (**SB09-013).**

- **Responsibility for Responding to Wild Land Fires:** Created a systematic, proactive approach to the management of wildland fire incidents in Colorado, regardless of cause, size, location, or complexity **(SB09-020).**

- **Incentives for Volunteer Firefighters:** Created a fund in the Division of Fire Safety to provide tuition vouchers to qualified volunteer firefighters who are enrolled in full-time or part-time study, and who agree to serve as volunteer firefighters for four years after completing their education (**SB09-021).**

- **Removal of Statutory Limit on the Amount that may be Raised for the Purpose of Fighting Fires:** Removed the statutory limit on the amount that can be raised in a year by a special property tax levied by a Board of County Commissioners for the purpose of fighting specified types of fires in a county (**SB09-105).**

2008 Forestry-related Legislation

- **Income Tax Deduction:** Five-year program that allowed a landowner to deduct the actual costs of wildfire mitigation up to $2,500 **(HB08-1110).**

- **Mitigating the Effects of the Pine Beetle Infestation:** Established a beetle mitigation fund that allows the public to make voluntary donations that can be used to treat beetle-infested state-owned lands **(HB08-1318).**

- **Extend the Forest Restoration Pilot Program:** Extended for 5 years the Community Forest Restoration Grant Program that was established in 2007 through the passage of the 2007 Community-Based Forest Restoration Act (HB07-1130; see below). Grants are available to communities for fuels mitigation and restoration **(SB08-71).**

- **Watershed Bonding for Forest Health:** With proper authority and agreement, bonds can be issued for forest health and watershed protection projects **(SB08-221).**

- **CSU Agency Line Item Authorization:** Authorized the General Assembly to appropriate funds directly to the Colorado State Forest Service, Agricultural Experiment Station and CSU Extension **(SB08-232).**

- **Training Directors of Fire Protection Districts in the WUI:** Directed the Division of Fire Safety to develop a pilot education program for board members of Fire Protection Districts in the wildland-urban interface **(SB08-39).**

- **Colorado Forest Health:** Promoted active management in National Forests impacted by bark beetles **(HJR08-1033).**

- **Concerning Stewardship Contracting:** Requested that the U.S, Forest Service, Bureau of Land Management and Colorado State Forest Service work together to identify and implement up to three long-term stewardship contracts **(SJR08-10).**

- **WUI Interim Committee:** Created an eight-member interim committee to hold hearings on issues related to the WUI, fuels mitigation, firefighting, bark beetle mortality and incentives for forestry-related industry **(SJR08-25).**

2007 Forestry-related Legislation

- **Community-Based Forest Restoration:** Authorized a 5-year cost-share grant program for community-based forest restoration pilot projects across the state **(HB07-1130).**

- **Forest Improvement Districts:** Authorized a municipality or county to propose to its voters the formation of a Forest Improvement District through which the municipality or county could tax itself to raise money for priority forest improvement projects **(HB07-1168).**

Reducing Fire Risk in the Wildland-Urban Interface

The primary purpose of federally based State Fire Assistance (SFA) funding is to mitigate wildfire risk in areas where human development is adjacent to wildland fuels, often collectively referred to as the wildland-urban interface (WUI). SFA funding is available and awarded through a competitive process.

To be considered for SFA grant funding, a project must meet one or more of the following criteria:

- ***Reduce hazardous fuels/restore fire-adapted ecosystems:*** Fuel treatments in or adjacent to identified fire-prone communities to reduce the threat of catastrophic wildfire. Includes fuelbreaks, defensible space, thinning and prescribed fire.

- ***Improve prevention/education in the WUI:*** Leadership to coordinate, develop and distribute WUI education programs on wildfire risk mitigation. Includes “Living with Fire” newspaper inserts, the CSFS "Are You FireWise?" Program and pamphlets, and brochures or handouts on wildfire risk mitigation.
- ***Planning:*** Creation of Community Wildfire Protection Plans (CWPPs) or the implementation of priority projects identified in existing CWPPs.

In addition to meeting the above criteria, SFA grant applicants also must be willing to match the allocated grant amount using a non-federal source (a 50/50 match requirement, using actual dollars, donated equipment/labor, or a combination thereof). Applications go through a rigorous review process, and ultimately are ranked by the CSFS and members of the Western State Fire Managers based on the applicant’s ability to meet the required criteria, provide measurable results and collaborate with partners. Projects with the highest ranking receive grant funding, though not always the full amount requested.

The CSFS awarded a total of $2.3 million in SFA grant funds in 2008-2009. These funds are being used to treat nearly 6,500 acres, inform more than 140,000 Colorado citizens about the importance of fire risk mitigation and support communities in the development of CWPPs.

Grand County Wildfire Demonstrates Effectiveness of SFA-Funded Projects

In the early summer of June 2007, three teenagers playing with gasoline and matches on the YMCA Snow Mountain Ranch near Granby, Colo., started an intense forest fire. The fire quickly jumped into the tinder-dry crowns of the surrounding beetle-killed lodgepole pines and was poised to burn a huge footprint into history.

Yet the fast-moving Y Fire ultimately would consume only 50 acres, sparing the YMCA’s cabins and all other structures in the area – including 100 homes in an adjacent subdivision. The fire died down as quickly as it ignited because a 200-foot-wide fuelbreak was finished only weeks before.

“When the Y Fire reached the fuelbreak, it dropped to the ground and firefighters were able to get a handle on it,” said CSFS Granby District Forester Ron Cousineau. “The fire behaved exactly as we hoped it would.”

Santa Fe Trail Ranch

Santa Fe Trail Ranch (SFTR) is a 17,000-acre subdivision in southern Colorado near Trinidad. I-25 forms the eastern boundary of the subdivision, Trinidad Lakes subdivision lies to the north, Vermejo Park Ranch borders the south and west, and Wootton Ranch lies to the south. Piñon-juniper forests dominate the north end of the community and ponderosa/mixed conifer forests dominate the south. Significant amounts of Gambel oak and New Mexico locust also dot the landscape.

Following the development and adoption of a CWPP in 2006, the committee began working with the head forester of Vermejo Park Ranch (VPR) to create a shaded fuelbreak on the boundary between SFTR and VPR. A shaded fuelbreak is an easily accessible strip of land 300 feet or more in width where fuel density is reduced, which provides firefighters with improved access to help them control fires. Fuelbreaks force crown fires to the ground so that firefighters can safely attack the fire directly. Thinning also reduces tree-to-tree competition for sunlight, water and nutrients, which enhances vigor in individual trees and improves overall forest health.

Over the past five years, the coalition has coordinated defensible space treatments on more than 120 of the 454 privately owned lots, which are 35 acres or more.

The SFTR Property Owners Association works with many partners to update and maintain its CWPP, including VPR, CSFS, Wootton Ranch, Colorado Division of Wildlife, Natural Resources Conservation Service, Fishers Peak Fire Protection District and the Las Animas County Fire Marshal. The coalition also partners with the Culebra Range Community Coalition, New Mexico Forestry Division, Sugarite Canyon Watershed Protection Project, Cimarron and Canadian Watershed Alliance Groups, Colfax County Coalition of Firewise Communities (NM) and Firewise Communities/USA to expand their understanding of current issues and generate interest in developing and implementing CWPPs in southern Colorado and northern New Mexico.

An active group from the start, the coalition has been able to educate, inspire and motivate property owners to embrace forest health restoration resulting in significant participation in fuels reduction and habitat improvement projects on private lands.

Protecting Our Watersheds

Colorado's Forest Restoration Pilot Program allows the state to fund projects that demonstrate a community-based approach to forest restoration. Projects funded by this program focus on protecting water supplies and related infrastructure, as well as restoring ecosystem function in forested watersheds. Forest management efforts range from thinning and fuels reduction to replanting trees.

To be eligible for funding through this program, projects must include a diverse group of stakeholders in project design and implementation, and must be located in an area with an approved CWPP. Every Forest Restoration Pilot Program project must address one or more of the following objectives:

- Reduce the threat of high-intensity wildfires and/or the negative effects of excessive competition between trees;
- Preserve old and large trees of ecological or scientific value;
- Replant trees in deforested areas;

- Improve the use of, or add value to, smaller-diameter trees.

As a result of the Forest Restoration Pilot Program, more than 5,300 acres will be treated with this funding for a total of more than 8,400 treated acres in 2008-2009.

LOCAL STATE PARTNERSHIPS MITIGATE WILDFIRE POTENTIAL

Durango residents use Dalla Mountain Park for hiking, walking dogs, mountain biking and rock climbing. Sandwiched between Bureau of Land Management (BLM) acreage to the northeast and private land to the southwest, the 176-acre park sits in a classic wildland-urban interface (WUI) zone. Until recently, the park was cloaked in a thick understory of flammable Rocky Mountain juniper and Gambel oak – vegetation that could have set the stage for a catastrophic wildfire.

The city contracted the Southwest Youth Conservation Corps to complete the Dalla Mountain Park treatments, employing hand crews to minimize soil disturbance in the watershed. Although non-mechanized thinning is more expensive and time- consuming than operations using heavy equipment, CSFS Durango District Forester Kent Grant says that it has a much lighter impact on the ground, which is important when watershed protection is one of the ultimate project goals.

In 2008-2009, more than 37 acres were treated at Dalla Mountain Park using Forest Restoration Pilot Program funding. More acreage is slated for treatment in the next one to two years.

"If there is a significant wildfire in Dalla Mountain Park, it should now be less intense and less likely to become a devastating crown fire," said Grant. "Hence it would have a limited impact on the Junction Creek and Animas River watersheds."

THE CSFS ENGINE CREWS

In 2006, the General Assembly directed the creation of a Wildfire Preparedness Fund in the State Treasury to address the risk of wildfire in Colorado's wildland-urban interface. Senate Bill 06-96 recognized the daunting challenge wildfire poses to public safety, fiscal management and natural resource integrity in the state.

The significance of SB-96 is the consistency it provides to acquire long-term aviation contracts, staff wildland fire engines, support National Guard resources, and train and use Colorado Department of Corrections State Wildland Inmate Fire Teams. In wildland fire management, consistency in the availability of resources leads to increased efficiencies and effectiveness in response to wildland fires.

One of the many successful efforts following the passage of SB-96 was the formation of the CSFS engine crews in 2007. Located at the CSFS Cañon City, Boulder, Golden and Fort Collins districts, these crews staff Type 6 and Type 4 wildland fire engines.

The local district offices provide daily supervision and project work. When not fighting fires, crews participate in projects that pertain to the management of Colorado's forests. Project work includes mountain pine beetle mitigation, wildland fire hazard reduction, timber stand improvement, preparedness and fire prevention education programs. The

crews also are available for fire suppression assignments at the district, state, regional and national levels.

When the engine program began in 2007, the program was new and in uncharted waters. Since then, the responsibilities of the crews have evolved in several innovative directions. Depending on the needs of the local CSFS district and the strengths of individual crews, personnel concentrate on thinning forests on state lands adjacent to private property; using prescribed fire as a tool for fuels reduction and forest management; or providing training and education as a way to encourage the development of much-needed human resources to fight fires and to educate the public on wildland fire.

RESTORING FORESTS

In 2009, the CSFS received American Recovery and Reinvestment Act (ARRA) funding from the U.S. Forest Service through a competitive grant process. The CSFS received a $6.25 million grant to create or retain jobs that help implement high-priority forest restoration and fuels mitigation projects. A portion of the funds also are being used to create and retain jobs in Colorado's wood products industries. In addition, the CSFS received a second grant for $4.465 million to help fund jobs affiliated with developing and implementing Community Wildfire Protection Plans.

Interested organizations competed for sub-grants by writing project proposals, per guidelines and requirements set forth in the Requests for Proposals. Interdisciplinary review panels evaluated project proposals and selected the following to receive ARRA funding.

SUPPORTING RURAL FIRE DEPARTMENTS

Wildfires can occur almost any time in Colorado, so it’s important to have trained firefighters and equipment available throughout the year. In the United States, 75 percent of the 35,000 local fire agencies are volunteer. These volunteer organizations are the first responders on approximately 80 percent of wildfires.

In addition, volunteer fire departments provide wildfire protection and emergency response services to residents in rural areas with populations of 10,000 or less.

Each year, federal funds are available through Volunteer Fire Assistance (VFA) grants administered by the CSFS. The grants allow fire departments to buy fire equipment, pay for training or training materials, or cover the cost of department organization. VFA funds are granted on a 50/50 matching basis. In order to help volunteer fire departments, which often are strapped for funds, only departments in rural areas may apply for these funds.

In 2008, 150 fire departments in Colorado received grant funding; in 2009, 126 departments received grants. The average grant awarded is $3,000, however, they can range from $100 to $10,000.

FEDERAL EXCESS PROPERTY PROGRAM BENEFITS RURAL FIRE DEPARTMENTS

In 2008, the Town of Walsh received a new 2½-ton, 878-gallon, 6x6 fire engine. The CSFS Fire Equipment Shop builds approximately eight new Federal Excess Property Program (FEPP) engines each year, which are then assigned to local fire departments throughout the state.

When CSFS Fire Equipment Shop personnel delivered the engine, they gave Walsh Fire Department firefighters a briefing and instructions in the use and minor maintenance of the new Type 4 fire truck. Walsh Fire Department Chief Lance James said, "We're excited to receive the new equipment, and particularly excited by the water tank design, which allows for lower weight distribution of the vehicle. This newer design is safer than the older design for firefighters. There is also additional room on the flatbed for equipment."

An equipment agreement between the State of Colorado, Colorado State Forest Service and the Town of Walsh was effective on October 1, 1990. Signed by the mayor, county sheriff and county commissioners, the agreement allows placement of fire equipment for the benefit of emergency use within Baca County.

The Walsh engine is one of 140 engines maintained in Colorado and authorized by law under the Cooperative Forestry Assistance Act of 1978. This Act provides a mechanism for federally owned equipment to be used locally for emergency and fire-related protection.

This beneficial agreement provides for the loan of fire equipment to be used for fire duties within the town and county, an annual maintenance inspection and repairs from normal wear and tear. The town pays a $200 per year inspection fee. In return, Walsh officials agree to only use the equipment for fire protection or other emergency situations when life or property are threatened; maintain the equipment in good operating condition with a minimum of tools and hose on the engine; provide adequate year-round equipment housing; pay for all operating costs and minor maintenance; maintain liability insurance; and submit national fire reports. If available, the engine also may be dispatched for emergency mutual aid or initial attack responses outside its normal jurisdiction.

THE FRONT RANGE ROUNDTABLE

The Front Range Roundtable was formed to "*serve as a focal point for diverse stakeholder input into efforts to reduce wildland fire risks and improve forest health through sustained fuels treatment along the Colorado Front Range.*"

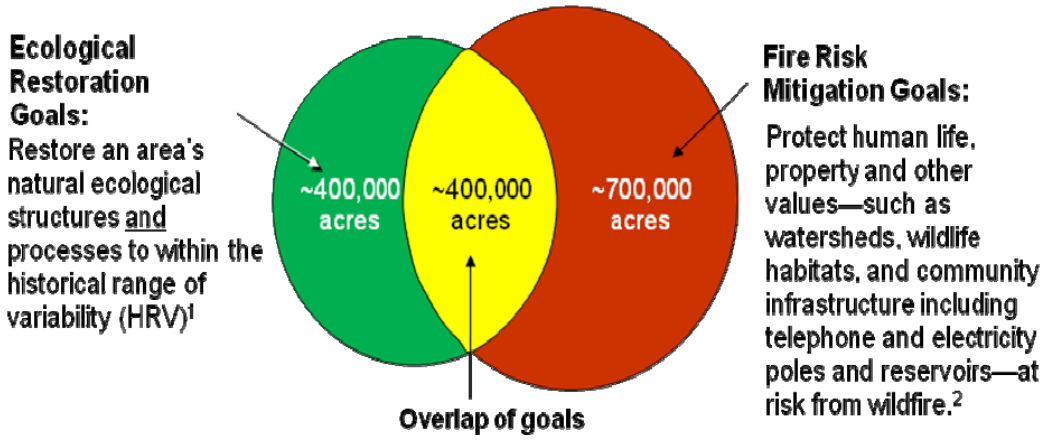
- The Front Range roundtable has reached consensus that 1.5 million acres of Front Range forests require treatments to reduce fire risk.

Ecological Restoration Goals:

Restore an area's natural ecological structures and processes to within the historical range of variability (HRV)[1]

Fire Risk Mitigation Goals

Protect human life, property and other values—such as watersheds, wildlife habitats, and community infrastructure including telephone and electricity poles and reservoirs—at risk from wildfire.[2]



County	Overlap Zone	Fire Risk Mitigation Zone	Ecological Restoration Zone	Total Roundtable Priorities
Boulder	51,021	77,212	35,978	164,211
Clear Creek	7,356	58,595	833	66,784
Douglas	40,529	61,143	90,807	192,479
El Paso	• 57,107	41,891	31,169	130,167
Gilpin	472	42,365	2,177	45,014
Grand	390	94,321	1,838	96,549
Jefferson	88,094	92,971	71,157	252,222
Larimer	42,350	130,956	98,856	272,162
Park	31,377	122,808	27,463	181,648
Teller	23,168	86,848	27,211	137,227
Total Front Range	341,864	809,110	387,489	1,538,463

FRONT RANGE FORESTS REQUIRING FOREST TREATMENT BY COUNTY (acres)					
County	Restoration only	Fire risk mitigation only	Both restoration and fire risk mitigation	Total restoration and/or fire risk mitigation	Private land (percent of total)
Boulder	35,978	77,212	51,021	164,211	58%
Clear Creek	833	58,595	7,356	66,784	59%
Douglas	90,807	61,143	40,529	192,479	42%
El Paso	31,169	41,891	57,107	130,167	62%
Gilpin	2,177	42,365	472	45,014	63%
Grand	1,838	94,321	390	96,549	65%
Jefferson	71,157	92,971	88,094	252,222	73%
Larimer	98,856	130,956	42,350	272,162	60%
Park	27,463	122,808	31,377	181,648	57%
Teller	27,211	86,848	23,168	137,227	61%
Total Front Range	387,489	809,110	341,864	1,538,463	60%
Source: Front Range Fuels Treatment Partnership: Living with Fire: Communities and Restoring Forests, May 2006					

COMMUNITY WILDFIRE PROTECTION PLANS (CWPPS)

Community Wildfire Protection Plans (CWPPs)

Community Wildfire Protection Plans are authorized and defined in Title I of the Healthy Forests Restoration Act (HFRA) passed by Congress on November 21, 2003, and signed into law by President Bush on December 3, 2003.

The Healthy Forests Restoration Act places renewed emphasis on community planning by extending a variety of benefits to communities with a wildfire protection plan in place. Critical among these benefits is the option of establishing a localized definition and boundary for the wildland-urban interface (WUI), and the opportunity to help shape fuels treatment priorities for surrounding federal and non-federal lands.

The CWPP, as described in the Act, brings together diverse local interests to discuss their mutual concerns for public safety, community sustainability and natural resources. It offers a positive, solution-oriented environment in which to address challenges such as local firefighting capability, the need for defensible space around homes and subdivisions, and where and how to prioritize land management on both federal and non-federal land.

The Colorado State Forest Service maintains a database of CWPPs that have been developed and/or are in the process of being implemented. To view the most recent list of CWPPs, visit www. http://csfs.colostate.edu/pages/CommunityWildfireProtectionPlans.html.

POST FIRE MITIGATION

NRCS Emergency Watershed Protection 2002

Year	Fire Name	County	Funding
2002	Coal Seam	Garfield Co.	446,199
	Missionary Ridge	La Plata Co.	2,183,904
	Hayman	Douglas/Park/Jefferson/Teller	5,627,369
	Million	Rio Grande Co.	214,046
	Snaking	Park Co.	72,883
	Schoonover	Douglas Co.	74,951
	Iron Mountain	Fremont Co.	96,298
	Dierich	Mesa Co.	38,013
	Burn Canyon	San Miguel Co.	232,393
	Panorama	Garfield Co.	108,298
	Cherry Creek	La Plata Co.	59,484
2003	Overland Fire	Boulder County	$56,114
2004	Picnic Rock	Larimer County	$137,680
	McGruder	Delta County	$18,000

2005	Mason	Pueblo County	$52,200
2006	Mauricio Canyon	Las Animas and Huerfano Counites	$85,586
2007	Newcastle	Garfield County	$89,281
2008	Ordway	Crowley County	$179,868

CONCLUSION

Declining forest health and increasing wildfire risk in Colorado has been brought about by a combination of factors over the years, including, but not limited to, fire suppression policies, insect and disease infestations, lack of fire-safe construction practices, and increased population in the wildland-urban interface. Fire prevention, mitigation, and suppression require a multi-agency, multi-organizational approach that involves interested stakeholders, communities, and decision-makers at all levels in order to be effective. In Colorado, numerous place-based forestry collaboratives have formed over the past decade to tackle the most pressing forest-health related issues, including wildland fire mitigation.

The costs of implementing large-scale, cross-boundary forest management projects to reduce fuels and mitigate fire risk is a continuing challenge. To help address this challenge, the Colorado General Assembly and Colorado Congressional Delegation have passed numerous bills related to forest management, and fire mitigation and suppression.

The current mountain pine beetle epidemic will pose additional challenges to firefighters, residents, and visitors in infested areas as large areas of dead lodgepole pine trees begin to fall and regeneration occurs. These areas will be susceptible to large fires that may burn hot, causing erosion and sedimentation, which will threaten important watersheds that supply domestic water.

Public education and technical assistance are essential to help wildland-urban residents make appropriate decisions about wildfire mitigation, and to help keep the public safe whenever and wherever wildfires do occur.

REFERENCE DOCUMENTS

1995 Colorado Wildfire Mitigation Plan
1999 Western State Fire Managers Report, Wildland Urban Interface
2001 Report to the Governor on Wildland Urban Interface
2001/2002 Colorado Wildfire Mitigation Plan
2003 Hayman Fire Case Study
2006 – 2007 Front Range Fuel Treatment Partnership Annual Report
2006 Front Range Fuel Treatment Partnership, Living With Fire, Findings and Recommendations
2007 Colorado Wildfire Mitigation Plan Update
2008 Report, The Health of Colorado's Forests
2009 The Health of Colorado's Forests, Special Edition
2008 – 2009 Colorado State Forest Service Accomplishment Highlights
2010 Colorado Statewide Forest Resource Assessment

2010 Colorado Forest Resource Assessment Implementation Strategy
http://csfs.colostate.edu

Lower North Fork Prescribed Fire

Prescribed Fire Review

April 13, 2012

Requested by:
State of Colorado
Office of Executive Director
Department of Natural Resources
Denver, Colorado

Office of the President
Colorado State University
Fort Collins, Colorado

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EXECUTIVE SUMMARY

The Lower North Fork Prescribed Fire Project, located south of Conifer, Colo., is part of a large scale restoration effort on Denver Water property. Colorado State Forest Service (CSFS) planned the project to consist of six units in accordance with their 2011 Service Agreement with Denver Water. The 50 acre Unit 4A is one of the units identified for prescribed fire application following mastication treatments. On Thursday, March 22, 2012, Unit 4A was ignited according to plan. Ignition was completed by 2000 that evening. On Friday, March 23, crews worked to secure the burn and by the end of the day, the prescribed fire was put into patrol/monitor status. To this point in time operations were completed according to the plan with no problems. On Monday March 26, 2012, a three-person crew was monitoring the Unit during a "red flag warning". At approximately 1315 winds carried a stream of ground level embers across the established prescribed fire control line. This complex series of winds resulted in two spot fires outside control lines that were quickly contained by mop-up/ patrol personnel on scene. The crew responded to a third spot fire at 1340 located approximately 1500 feet southeast down the control line from the two earlier contained spot fires. The new spot fire quickly became established and it exceeded the capacity for control by ground forces resulting in an escape and subsequent conversion to a wildfire at 1430.

The Governor of Colorado and the President of Colorado State University (CSU) convened an independent team to review the Prescribed Fire and key factors that led to the escape. The Review Team interviewed personnel associated with the implementation of the prescribed fire; and reviewed and examined the written record of events and actions leading up to the escape.

The Review Team found four factors contributing to the escape and conversion to wildfire: of the four, the one that acted as the catalyst that finally set the outcome into motion was a rapidly escalating wind event. A fire weather watch for strong winds was issued at 1409 on Saturday, March 24, 2012 and at 0526 on March 25, 2012 was upgraded to a red flag warning for strong and gusty winds for Monday, March 26, 2012. Although the patrol crew was on scene Monday when the winds escalated to 15-20 miles per hour (MPH) steady, and were gusting to 55 MPH at ground level, they were not able to keep the Prescribed Fire contained. The prescribed burn unit had been mopped up 200 feet inside control lines but was an insufficient buffer area due to the combination of escalating winds and persisting hot spots at the interior of the burn area. Spot fires at multiple locations quickly exceeded the capacity of ground forces.

The other factors that potentially contributed to the prescribed fire escape include (See Page 55):

- Unburned fuel and residual heat present in the burn unit at the time of the wind event
- Operational actions drawn from experience and common practice
    - 200 foot buffer for mop-up

    - anticipation of need to respond to other wildfires
- Weather and fire behavior projections that did not/could not predict the complete set of circumstances that occurred.

Recommendations (See page 61):

- The WIMS-RAWS-NFDRS program needs improved operating procedures to ensure safe and more effective fire operations throughout the year.
- Replace use of the Keetch/Byram Drought Index (KDBI) with other indices such as NFDRS indices of Energy Release Component (ERC) or 1000-hour time lag fuel moisture as measures of fire danger and cumulative drought and input to fire planning
- Strengthen mop-up standards tied to fuel consumption and predicted weather as a required element in prescribed fire plans
- Refine the prescribed fire plan technical review process.
- Ensure that all prescribed fire plans include up-to-date information prior to implementation
- Separate masticated fuels from un-masticated fuels by sub dividing or redesigning treatment units to address fuel moisture and potential fire behavior variation.

BACKGROUND

Changing fuel complexes in combination with significant rapid expansion of those areas where structures and other human developments meet or intermingle with undeveloped wildland or vegetation fuels (wildland-urban interface [WUI]) have created a significant wildfire protection challenge. Wildfire risk to personal health and safety, communities, infrastructure, and natural resources is escalating across the western United States. Wildfire recognizes no boundaries or jurisdictional responsibilities; a single event can easily and quickly affect private, county, state, tribal and Federal lands; threaten communities, infrastructure, economies, and valuable natural and cultural resources.

The WUI areas along the Colorado Front Range are not immune to outcomes generated by interactions of wildfire, urban expansion and altered fuel complexes. In the past three decades, an increase in fire behavior, home and property losses, suppression costs, and threats to communities and social infrastructure, as well as attrition in ecological conditions are taking place. In Colorado, average annual statewide fire numbers by 10-year periods accounted for by the Colorado State Forest Service (CSFS) since 1960, show an alarming increased trajectory (Figure 1).

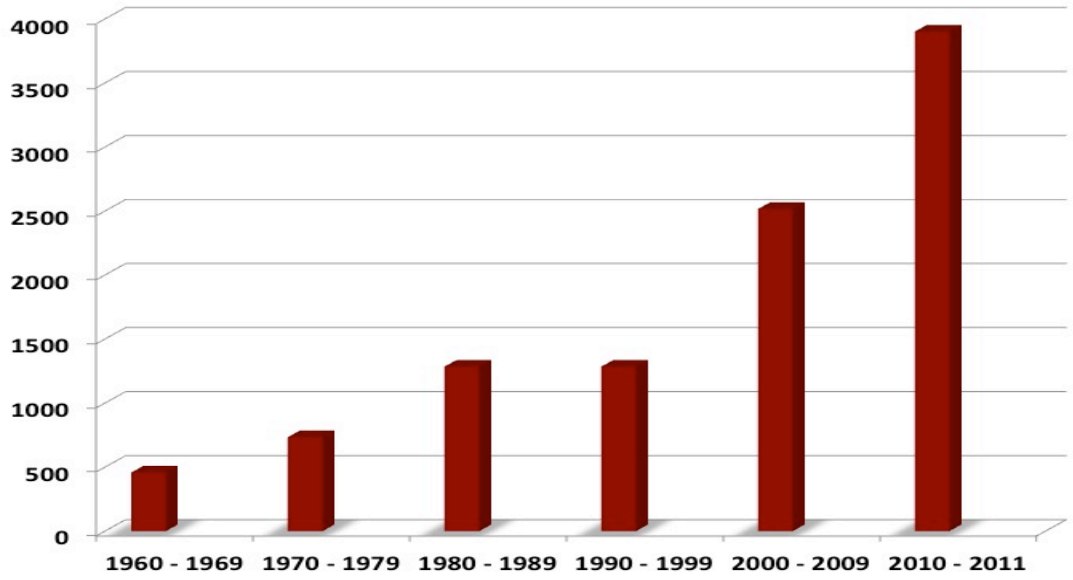

Figure 1. Average annual numbers of wildfires by 10-year periods in Colorado from 1960-2009, with 2010 and 2011, as one entry (source CSFS, Fort Collins, CO).

Increases in number and sizes of significant wildfires are occurring across all jurisdictions. In terms of large wildfire size in Colorado (fires reported as larger than 100 acres), the 30 largest fires on record have all occurred since 1996 (source Rocky Mountain Area Coordination Center). Seventy-seven (77) percent of these 30 fires have occurred since 2002 with slightly over half occurring during 2002, (57%) and the remainder occurring since 2002, (source RMACC). This data indicates that individual fire sizes have been increasing during recent years. Twenty (20)

percent of this set of large fires has occurred across the Front Range WUI area. Several notable individual wildfires occurred in the last 30 years that have had significant impacts on Front Range forest restoration and wildfire risk mitigation activities. These are shown in Table 1:

Table 1. Wildfires having significant influence on Front Range forest restoration and wildfire risk mitigation planning and implementation activities.

Fire Name	Year	Significance
Buffalo Creek	1996	Caused substantial erosion and sedimentation in Denver Water facilities in Denver metropolitan area. One of the 30 largest wildfires in Colorado history, 10 homes destroyed.
Hayman	2002	The largest in fire size and the most costly in terms of suppression costs in Colorado history, 133 homes destroyed.
Four Mile Canyon	2010	The most costly wildfire in terms of private property loss in Colorado history.

A more detailed description of significant Front Range wildfires is provided in Appendix B.

As large fires have become more damaging, vegetation manipulation and fuel reduction treatments represent an important component of wildfire risk mitigation being utilized along the Front Range. Strategic plans have been developed identifying fuel treatment projects to be completed in the Lower North Fork area of Jefferson County, Colo. Many specific projects have been completed over recent years.

The Lower North Fork Prescribed Fire was part of this overall program of work. The Prescribed Fire was conducted on March 22, 2012, in accordance with an approved Prescribed Fire Plan. On March 26, 2012, a severe wind event ignited a wildfire outside the burn Unit that became the Lower North Fork Wildfire.

In response to this event, the State of Colorado convened a Team to review the Prescribed Fire. This report represents the results of that review. Specific analysis and recommendations are provided in the following sections of the report.

PRESCRIBED FIRE PURPOSE AND PROGRAM GUIDANCE

Prescribed Fire Purpose

Protecting wildland-urban interface areas from the effects of wildfire is a focus of all land management and emergency response agencies/organizations. A central goal to improve protection capability involves reducing potential fire behavior and increasing the likelihood of successful fire suppression efforts. Under a given set of weather conditions, vegetation and fuel structure exert the dominant influence on fire behavior. To achieve reduced fire behavior potential, active management that concurrently modifies structure, composition and amounts of all components of fuel complexes is necessary.

A wide range of vegetation manipulation techniques and fuel treatment options are available. Specific methods allow focus on different components of the fuel bed. For example, thinning of trees mainly affects standing vegetation; mechanical methods such as chipping, mastication, and roller chopping can affect understory, mid-level vegetation and some lower level forest crown fuels. Mechanical thinning can be effective in reducing vertical fuel continuity (Graham and others 1999), but as a single treatment it does little to reduce surface fuel amounts. Mastication alone does not reduce fuel quantities; however, it is useful in changing fuel location and configuration. In some cases mastication affects the vertical fuel continuity but can actually add to surface fuels and potentially increase surface fire intensity. Generally mastication opens up forested stands, rearranges fuels from aerial positions to surface positions and can lower overall resistance to control and improve accessibility.

Prescribed fire is the application of fire through a planned ignition to meet specific objectives identified in a written and approved prescribed fire plan. It can be conducted as pile burning or broadcast burning. Pile burning follows other treatments to reduce woody debris remaining after those treatments. Broadcast prescribed burning removes natural and activity-generated fuels and modifies surface fuel complexes.

Prescribed fire represents a viable and widely accepted option for treating fuel and vegetation complexes. Experts agree that prescribed fire facilitates changes in potential fire behavior (Graham and others 2003, 2004). Overall, prescribed fire is useful for affecting fuel complex attributes (Graham and others 2004) by:

- Reducing quantities of fine fuels, duff, large woody fuels, rotten material, shrubs and other live surface fuels.
- Positively altering both vertical and horizontal fuel continuity (shrub, low vegetation, woody fuel layers).
- Reducing compactness of surface fuel components.

In some cases, multiple treatments of a single type may be needed. A combination of phased treatment of different types may also be necessary to accomplish objectives. This is especially true for areas that have experienced continual fire suppression, have altered fuel complexes or have substantial numbers of high values present, as is the case in WUI areas.

The combination of mechanical non-fire and prescribed fire applications as a fuel treatment process in WUI areas has been widely and successfully used. This sequence allows the

mechanical removal of ladder or vertical fuels followed by reductions in surface fuel amounts. Combinations of treatments are highly effective in decreasing the intensity and severity of potential wildfires (Graham and others 2004).

In 2006, the US Forest Service initiated a program to evaluate the effectiveness of prescribed fire, mechanical, and chemical treatments designed to reduce the risk of wildfire. When a wildfire starts within or burns into a fuel treatment area, an assessment is conducted to evaluate the resulting impacts on fire behavior and fire suppression actions. In 2011, the U.S. Forest Service made the effectiveness assessment mandatory whenever a wildfire impacted a previously treated area. The purpose of the effective assessments are to answer the questions of:

- Are fuel treatments affecting fire behavior by reducing the intensity and/or rate of spread?
- Does suppression effectiveness improve through enhanced firefighter safety, reduced suppression costs, and/or reduced potential fire damage?

Since 2006, over nine hundred assessments have been completed since the program began, and data has shown that fuel treatments are effective in reducing both the cost and damage from wildfires.

Table 2. Summary of US Forest Service Fuel Treatment Effectiveness on Wildfires

Year*	Number of Treatments Burned Over By Wildfire								Total Records
	Did Treatment Change Fire Behavior?				Did Treatment Help Control Fire?				
	No		Yes		No		Yes		
	Number	%	Number	%	Number	%	Number	%	
2006		0%	10	100%		0%	10	100%	10
2007	5	3%	185	97%	1	1%	189	99%	190
2008	3	2%	154	98%	1	1%	156	99%	157
2009	16	16%	87	84%	10	10%	93	90%	103
2010	19	13%	131	87%	7	5%	143	95%	150
2011	49	14%	293	86%	54	16%	288	84%	342
2012		0%	21	100%		0%	21	100%	21
Total	**92**	**9%**	**881**	**91%**	**73**	**8%**	**900**	**92%**	**973**

*Reporting was optional until Dec 2010. 2012 Data current through 4/5/12

Prescribed Fire Program Guidance

Prescribed fire planning and implementation is conducted by most state, federal, and tribal agencies and numerous local and private entities. An endorsed and comprehensive set of guiding statements exists to frame program planning and implementation. Useful guidance ranges from broad interagency information and recommendations to agency-specific rules and regulations. The set of prescribed fire program framework elements and sources that are pertinent to prescribed fire planning and implementation have been reviewed by this team. They are listed in Table 3. Materials listed in this table are general in nature and intended only to show the sources of prescribed fire framework information. A tabulation of information relevant to all levels of the Prescribed Fire Program is provided in Appendix C.

Table 3. Prescribed fire program framework source documents.

Document	Purpose	Source
Interagency Prescribed Fire – Planning and Implementation Guide	Establish interagency, recommended guidance at the programmatic scale	National Wildfire Coordinating Group (NWCG)
Quadrennial Fire Review	Provide interagency strategic recommendations at the programmatic scale	National Wildfire Coordinating Group (NWCG) (includes National Association of State Foresters [NASF] as a signatory)
A National Cohesive Wildland Fire Cohesive Strategy	Develop interagency, strategic recommendations and implementation guidance at the national scale	U.S. Department of the Interior, U.S. Department of Agriculture (includes National Association of State Foresters [NASF] as a member of Wildland Fire Executive Council [WFLC])
Living With Fire: Protecting Communities and Restoring Forests. Finding and Recommendations of the Front Range Fuels Treatment Partnership Roundtable	Develop a long-term vision and recommended course of action for protecting communities from the risks of wildfire and restoring forest health at a local scale for 10 Colorado Front Range counties	Front Range Fuels Treatment Partnership Roundtable (Colorado Department of Natural Resources, Colorado State University, and Colorado State Forest Service are member organizations)
Colorado Revised Statutes	Define statewide management objectives and requirements	State of Colorado
Services Agreement, Colorado State University (CSU)/Colorado State Forest Service (CSFS) and Denver Water Board	Establish working agreement for services furnished by CSU to Denver Water for wildland fire management planning and administration, wildland fire response, and prescribed fire planning and implementation interagency-level agreement stipulating site-specific planning and implementation work	Colorado State University and City and County of Denver Board of Water Commissioners, Denver Water
North Fork Fire Protection District Community Wildfire Protection Plan	Establishes strategic site-specific recommended practices for mitigating wildfire hazards	Jefferson County Department of Emergency Management, North Fork Fire Protection District, and Colorado State Forest Service
Prescribed Fire Program Guidelines and Procedures. Prescribed Fire Procedures.	Establishes agency-specific procedures to follow in planning and implementing prescribed burns. Agency-level institutionalization of policy and procedures.	Colorado State Forest Service

Colorado State Forest Service policy related to the preparation, review and approval of prescribed fire plans is contained within their Prescribed Fire Program Guidelines and Procedures (CSFS 2011). This policy addresses seven functions related to prescribed fire planning including:

- Contracting
- Permitting
- Writing
- Review and Approval
- Implementation
- Reporting
- Escaped Prescribed Fires

In addition, the Colorado State Forest Service utilizes a Prescribed Fire Desk Guide, which provides templates for prescribed plan writing, checklists for technical review and approval of plans and information sources useful for prescribed burn planners. The elements of the Colorado State Forest Service standard plan template are derived from the Interagency Prescribed Fire Planning and Implementation Procedures Guide (2008). The Interagency Prescribed Fire Guide provides unified direction and guidance for prescribed fire planning and implementation. It is approved for use by the U.S. Fire Administration, National Association of State Foresters, U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, Bureau of Land Management and the National Park Service. Strict adherence to the guide is not mandated or expected and the guide states,

*"The guide describes what is **minimally** acceptable for prescribed fire planning and implementation. Agencies may choose to provide more restrictive standards and policy direction, but must adhere to these **minimums**." (NWCG 2008, Page 7)*

PRESCRIBED FIRE PROGRAM SUCCESS AND PAST ESCAPES

Prescribed fire is accepted as a highly feasible technique for vegetative manipulation and fuel treatment. The application of prescribed fire has been practiced for more than 80 years; however, it was done at a very small scale in its early history. It has been utilized extensively in forest management for site preparation, removal of competing vegetation, slash treatment, tree thinning, insect and disease control and for maintenance of visual scenes. It has also proved important for wildlife habitat manipulation and improvement, big game winter range improvement, livestock forage improvement, control of invasive species, watershed protection, maintenance of historic scenes, protection of cultural resources, sensitive species, ecosystem health maintenance and reduction of hazardous fuels. Without the option of prescribed fire, many land management objectives either could not be accomplished, or they could only be accomplished under much higher cost scenarios with potentially greater environmental damages.

The scale of prescribed fire utilization varies among land management agencies. The Colorado State Forest Service is one of the leading agency practitioners of prescribed fire in Colorado (Figures 3 and 4). These tables show that in terms of numbers of fires, the CSFS has ranked as the third highest for much of the 2001 to present time period (Figures 3 and 4). In terms of numbers of acres, the CSFS has ranked fourth (Table 4).

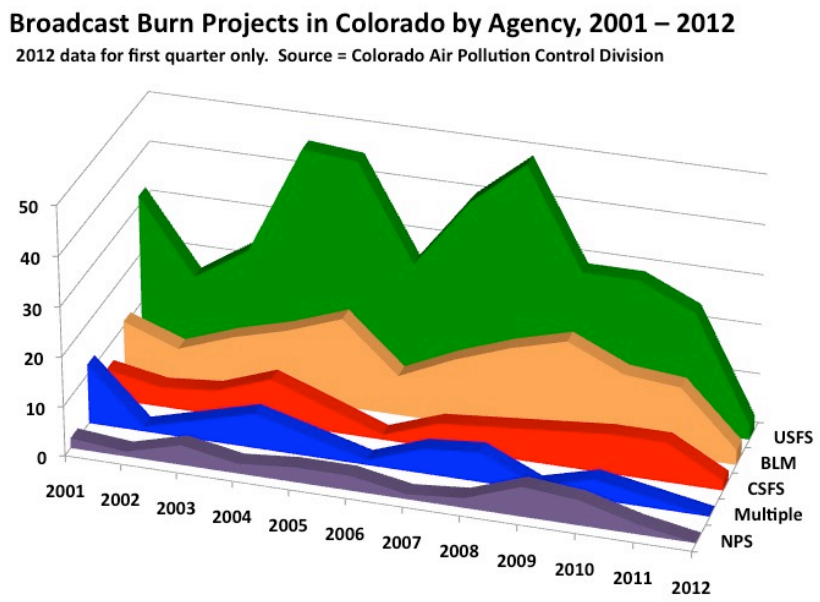

Figure 3. CSFS broadcast burn projects with air quality permits and activity from 2001 to present.

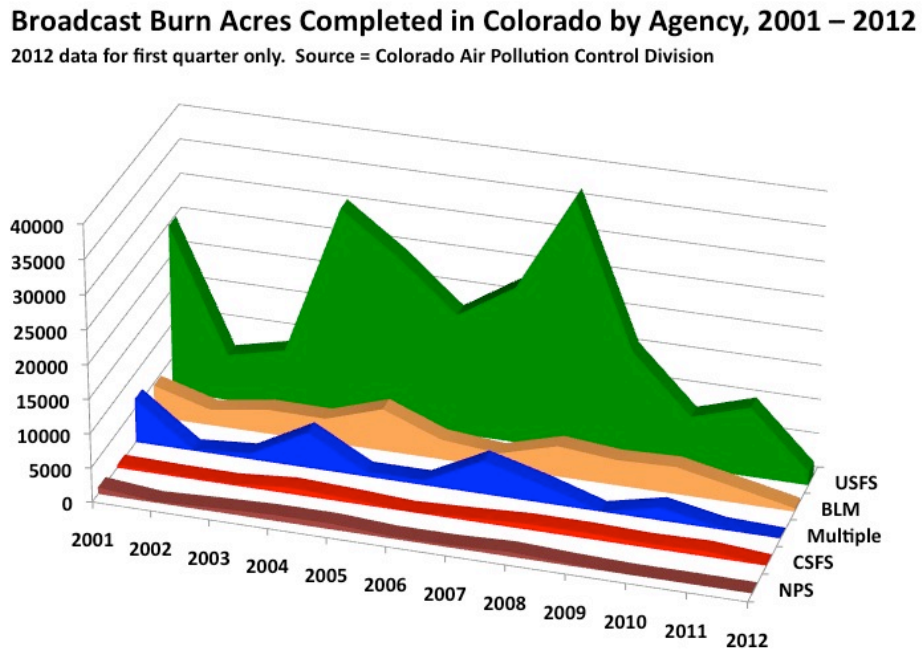

Figure 4. CSFS broadcast burn acres from 2001 to present.

Documentation of prescribed fire success and escape data is incomplete on a national interagency basis. Individual agencies have maintained data where possible and some information is available. This information indicates that escaped prescribed fires do not occur frequently, but they have occurred since the start of the Program. No agencies or organizations have been exempt from escaped prescribed fires.

Information regarding prescribed fire success during earlier time periods lacks clarity, but several known significant escaped fires, including the Bogus Fire in California in 1957 and the Mack Lake Fire in Michigan in 1980, have been documented (Forest Service 1957 and Simard 2003). Most land management agencies involved in prescribed burning seem to have experienced infrequent escaped prescribed fires. Some more notable examples include: Lowden Ranch Prescribed Fire, Bureau of Land Management, California – 23 residences destroyed; Upper Frijoles Units One and Five Prescribed Fire (Cerro Grande Wildfire), National Park Service, New Mexico – 235 buildings destroyed.

Colorado State Forest Service statistics show that between 2004-2011, the Agency implemented 175 prescribed fires for 14,189 acres, with only two of the fires escaping.

The frequency of escaped prescribed fires is relatively low, but escapes have happened. Dether and Black (2006) examined a number of prescribed fire escape reviews to help increase individual and organizational capacity to anticipate and respond to unexpected occurrences. They report that some important factors contributing to prescribed fire escapes are:

- Unforeseen and unexpected events - the most common form of unforeseen events are related to unexpected amplitude of events, such as greater than expected fire behavior due to winds, fuel moistures, fuel complexes and unexpected complexity.
- Weather was found to be the immediate causal factor in nearly 50% of the escapes reviewed; unexpected winds, in both strength and duration, were commonly cited as contributing weather factors.

REVIEW PROCESS

Review Guidance

Prescribed fires that have become escaped prescribed fires can result in serious consequences. These fires must be reviewed to determine specific factors that resulted in the escape. In all cases, escaped prescribed fires offer significant opportunities to learn from outcomes to improve future planning and implementation, and ultimately, reduce the incidence of future escapes.

Reviews concentrate on unintentional elements including mistakes, accidents, errors, system policy, protocol and procedural issues. Intentional rule violations warrant greater emphasis and are usually dealt with through other processes or investigations.

Recent interagency planning has created interagency endorsed broad-scale planning and implementation guidance for prescribed fire. This guidance includes recommendations for reviews of escaped prescribed fires (NWCG 2008). Colorado State Forest Service Prescribed Fire Procedures also outline a process and applicable questions for reviewing escaped prescribed fires (CSFS 2011).

In recent years, a great deal of work has been done to develop more successful and efficient review processes. Most past reviews have fixated on determining, in hindsight, what rules or protocol were broken, identify blame, and create additional rules and compliance incentives. The Facilitated Learning Analysis (FLA) (USFS 2012) recognizes a basic review principle, while accidents are very rare, risk is never absent.

This review has been designed based on both sets of guiding documents (NWCG 2008, CSFS 2011) and the FLA process. The report addresses the elements defined in the Colorado State Forest Service Prescribed Fire Procedures. It also seeks to fulfill the commitment to learning, and set the stage for meaningful improvement in the future. The full description of review processes, goals and objectives, inclusive elements, and documentation guidance can be found in the Interagency Prescribed Fire Planning and Implementation Procedures Guide (USDA-USDI 2008), Colorado State Forest Service Prescribed Fire Program Procedures (CSFS 2011), and the Facilitated Learning Analysis Implementation Guide (Forest Service 2012).

Review Objectives

The State of Colorado convened an independent Review Team to conduct a review of the Lower North Fork Prescribed Fire. The number of individuals assigned to the team, and their functional expertise, were commensurate with the scope and focus of the Review and the complexity of the situation. A formal Delegation of Authority (Appendix A) was provided to the team leader to conduct a thorough review of the Prescribed Fire. This Review was specifically charged to only address the Prescribed Fire up to the time of the wildfire declaration. Any review of the Wildfire will be separate from this review, as will an investigation of the fire origin and cause.

Goals of this review were to:

- Guide future program actions by minimizing future unintended outcomes
- Identify actions necessary to reduce the likelihood for escapes from prescribed fires generally

Given the above foundational goals, the specific purpose of the review was to:

- Document the review process
- Review the background situation
    - Document the problem statement associated with fuel alterations and WUI growth
    - Describe the environmental, social, economic and political setting
    - Describe the fuel treatment program for this portion of the Colorado Front Range
- Describe the Lower North Fork Prescribed Fire
- Document key observations and learning elements though analysis
- Summarize factors potentially contributing to the escape of the Prescribed Fire
- Define lessons learned from this event
- Provide recommendations to strengthen future program activities and build prescribed fire capacity

Factual information collected during the Review was centered on policy, protocols and performance.

Review Team

The Review Team consisted of:

Bill Bass	Team Leader
Tom Zimmerman	Team Member
Frankie Romero	Team Member
Dave Hamrick	Team Member
Tammy Williams	Team Member
Jace Ratzlaff	Team Member
Kelly Close	Team Member
Dean Clark	Team Member
Tim Mathewson	Team Member

Additional staff support and expertise was added to the team when necessary.

The Review Team interviewed personnel associated with the planning and implementation of the Prescribed Fire, reviewed written documentation of events and actions leading up to the declaration of the Prescribed Fire as a wildfire. The Team visited the Prescribed Fire site and developed a final report.

SETTING

Environmental, Social, and Political Setting

The Denver metropolitan area is located in the transition zone from the prairie to the Rocky Mountains. This area is a rapidly growing and expanding urban region. The majority of the geographic area is found adjacent to the mountains, and much of it exists in the foothills representing a significant WUI area. Denver serves as the economic and commerce hub of the central Rocky Mountains and western Great Plains. It is also home to one of the country's largest international airports, crossroads of two national interstate highways and commercial railways and home to over half of Colorado's population.

The foothills and mountains of the Colorado Front Range are adjacent, visible, and directly influential to the Denver metropolitan area. This area is critical for supplying water, providing recreational opportunities, providing highly valued scenery, supporting abundant species of wildlife, and contains many homes and businesses.

Jefferson County occupies part of the foothills area southwest of Denver. It is close to Denver, other parts of the metropolitan area, and is within commuting distance for local residents. These facts make this area highly desirable for mountain living. As a result, population growth and associated WUI expansion continues to occur. Jefferson County has the fourth largest population in the State with parts of the County experiencing a 20% population increase since 2000. It has been estimated that Front Range WUI areas in general may double over the next 20 years (FRFTP Roundtable 2006).

Vegetation in this area consists of forests, mixed conifer woodlands and grasslands. Ponderosa pine and Douglas-fir comprise the majority of forest, with aspen, lodgepole pine, and riparian hardwoods occurring in lesser amounts in isolated areas. A high proportion of this area is a fire-dependent ecosystem. This type of ecosystem has historically experienced frequent natural fire that maintained an open forest structure and diverse vegetation composition.

The Upper South Platte Watershed in the heart of this area is extremely important. This watershed supplies the Denver metropolitan area with 80 % of its water (Jefferson County 2011). It has experienced severe erosion and sedimentation following past fire events, and future wildfires may cause even more negative effects.

A majority of vegetated areas and fuel complexes in wildland areas have been subject to structural shifts and alterations as a result of a myriad of factors. These include changing land use, fire suppression, environmental changes, insect, disease, invasive species, spread and proliferation, landscape fragmentation and weather and climatological drivers. In this area, and across the entire western United States, changes in forest structure and composition over the past 60 to 100 years are increasing fuel loads. This makes coniferous forests more susceptible to intense and highly severe fires (Graham and others 2004). The Front Range has experienced a prolonged drought, continuous rapid expansion of the WUI and an accumulation of hazardous fuels in a fire-prone region. These circumstances have created incubation period for

catastrophic wildfires with significant risk to life and property. Fuel complexes that resist control, steep topography, and narrow, dead end roads complicate a difficult fire protection scenario.

Large impactful wildfires have been occurring on the Front Range, and they have caused great damage to infrastructure and natural resources. The Buffalo Creek Fire in 1996 caused severe post-fire erosion and sedimentation. This fire event served as the impetus to develop a comprehensive, long-term, strategic plan to increase watershed protection in the Upper South Platte area (Figure 2). In 1998, land and fire management organizations, including the Colorado State Forest Service (CSFS), Denver Water, U.S. Forest Service (USFS), Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), Natural Resource Conservation Service (NRCS) and the Coalition for the Upper South Platte (CUSP), formed a steering committee to address forest health issues within the watershed. As work proceeded, the U.S. Fish & Wildlife Service also became involved. The primary purpose of this effort was to demonstrate the effectiveness and plan for future implementation of landscape-scale forest protection and restoration practices.

The Hayman Fire in 2002, the single largest fire in Colorado history, burned approximately 140,000 acres. The Fire consumed 133 homes, 466 outbuildings, and left portions of four counties highly vulnerable to post-fire flooding and erosion (FRFTP Roundtable 2006). Following the Hayman Fire, and the 2002, fire season, a coalition of organizations and government agencies came together to identify areas needing treatment to protect communities and restore forest health. This is referred to as fire risk mitigation and ecological restoration (Figure 2). The coalition, known as the Front Range Fuels Treatment Partnership Roundtable, identified approximately 1.5 million acres of forest that may be in need of treatment (approximately 60% of the area is privately owned). These activities are a sampling of the multitude of strategic planning and implementation activities that have taken place to date (Figure 2).

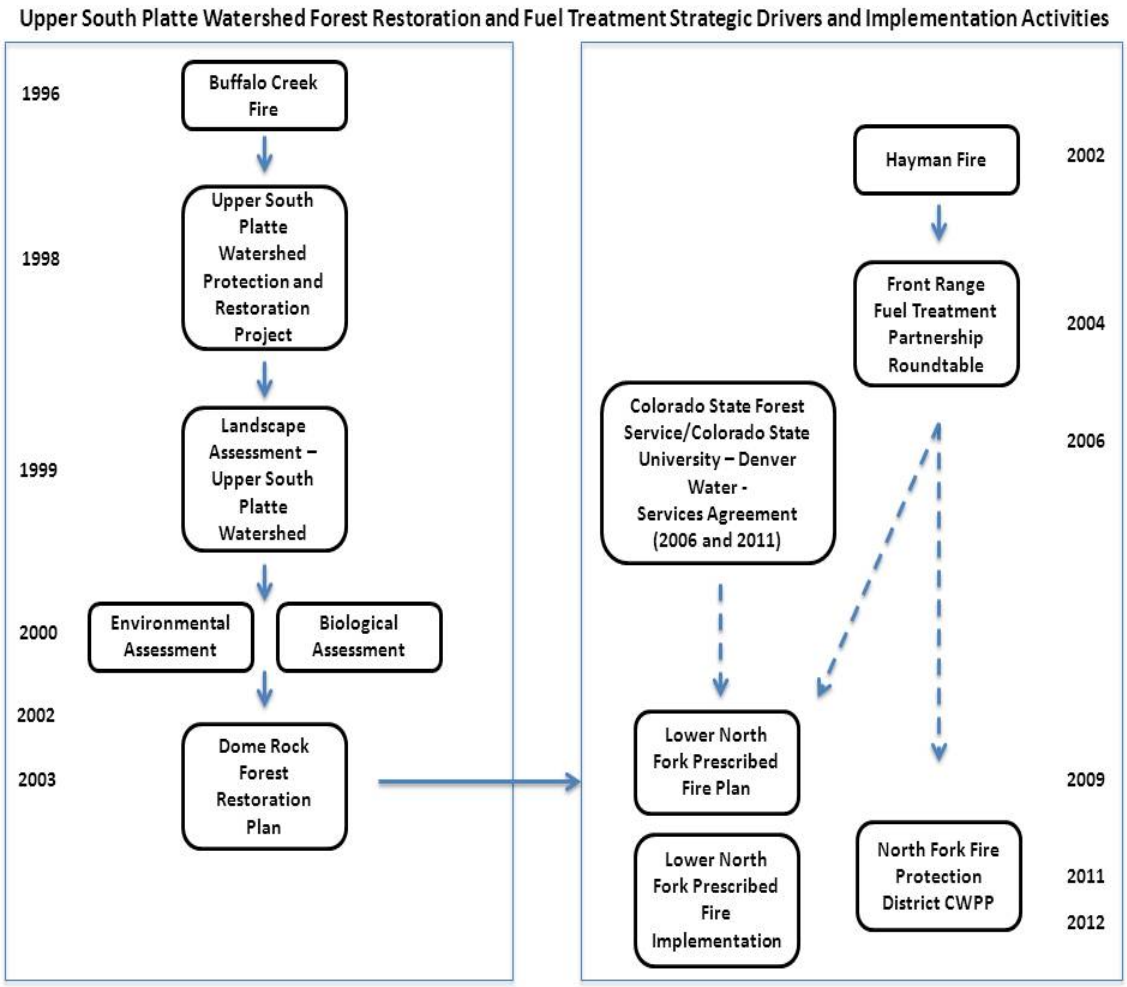

Figure 5. Upper South Platte Watershed forest restoration and wildfire risk mitigation activities. The solid arrows indicate sequential flow while dashed lines indicate indirect influence.

The magnitude of the areas needing fuel treatment, expanding WUI areas, increasing total fire numbers and growing sizes of large wildfires are symptomatic of a rapidly escalating community protection and forest health problem. A recent assessment of forest conditions and risk from wildfires shows that a majority of the Colorado Front Range WUI area is in the high to very high levels. Figure 6 shows Front Range forest conditions and wildfire risk assessment levels (FRFTP Roundtable 2006).

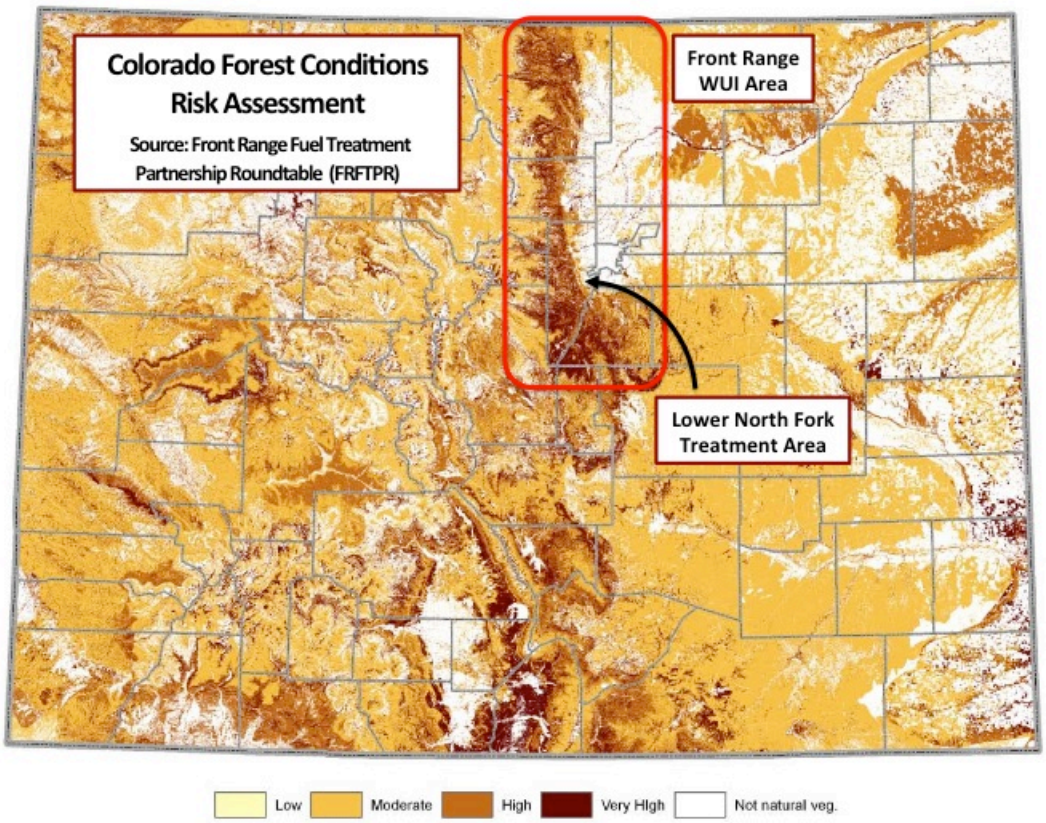

Figure 6. Colorado Front Range forest conditions and risk assessment identified for forest treatment, including fire risk mitigation and ecological restoration. (Source: FRFTP – 2006)

Community Wildfire Protection Plans (CWPP) are strategic plans that identify specific wildland fire risks facing communities and neighborhoods. They provide prioritized mitigation recommendations designed to reduce those risks. The Healthy Forests Restoration Act (HFRA) of 2003, provides the impetus for local communities to engage in comprehensive forest and wildfire management planning. It also serves as incentive for public land management agencies to consider CWPP treatment recommendations as they develop their own strategic management plans. The CWPP development process facilitates collaboration among community-based organizations, fire protection authorities, local governments, public land management agencies and private landowners in an effort to identify and prioritize measures to reduce wildfire risk.

CWPP's can include a fire behavior analysis and community wildfire hazard rating as a comprehensive and scientifically-based assessment. The actions recommended in a CWPP are designed to lower wildfire hazards to neighborhoods, the economy and ecological values at risk. Values at risk priorities for protection may include:

- Watersheds
- Tourism

- Private property and infrastructure. Many homes in the area have a "high" fire hazard rating due to expected fire behavior and surrounding wildland fuels.
- Aesthetics
- Recreation
- Historic/cultural resources

CWPP's also recommend treatment options that may include: shaded fuelbreaks, machine mowing, prescribed fire, brush mastication, timber mastication, manual thinning and felling and feller buncher removal of larger diameter trees.

Lower North Fork Prescribed Fire Project

Part of the focus to improve protection capability in the Upper South Platte Watershed area, and to support the Upper South Platte Watershed Restoration Plan, the Lower North Fork Prescribed Fire Plan was developed by the Colorado State Forest Service to reduce fuels and decrease potential fire behavior.

The Lower North Fork Prescribed Fire was developed consistent with the direction stated in the prescribed fire framework elements described in Table 1. The proposed burn areas are located in western Jefferson County, near the community of Foxton, on the Front Range area southwest of Denver (Figure 7).

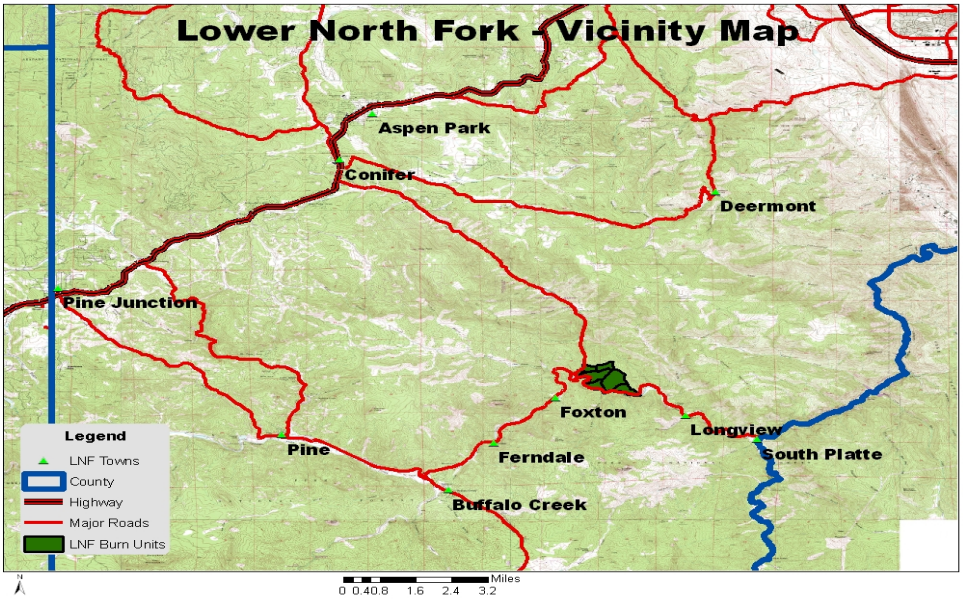

Figure 7. General vicinity of Lower North Fork Prescribed Fire.

The area is bounded by portions of the Pike National Forest (South Platte Ranger District) to the south and west, and private land to the north and east. Land ownership within the area is primarily individual homeowners and Denver Water. The Colorado State Forest Service and Jefferson County Open Space also own land tracts in the area.

A comprehensive plan valid for five (5) years was developed. It identified six (6) treatment units within the planned area (Figure 8). The maximum acres to be treated were 335. The management use/type of project was identified as natural fuel reduction (ecosystem management), activity fuel reduction and hazard fuel reduction. Prescribed fire was defined as the treatment method, with broadcast burning as the primary technique. The Lower North Fork Prescribed Fire was considered to be part of a project that included non-fire fuel treatments (mechanical mastication) with all treated material left on site.

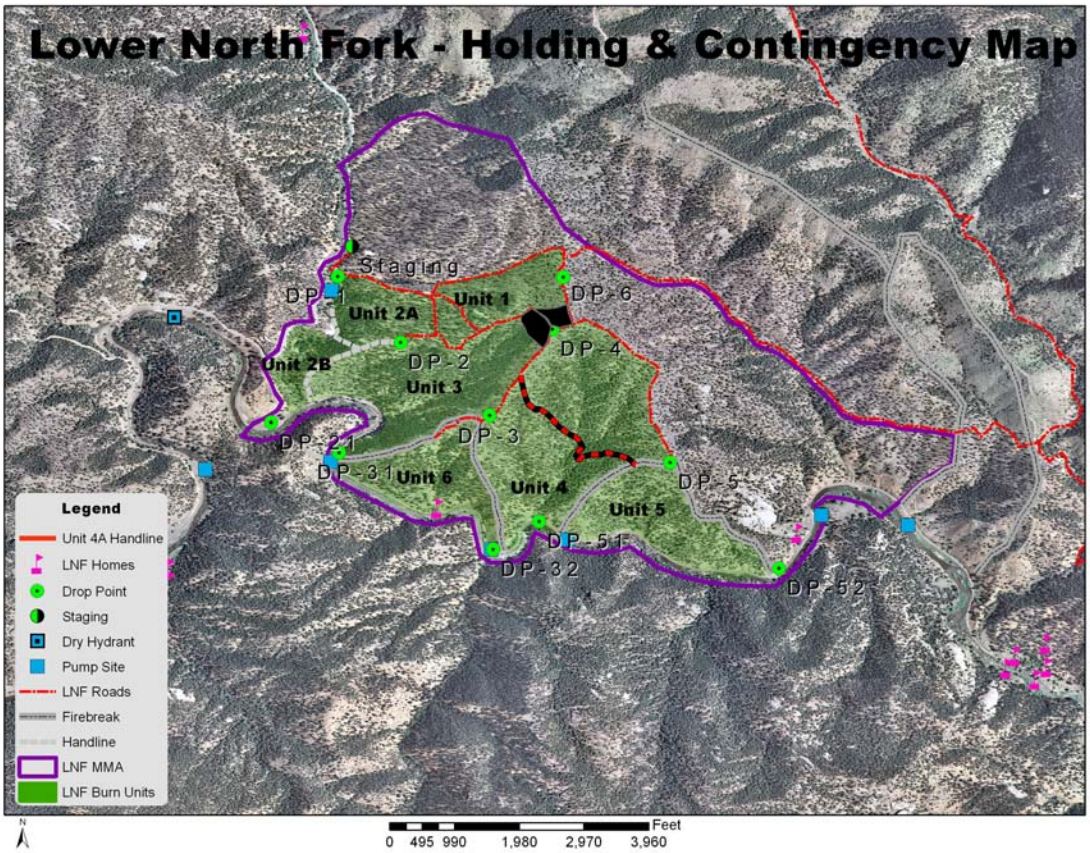

Figure 8. Lower North Fork Prescribed Fire treatment units.

Lower North Fork Prescribed Fire Objectives

The following objectives were identified for the Lower North Fork Prescribed Fire Project:

- Overall resource management goal (from general project plan):
  - Restore forest health and vigor
  - Reduce wildfire hazard
- General control objectives (from Incident Action Plan for Burn):
  - Provide for public and firefighter safety
  - Resource management:
  - Minimize smoke impacts to sensitive receptors through adherence of the smoke management plan

    - Provide on-the-ground training opportunities to local fire cooperators

- Prescribed fire objectives (from Prescribed Fire Plan):
    - Remove 70% or more of the woody fuel less than one inch in diameter
    - Remove 50% or more of the woody fuel greater than one inch in diameter
    - Retain 90% or more of the residual stand in the masticated areas
    - Create a mosaic of open patches (five acres or less) in the un-masticated areas, not to exceed 33% of the total untreated area

Additional information is described later in this report, and it is also available in the Lower North Fork Prescribed Fire Plan (on file at CSFS Golden District Office, Golden, CO).

DESCRIPTION OF THE EVENT

Chronology of Events Leading up to Wildfire Declaration

Table 3. Chronology of Events Leading up to Wildfire Declaration

DATE	EVENTS
2011 Mar. 1-2	First entry on Lower North Fork (LNF) Prescribed Fire project. Blacklining operations in Units 1 and 3
2011 Mar. 02	Smoke Form E (accomplishment) submitted for Unit 1 blacklining reports 3 acres
2011 Mar. 10	Fire effects report documents fire behavior and effects
2011 Sept. 28	LNF Unit 1 broadcast ignition operations
2011 Sept. 28	Smoke Form E (accomplishment) submitted for LNF Unit 1 reports 25 acres
2011 Sept. 29	Burn Boss report includes notes of short-range spotting on all burn days, long residence time for flaming and combustion in masticated fuels and variable wind conditions due to topography
2011 Oct. 04	LNF Unit 1 broadcast ignition operations continue. Go / No-Go Checklist signed by Burn Boss at 0905 hrs.
2011 Oct. 04	Test fire documentation reports “low end” fire behavior
2011 Oct. 04	LNF Unit 1, “Roaded Island” subunit burned, 7 acres ignited per Burn Boss report
2011 Oct. 04	Smoke Form E submitted for 11/04 operations reported 7 acres
2011 Oct. 12	Burn Plan Prescription Parameters revised based on observations from prior burn days, some prescription elements changed to allow increased flexibility to burn under typical site conditions while safely meeting objectives
2011 Oct. 13	Blacklining in Unit 4a on east side of unit along road, handlines improved on south and west side of unit
2011 Oct. 13 1430 hrs.	Burn Boss notes reported 50 x 50 spot on east flank near DP-5; contained w/in 10 min. GPS track of perimeter shows spot fire was .37 acres.
2011 Oct. 13	Smoke form E submitted for 11/13 blacklining reported 5 acres burned
2011 Oct. 17	Planned ignitions in Unit 4 cancelled due to poor weather forecast
2011 Oct. 19	Burn Boss report from 11/13 operations states blacklining created a +/- 50’ buffer along NE corner of Unit 4a
2011 Nov. 10	Test plots ignited along north perimeter Unit 4a, total acres .25, fuels reported not dry enough for broadcast burning

DATE	EVENTS
2012 Jan. 03	Smoke Form F (annual activity) submitted reporting 2011 LNF project accomplishments, reported 2011, burn days on March 1-2; Sept. 28; Oct. 4; Oct. 13 and Nov. 10 for total of 44 acres
2012 Mar. 13	CSFS Golden District Resources visited LNF Unit 4a to check fuel conditions and clear control lines
2012 Mar. 19	Blacklining operations in Unit 4a along NW side from DP-4 toward the weather station created blackline approximately 50-60 feet deep
2012 Mar. 20	Mop-up of area blacklined on 3/19, port-a-tank, pump and hose lay installed at DP-5 to plumb lower control line
2012 Mar. 21	Colorado State Forest Service personnel conducted 20 acre White Ranch Prescribed Fire on Jeffco Open Space lands; afterwards personnel continue preparations for LNF Unit 4a
2012 Mar. 21	Observations for Spot Weather Request taken at top of Unit 4 at 0945hrs. 39 dry, 34 wet, DP 28, RH 64, W 1-2 G 3 from NE
2012 Mar. 22	Burn day, Unit 4a ignition operations
2012 Mar. 22 0930 hrs.	Operational briefing is held at Reynolds Park, afterwards resources moved into position on the burn unit
2012 Mar. 22 1129 hrs.	Go / No-Go Checklist signed by RXB2, Ignition Specialist and Holding Specialist
2012 Mar. 22 1145 hrs.	Test fire ignited on northern edge of unit approximately 30 yds. E/SE of DP-4. Results acceptable, documentation by Burn Boss
2012 Mar. 22 1200-1700 hrs.	Ignition continues, resources on scene exceeded burn plan requirements for ignition operations: 2 Type 2 handcrews; 6 engines; qualified overhead
2012 Mar. 22 1700 -2030 hrs.	Initial mop-up begins. All resources released from LNF Unit 4a project area by 2030
2012 Mar. 22	Smoke Form E (accomplishment) submitted for Unit 4a reports 40 acres ignited
2012 Mar. 23	Burn unit perimeter is mopped-up approximately 200 feet deep; resources on scene were ICT4, 3 Type 6 engines, 2 Type 4 engines, and one Type 2 handcrew. The number of resources on scene exceeded burn plan requirements for extended mop-up operations
2012 Mar. 24	Patrol of LNF Unit 4a is conducted by ICT4 – only fire activity reported found in isolated stumps, logs, and duff pockets within the burn unit.
2012 Mar. 24	After update on unit conditions from the ICT4, the Burn Boss and CSFS Golden District Forester determined no need for patrol on Sunday
2012 Mar. 25	Lower North Fork Unit 4a is unstaffed
2012 Mar. 26	Burn Boss visited White Ranch Prescribed Fire site and declared burn “out”. He

DATE	EVENTS
	then returned to CSFS Golden District office.
2012 Mar. 26 1000 hrs.	ICT4 with two firefighters arrived onsite in morning for patrol. Fire activity observed is the same as found on March 24. Personnel patrolled control lines and found no concerns. Personnel began breaking down hose lay and have all water handling equipment packaged for backhaul by approximately 1230 hrs.
2012 Mar. 26 1240 hrs.	Winds increased blowing embers from interior of burn unit through the blackline reigniting fuels inside northeast flank of burn unit.
2012 Mar. 26 1300 hrs.	Firefighters have begun mop-up of smokes appearing within perimeter. FFT1 requested Type 6 engine from CSFS Golden District. ICT4 takes UTV w/ tank & pump to get water
2012 Mar. 26 1315 Hrs.	Two small spot fires discovered SE from DP-4. These are quickly contained and mopped-up. UTV w/ water back on-scene
2012 Mar. 26 1330 hrs.	New spot fire discovered outside control line near DP-5
2012 Mar. 26 1340 hrs.	ICT4 called CSFS Golden office to notify Burn Boss and District Forester
2012 Mar. 26 1347 hrs.	ICT4 requests additional resources through CSFS Golden office
2012 Mar. 26 1348 hrs.	Burn Boss (in Golden) requested additional resources through Jefferson County Sherriff's Office
2012 Mar. 26 1350 hrs.	ICT4 reported 1.5 acres outside burn perimeter and growing fast
2012 Mar. 26 1430 hrs.	Spot fire exceeded suppression capability of on-scene resources. The ICT4 (in communication with the Burn Boss) declared an escaped fire.

Narrative of events leading up to wildfire declaration

The first prescribed fire entries in the Lower North Fork Project Area occurred in 2011. These entries consisted of blacklining operations in Unit 1 and 3 followed by broadcast burning of Unit 1 in two phases and finally blacklining operations on Unit 4. CSFS personnel gained more experience with burning conditions in the masticated fuels during the burning of Unit 1. Observations of fire behavior resulted in revision of the burn prescription. Some prescription elements were changed to allow increased flexibility to burn under typical site conditions while safely meeting objectives.

The first entry into Unit 4A occurred on October 19, 2011, when a section of the upper perimeter was blacklined. This blacklining operation created an approximately 50' strip of "black" from DP-4 to DP-5. During this operation a spot fire occurred across the road in a small saddle north of DP-5. The spot fire was contained and extinguished. GPS mapping showed the spot fire to have been .37 acres in size. The Burn Boss reported five acres ignited during this blacklining operation.

On March 13 of 2012, CSFS personnel visited the Lower North Fork Project area to assess fuel conditions and clear control lines in preparation for continuing burning operations on Unit 4A. On March 19 an additional section of the Unit 4A perimeter was blacklined from DP-4 down the upper west side of the Unit toward the weather station. On March 20 personnel conducted mop-up of the

area blacklined the previous day. They also installed a port-a-tank, pump and hoselay to plumb the lower west side of the perimeter from DP-5 to the low point of the handline. CSFS personnel continued to monitor the weather, and based upon favorable forecasts, they decided to proceed with the main ignition of Unit 4A on March 22.

MARCH 22

Personnel met at Reynolds Park along Foxton Road a few miles north of the prescribed fire area for the operational briefing. After the briefing the resources proceeded to the Burn Unit. Time was spent performing reconnaissance of the Unit for resources who had not been there previously. The Firing Boss, in particular, took extra time to gain familiarity with the Unit. All personnel were in place and ready for the test fire by approximately 1100.

The Burn Boss reviewed the Go/No-Go checklist with the Firing Boss and Holding Specialist. After concurrence that all elements were a "Go" the checklist was signed at 1129. The test fire was initiated, results were favorable, and the test fire documentation was signed by the Burn Boss at 1145. Ignition operations targeted the masticated fuels with some ignition also in the "natural" fuels in the interior of the unit. The interior of the unit was not completely ignited. By approximately 1700 hours all resources on scene began mop-up of the perimeter. Mop-up efforts targeted the first 100 feet inside the burn perimeter. Additional actions included "grid" searches of the area outside the perimeter of the burn, and no spot fires were found. The Burn Boss Trainee indicated there were no holding or smoke management concerns when resources were released between 1900 and 2000 hours.

MARCH 23

Operations on March 23 were focused entirely on mop-up of the burn perimeter. The burn was well staffed with on-scene resources consisting of the following:

(1) RXB2/t / ICT4;
(1) Type-2 Handcrew (20 persons);
(2) Type-4 Engines with ENGB each and FFT2 each;
(3) Type-6 Engines with ENGB each and total (6) FFT2

On-scene resources totaled 34 persons and five engines, more than double the burn plan requirements for extended mop-up staffing. The Spot Weather Forecast issued March 23 for the LNF project contained a minimal discussion with no mention of upcoming wind events or red flag warnings; "clear through the afternoon with light winds and poor dispersal much of the day." One small spot fire (1/10 ac.) was discovered that morning below the lower handline on the west side of the Unit. The spot was quickly lined and extinguished. The engine crews mopped up along the roaded (upper) portion of the Unit and the handcrew worked along the lower handline.

Mop-up activities concentrated on areas within two to three chains of the road per burn plan direction. No significant holding concerns or excessive smoke production were noted. One of the Engine Captains felled two snags and reported that he heard at least four other snags come down within the Unit. Communication was passed advising personnel of the snag hazard and cautioning against working too far interior. Good progress was made and lots of water was utilized. Each engine refilled at least twice and the port-a-tank was refilled once. All personnel interviewed felt good about their progress with no smokes were reported within two chains of the road by the end of the day.

Resources were released late in the afternoon and all had departed the Unit by 1730. Prior to leaving the ICT4 met with personnel from Elk River Fire and gave them a key to the gate at the entrance to the project area. The ICT4 planned for a minimal patrol the next day.

MARCH 24

The NWS Zone Forecast issued 0523 hrs. MDT on March 24 indicated *"Max Temperature 58-68, Min Humidity 14 – 24%, Southwesterly flow aloft will increase and becomes south-southwesterly into Monday afternoon… Fairly strong low level winds are expected Monday… so fire danger will be worse."*

The ICT4 from the previous day performed the burn area patrol. During interview he stated that while driving into the area he saw no smoke until getting to the top of the burn unit near DP-4. He patrolled the area on foot and on ATV. He reported two visible smokes within the interior of the Unit. One was in the lower portion of the eastern half of the burn and the other well inside the western half. This smoke on the east side was described as deep duff burning in a shallow drainage. He finished his patrol and was leaving the Unit at approximately 1300.

The ICT4 removed burn signs that had been posted on Highway 285. He stated that this was done so that if a smoke was sighted from Highway 285 it would hopefully generate a 911 call. Prescribed burn signage was left in place along the Foxton Road.

The ICT4 contacted the Golden District Forester and the Burn Boss after return from the burn unit patrol. After discussing conditions on the burn the District Forester decided no patrol would be necessary on March 25 (Sunday). The plan was for the ICT4 to return to the unit on March 26 (Monday) for another patrol and possibly to remove the port-a-tank, pump and hoselay.

The NWS issued a Fire Weather Watch at 1409 *"…in effect from Monday afternoon through Monday evening for wind and low relative humidity for the Front Range Foothills below 7000 feet in Northern Colorado…"*

The NWS re-issued the Fire Weather Watch at 2131 PM *"…Fire Weather Watch remains in effect from Monday afternoon through Monday evening for wind and low relative humidity for the Front Range Foothills below 7000 feet in Northern Colorado… Timing… 12 noon MDT to 7 PM MDT on Monday… Winds… southwest 20 to 30 mph with gusts up to 50 mph."*

MARCH 25

No patrol operations occurred on Sunday, March 25. The burn was unstaffed.

The NWS Zone Forecast issued 0526 MDT on March 25 contained a *"Fire weather watch in effect from Monday morning through Monday evening for fire weather zones 215… 216… and 238 through 251 for strong winds and low relative humidity… Conditions may approach red flag criteria in areas south and southwest of Denver by late afternoon… The strong winds on Monday will make it to the surface… with red flag conditions a good bet for the plains. Fire Weather Watch in effect from noon Monday through 7 PM Monday for strong winds and low relative humidity… "*

The NWS upgraded the Fire Weather Watch to a Red Flag Warning at 1215 *"…for wind and low relative humidity… which is in effect from 10 AM to 7 PM MDT Monday. The Fire Weather Watch is no*

longer in effect… Winds…southwest 20 to 30 mph with gusts up to 50 mph. Winds will shift to the west late in the afternoon…"

The ICT4 and Burn Boss received pages on Sunday evening March 25 from the CSFS State FDO and also from Jefferson County Dispatch advising of the red flag warning for Monday.

MARCH 26

The NWS Zone Forecast issued 0551 MDT on March 26 contained a *"Red Flag Warning in effect from 10 AM until 7 PM for fire weather Zones 215… 216… and 238 through 251 for strong winds and very low humidity…20-foot winds / Valleys and Lower Slopes … southwest 8-13 mph with gusts to 25 mph increasing to 22-32 mph with gusts to 60 mph in the afternoon."*

The ICT4 arrived on the burn unit in a pickup truck with two firefighters around 1000. All control lines were patrolled and the lower handline was mapped with a GPS unit. No holding concerns were noted. The same two interior smokes that were noted on Saturday were still visible. One was located on the west side of the Unit and another one in a shallow drainage on the lower east side. No mop-up needs were observed, no additional mop-up was conducted.

The ICT4 and the two firefighters proceeded to break down the port-a-tank, pump and hoselay. The water handling equipment was loaded for backhaul by approximately 1230. The group proceeded from the area around DP-5 up the road toward DP-4 between 1240 and 1250. By this time winds had increased significantly to approximately 10-15 mph. The winds fanned the hot areas within the burn resulting in increased smoke and embers "like fleas" landing in the blackline area and reigniting available fuels. The patrol crew began to mop-up these new smokes within the perimeter.

At 1300 the ICT4 left the FFT1 and FFT2 at the burn and took a UTV w/ 70 Gallon tank and pump down to the creek to get a load of water. The FFT1 called on the radio to the CSFS Golden District office for a Type 6 engine to be brought up to the burn and specifically stated no additional firefighters were being requested, just the engine. Before the ICT4 returned, the two firefighters discovered a couple of small spot fires across the road approximately 1/8 mile SE of DP-4. Upon return to the unit at approximately 1315 the ICT4 found the two firefighters working the two "desk sized" spots. The spots had been lined and were being mopped up. Water in the UTV was used to extinguish the spots.

By this time wind speeds had increased and more smoke and embers were blowing across the control lines. The firefighters were surprised at material reigniting in the black and wondered "how is this stuff burning." They noticed an increase in smoke coming from the area around DP-5. The FFT1 was sent to investigate and viewed the area of concern from a higher point on the road. He reported back to the ICT4 that it was smoke from within the burn unit blowing across the line.

The ICT4 called on the radio to the CSFS engine en-route to the burn and heard they were approximately five minutes from the gate at the bottom of the project area. He was still concerned about the volume of smoke he was seeing around DP-5. At 1330 he took the UTV, which was out of water, down the road for a closer inspection. Upon arrival he discovered a new spot fire adjacent to the control line in the same saddle where a spot fire had occurred during blacklining the previous October. This new spot fire was approximately 10'x10' in size and was burning hot in the masticated

fuels. The ICT4 took the UTV back up the road and used the truck radio to call the CSFS Golden office at 1340 to report the spot fire and relay size-up information.

At 1347 he called the CSFS Golden office again to request more resources. Then he took the UTV back down to the creek to get more water. At 1348 the Burn Boss called Jefferson County Sherriff's Office Fire Management staff to request that North Fork Fire and Elk Creek Fire resources be sent to the burn. By this time the CSFS engine requested earlier had arrived on scene and was utilized by the ICT4 and two firefighters to work the new spot fire. At 1350 the spot was reported to be 1.5 acres in size, well established in the masticated fuels and resistant to control efforts given the increased winds.

Resources from North Fork Fire arrived between 1400 and 1415 and resources from Elk Creek Fire arrived approximately 10 minutes later. The ICT4 discussed the situation via radio with the District Forester and the Burn Boss. The fire was declared an escaped fire at 1430.

KEY ANALYSIS OBSERVATIONS AND LEARNING ELEMENTS

Seasonal Severity, Weather, and On-Site Conditions Leading Up to the Wildfire Declaration

Seasonal Severity

Strong low pressure systems brought near record snowfall and cooler than average temperatures to the Colorado Front Range in February. An abrupt pattern shift resulted in the driest and one of the warmest months of March on record. The record warmth and dryness leading up to March 26, 2012, quickly depleted February's snowfall gains below 9000 feet MSL. The weather pattern supported a high frequency of wind events, exacerbating the drying of fuels along the Front Range. See Appendix F.

Weather

March 19, 2012- Lower North Fork Blacklining Operations

Blacklining operations on March 19, 2012, on the Lower North Fork Unit was performed and completed under non-critical atmospheric conditions. On-Site observations indicate a prevailing south-southwest wind of 3 to 6 mph with gusts to 10 mph with good lift and dissipation of smoke. On-site temperature readings were consistent with Remote Automated Weather Station (RAWS) observations at similar elevations (6800-7100 feet msl), however relative humidity readings were 10% to 12% higher.

March 20-21, 2012

Site weather observations were taken on March 21, 2012, on the Lower North Fork Unit for the purpose of obtaining a spot weather forecast. The maximum temperature readings from local RAWS observations ranged from the mid-40s to low 50s. Minimum relative humidity range from 19% to 22%, with prevailing wind from the east to northeast at 7 to 10 mph with gusts 16 to 21 mph. Manual calculations of the Haines Index from Denver (DNR) Radiosonde data ranged from a 3-very low on the afternoon of March 20, 2012, and a 2-very low the afternoon of March 21, 2012. Much of the Colorado Front Range was under the influence of a "Cut Off" low pressure system centered over Kansas and Oklahoma. No precipitation was recorded in the Unit.

March 22, 2012- Lower North Fork Prescribed Fire

The eastern plains and Front Range of Colorado remained under the influence of a "Cut Off" low pressure system centered over southern Kansas and Oklahoma. On-site wind observations measured an east to northeast (at times variable) wind direction with maximum sustained wind speeds ranging 5 to 9 mph with maximum gusts of 10 to 12 mph. Maximum temperatures reached 59ºF with a minimum relative humidity of 21%. Calculated Haines Indices from the DNR radiosonde data ranged from 2-very low at 0600 MDT to a 3-low at 1800 MDT.

March 23-26, 2012- Changing Meteorological Conditions and the Lower North Fork Prescribed Fire and Wildfire
Meteorological Conditions March 23, 2012

March 23, 2012, marked the beginning of changing atmospheric conditions that became more conducive to support large fire activity. On March 23, 2012, a ridge of high pressure extended from New Mexico, northward into Colorado, eastern Wyoming and the Black Hills of South Dakota, as a new trough of low pressure began to take shape off the west coast. The shift in the pattern resulted in a significant air mass change across Colorado including the Front Range. Temperatures increased 15 to 20 degrees from the previous day of March 22, 2012, with maximum readings in the low 70s at the Bailey and Polhemus RAWS near the Lower North Fork burn site. Denver, Colorado set a new record high that afternoon of 76 degrees. Local RAWS also showed a steady decrease in relative humidity during the early morning hours, with values dropping into the single digits by 1400 MDT on March 23, 2012.

Meteorological Conditions March 24-25, 2012

The air mass along the Front Range and over the Lower North Fork Unit became more precarious on March 24 and 25, 2012, leading up to the critical fire weather pattern on March 26, 2012. The upper ridge that extended across Colorado on March 23, 2012, had shifted into the plains as an upper air trough and associated surface front migrated east into California and Nevada by the end of the day on March 25, 2012. The shift in the ridge resulted in a slightly cooler temperature, but still above average with readings in the mid-60s to around 70 at the Bailey and Polhemus RAWS sites. It is important to note, relative humidity dropped into the single digits on the afternoon of March 24 and 25, 2012. The air mass remained unstable and dry with calculated Haines Indices of 5 to 6.

A Fire Weather Watch was issued by the Boulder National Weather Service Office on Saturday, March 24, 2012, 0209 for Monday, March 26, 2012, from 1200 MDT to 1900 MDT, highlighting increasing winds (Southwest 20 to 30 mph with gusts up to around 45 mph), and low humidity (6%), including fire weather zone 216 that encompasses the Lower North Fork Unit.

The Fire Weather Watch for Monday, March 26, 2012, was upgraded to a Red Flag Warning by the Boulder National Weather Service office on Sunday, March 25, 2012, at 1215 MDT, highlighting a west to southwest wind of 25 to 35 mph and gusts up to 65 mph, including fire weather zone 216 that encompasses the Lower North Fork Unit.

Meteorological Conditions March 26, 2012-Lower North Fork Wildfire
Upper Air and Surface Pressure Features

Meteorological conditions that contributed to the escape of the Lower North Fork Prescribed Fire on March 26, 2012, were consistent with historic fire events that have occurred across Colorado (South Canyon 1994, Bobcat Gulch 2000, Hayman 2002, Overland Fire 2003). Analysis of upper air and surface pressure charts on March 26, 2012, showed an eastward shift of the upper ridge into the high plains as an upper air trough and associated cold front migrated into Utah early in the day (Similar to meteorological features outlined in the South Canyon Fire Investigation published in August 1994). The “Break Down of the Upper Ridge” (or shift eastward ahead of an upper trough and surface front) is highly recognized and well documented “critical fire weather pattern” that can produce strong

gusty winds, warm temperatures, low humidity (drying of fuels), enhance vertical lift (unstable atmosphere) and extreme fire behavior.

Meteorological Conditions During the Morning (Midnight to 1200 (Noon) MDT) of March 26

The Polhemus RAWS observations (ridge top) during the early morning hours (Midnight-0800) of March 26, 2012, showed steady temperatures (48ºF-50ºF), poor overnight relative humidity recovery (23%-28%), south-southwest winds 8 to 11 mph with gusts 20 to 24 mph. The Bailey RAWS data for the same time also showed steady temperatures overnight (44-46), moderately dry relative humidity recoveries of 36%-40% and light west to northwest winds of 2 to 4 mph. Early morning satellite sequence and local observations also revealed dense mid and high level cloudiness over the Lower North Fork Unit, ahead of the upper trough and surface front. Steady temperatures and poor relative humidity recovery are consistent with not only air mass characteristics in place at the time, but with known impacts from cloud cover and wind at night (both of which disrupt radiational cooling and corresponding rise in relative humidity).

Water Vapor (WV) satellite imagery revealed mid-level dry air extending northeast from the Desert Southwest into western Colorado at 0900 MDT. Utilizing Denver Radiosonde data from 12Z (0600 MDT), manual calculation of Haines Index was 6-High.

Meteorological Conditions During the Afternoon 1200 (Noon) MDT to 1800 MDT of March 26th

Between 1200 and 1230 visible satellite sequence show that mid and high level cloud cover had moved east of Jefferson County and the Lower North Fork Unit. Corresponding Water Vapor (WV) imagery also showed significant mid-level level dryness over the Lower North Fork at the same time. Polhemus solar radiation values from the 11:54 MDT and 12:54 MDT observations significantly increased indications cloud cover had dissipated and direct sun was reaching the surface. A similar increase was observed at the Bailey RAWS between the 10:22 MDT and 11:22 observation time. Temperatures during the same time frames increased 6ºF with corresponding relative humidity decreases from 17% to 9% at Polhemus and 12% to 9% at Bailey. Wind changes during this time were most noticeable at Polhemus with sustained 10-minute average winds increasing from 16 mph to 23 mph and gust increase from 36 to 49 mph from the west to southwest. Wind data from the portable weather station on the Lower North Fork Unit also showed the same increase in wind speed; however the wind direction sensor appeared to be malfunctioning (stuck at 169.9 degrees from March 19 through March 26, 2012).

The overall climatological and meteorological factors that contributed to rapid increase fire growth potential on the Lower North Fork Prescribed Fire include:

1. Record warmth and dryness during the month of March
2. Rapid depletion of snowpack gained in February, exposing fuels to prolonged warm temperatures, low humidity and wind.
3. Air mass change (warm, dry, and unstable) beginning March 23, 2012
4. Rapidly changing weather conditions (temperatures, relative humidity, wind, and instability).
5. A decrease in cloud cover resulted in increased vertical mixing between the air mass at the surface and aloft, allowing stronger winds to surface.

6. Critical fire weather pattern (above average temperature, low humidity, strong and gusty winds, Unstable Atmospheric Conditions, Haines Index of six, poor overnight relative humidity recovery)- Red Flag Conditions.

Fire Behavior

Topography

Terrain in the general vicinity of the Prescribed Fire Unit is mountainous, with a major river drainage (North Fork of the South Platte River) running to the south-southwest of the units (Figure 9). Elevation ranges from 6,300 feet along the river to 7,000 feet at the top of Unit 4A. The southernmost extent of Unit 4A is about 6,600 feet in elevation.

Slope in the area is moderate to steep. On Unit 4A itself, slope ranges from nearly flat along the upper road (1.8% slope) to 85% in the steepest portion near the bottom of the Unit. The average slope of Unit 4A is 36%.

Slope class, %	Percent area of Unit 4A
0-20	8.5
21-40	53
41-60	36
61-80	2.5
>80	<0.1

The aspect of Unit 4A is generally facing south to southwest. Several prominent draws run to the north, north-northeast, and east from near the bottom of the Unit.

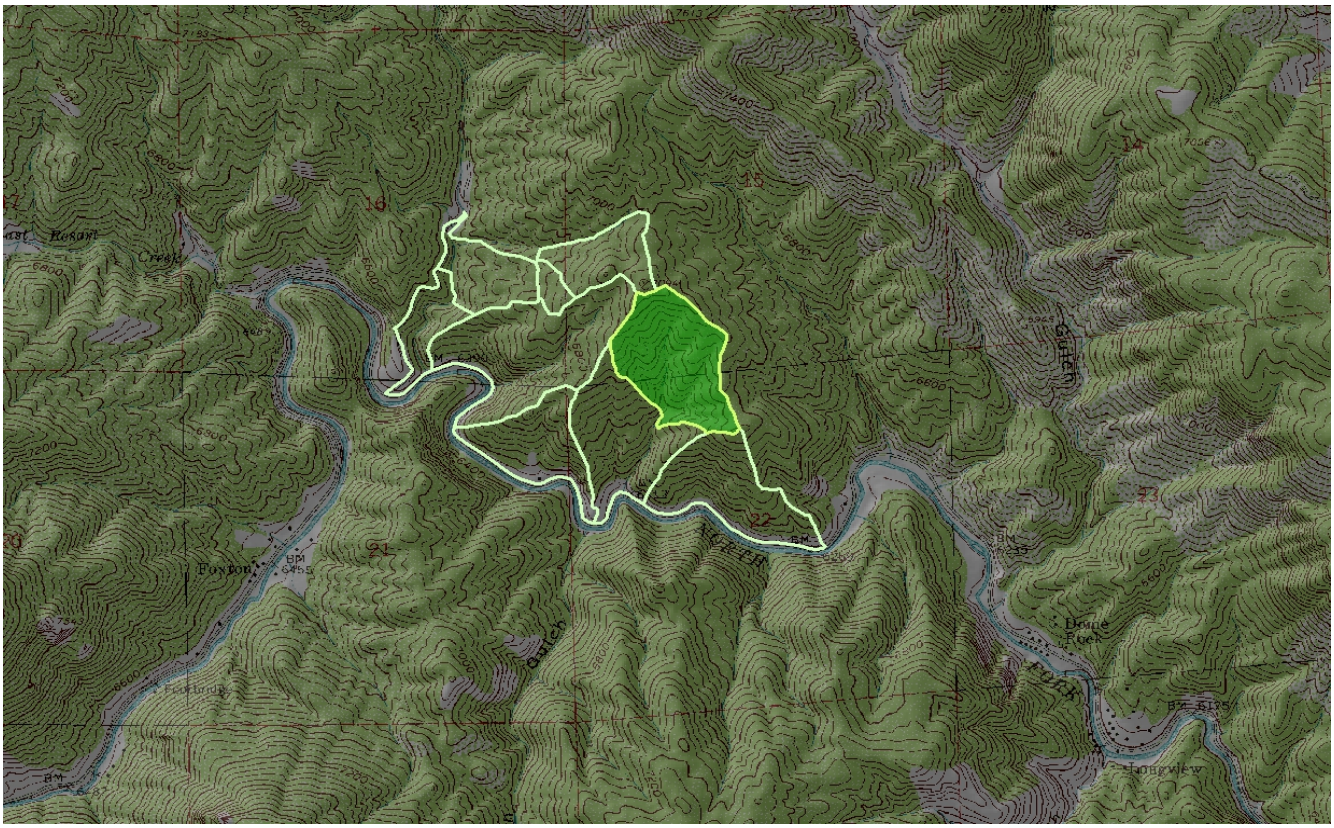

Figure 9. General terrain in the vicinity of Unit 4a (highlighted).

Fuels

Fuels within Unit 4A, include open ponderosa pine with light grass understory and denser mixed ponderosa pine/Douglas-fir stands with timber litter understory (Figure 10). Significant portions of the Unit were masticated fuels resulting from mechanical treatment of woody fuels (Figure 11). In the two draws in the southern portion of the Unit, fuels had not been mechanically treated due to access limitations by mechanical equipment (Figure 11).

Outside of Unit 4A, fuels varied. In Unit 1 and the upper portion of Unit 3, surface fuels were largely absent due to prescribed burning the previous year. To the north and northeast of Unit 4A, fuels were similar to those on the northern portion of Unit 4A – mechanically treated fuels with interspersed grass under open ponderosa pine. South of Unit 4A, fuels were similar to the lower portion of 4A – dense ponderosa pine/Douglas-fir stands on more northerly aspects, with open ponderosa pine and light grass on more southerly aspects. Surface fuels had been mechanically treated in a significant portion of the area north, east, and south of Unit 4A. See Fuels Treatment Map for a delineation of areas that had been mechanically treated.

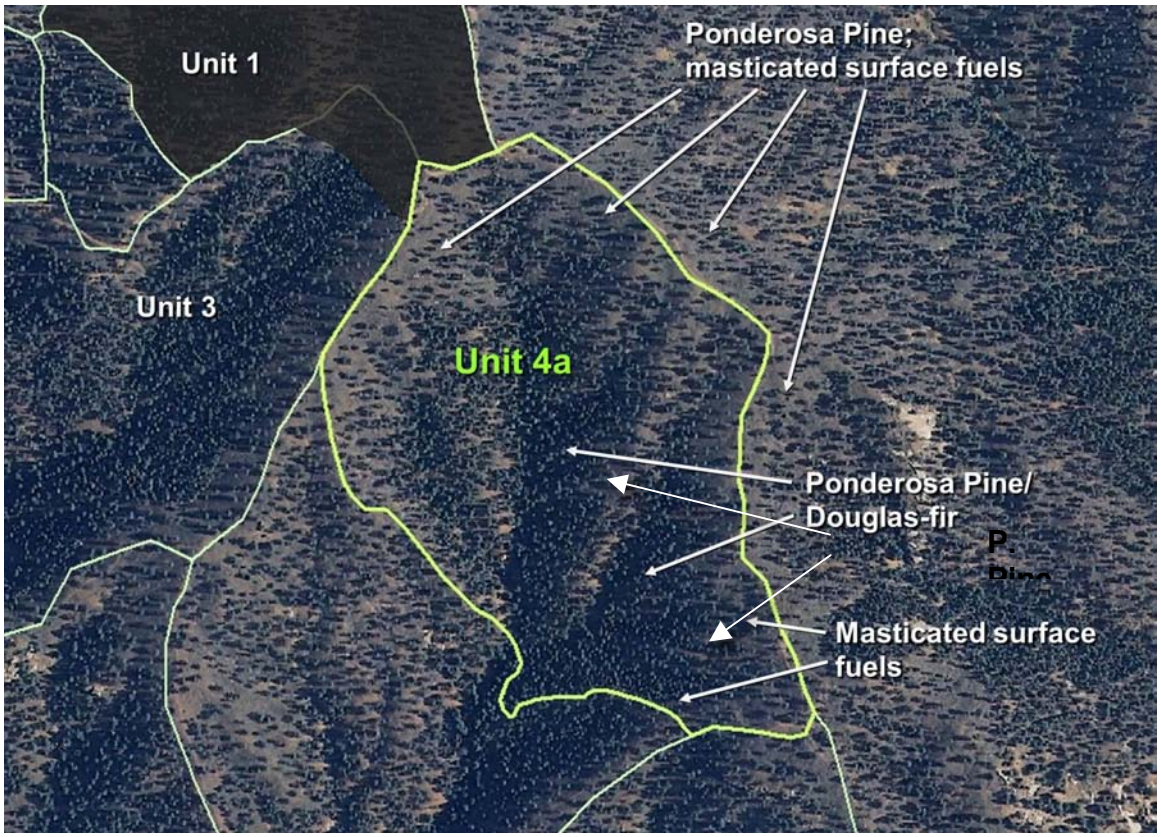

Figure 10. Fuels in Unit 4 and vicinity. Denser stands of mixed ponderosa pine/Douglas-fir are found on more north-facing slopes and in the lower reaches of the draws in the unit.

Figure 11. Mechanically treated fuels with interspersed grass (left), and non-treated fuels found within draws and on steeper northerly exposures (right) in Unit 4a. Photo Source: Fire Behavior and Effects Documentation, Lower North Fork Project (left), and site visit April 6, 2012 (right), (K. Close).

Fire Behavior

Fire Behavior on the Day of the Rx Burn – March 22, 2012

Winds were light and upslope and consistently out of the northeast to south during the firing operation. The RH was in the mid-20s, and temperature and RH held fairly constant from 1100 through 1600. Conditions throughout the operation remained well within prescription parameters with the exception of an occasional wind gust. Crews noted smoke moving to the southwest, with good dispersion all day through about 1900.

Fire behavior throughout the ignition operation was moderate, with intensity and spread rate largely controlled by the rate of ignition (Figure 12). Flame lengths were generally less than three feet, with higher intensities in pockets of heavier fuel accumulation. Crews reported occasional single-tree torching, but this was minimal and full consumption of the canopy of a torching tree was not occurring. No group-tree torching or other crown fire was observed. In fact, crews noted that the tree canopies were largely untouched, with good consumption of surface fuels.

Fuel consumption was nearly complete in mechanically treated fuels and lighter understory fuels, and fire activity was minimal by the end of the ignition operations (Figure 12). When active fire hit previously blacklined areas, the fire went out. There were some unburned pockets of fuel in the interior of the Unit, and crews burned out many of these.

The draw on the south portion of the Unit was the last to be ignited. Fire behavior there was more moderate than some expected – fire didn't get up into the crowns, and didn't make any significant runs up any drainages. There was good consensus among on-site personnel that "the fire behaved very nicely that day." In the heavier understory fuels found in untreated mixed conifer stands, fuel consumption was incomplete to spotty in mid-slope locations. In the lower reaches of deeper draws, and northerly aspects in the south and southeast portions of the Unit, significant areas appear to not have burned at all due to higher fuel moisture in these cooler locations (Figure 13).

Figure 12. Fire behavior in mechanically treated fuels during ignition (left) and post-flaming phase (right). Photo Source: Fire Behavior and Effects Documentation, Lower North Fork Project.

Figure 13. Nearly complete consumption of surface fuels near the control line at the southeast corner of Unit 4A (left). About 80-100 feet below this, in the bottom of a draw, fuels appear to have not burned at all (right). Duff in this scenario was about 3-5 inches deep. Photo Source: April 6, 2012 site visit. (K. Close).

Figure 14. Partial consumption of surface fuels in a draw on the southeastern portion of Unit 4a. There was no apparent consumption in the lower third of the draw. Past this point, consumption ranged from minimal with no duff reduction (left) to partial consumption over broader areas (right). Duff in this location was 2-3 inches deep, and had not been consumed to any significant degree. Above the halfway point, fuels consumed more completely. Photo Source: April 6, 2012 site visit. (K. Close).

In post-burn assessment of the two deeper draws in the southern portion of the Unit, there appeared to be a moisture gradient that influenced vegetation, and possibly fuel consumption. In the lower third of the draws, duff was 3-5 inches deep, and there was no visible evidence of any fire activity (Figure 13). Up to about the halfway point up the draws, fuel consumption was spotty, with only partial duff consumption. In the upper third of the draws, surface fuel consumption was more complete (Figure 14). In some areas, fuels had been reduced to white ash (Figure 15). Additionally, there was evidence of group-tree torching in the uppermost part of a draw, about 300 feet below the eastern perimeter.

Figure 15. Near-complete consumption of surface fuels in the upper portion of the draw, to white ash in many locations (left). About 300 feet below the road, there was evidence of a small group of trees torching (left and right). It was not clear if this torching occurred during the day of ignition or at some point later. Photo Source: April 6, 2012 site visit. (K. Close).

Fire Behavior March 23 and 24

Fire activity within Unit 4A was minimal on March 23 and 24, 2012. Patrol personnel reported that surface fuels had largely burned out within the Unit, and there was no apparent fire activity or heat within 200 feet of the perimeter. There were two locations in the interior of the Unit that were each producing a small amount of light, white smoke. This smoke did not increase in volume or density, and would dissipate when it reached the treetops.

Fire Behavior March 26

Mid to Late Morning – The area had been under a full cloud cover all morning. Weather recorded at the Bailey RAWS indicated temperatures were in the upper 50s, RH 14-17%, and winds 5-6 mph. On-site ridgetop winds measured at the HOBO weather station were about 4 mph through mid-morning, and began increasing in speed between 1000 and 1100 (Figure 16). Fire activity was minimal, and similar to that observed on March 24, 2012. Areas that had been burned and mopped up inside the control lines showed no visible fire activity. The only apparent activity within the Unit were the two small smokes noted previously, which were well within the interior of the Unit. Smoke from these two locations was light, and dissipated upon reaching the treetops.

Late Morning into early afternoon – After about 1100, conditions began changing on the site. The cloud cover began breaking up, and the morning surface inversion was also dissipating. Personnel on site noted that "everything still looked ok" at approximately 1200.

Between 1222 and 1254, the Bailey and Polhemus RAWS sites both indicated the cloud cover over the area had dissipated, with solar radiation increasing (Figure 16). The site was now subject to solar heating, which would have the effect of drying and warming fine fuels in the area. Winds were increasing, temperatures were increasing, and RH was steadily dropping. The RH dropped to single digits by about 1300.

Time	RAWS Station	Temp. (deg. F)	RH (%)	Wind Speed and Gust (), mph	Wind Dir.	Solar Rad. (W/m^2)
1022	Bailey	59	14	6 (13)	SW	394
1122	Bailey	59	12	5 (14)	SW	611
1222	Bailey	64	9	6 (16)	SW	809
1322	Bailey	66	6	6 (19)	SW	942
1422	Bailey	65	5	8 (17)	WSW	909
1522	Bailey	63	6	10 (19)	WSW	809
0954	Polhemus	51	23	11 (25)	SW	152
1054	Polhemus	54	22	16 (36)	SW	244
1154	Polhemus	54	17	23 (49)	SW	269
1254	Polhemus	59	9	21 (50)	WSW	875
1354	Polhemus	62	5	26 (47)	WSW	986
1454	Polhemus	63	4	27 (55)	WSW	805

Time	Location	Wind Speed (mph)
1000	HOBO (Unit 4a)	8.7
1100	HOBO (Unit 4a)	12.0
1200	HOBO (Unit 4a)	14.1
1300	HOBO (Unit 4a)	15.4

Figure 16. Weather readings from the Bailey and Polhemus, RAWS and HOBO weather station during March 26, 2012.

Shortly after 1230, as winds increased, personnel on site noticed “embers” being blown from inside the unit below DP4 and re-igniting spots in the existing black line below DP4.

At this time, personnel on the upper (north) road also reported seeing “duffers” – small smokes – appearing in the black line below the road, inside the unit, on the northern perimeter. These “duffers” began to work their way up the hill, and personnel on site began suppressing them. Personnel later remarked that this was a surprise, as this area had appeared black and cold since the day of the ignition.

Between 1240 and 1300, the “embers” coming into the upper part of the unit below DP4 intensified. Winds continued to increase, and the RH continued to drop. Winds across the road on the upper (north) part of the unit were estimated to be reaching 15 mph with stronger gusts.

Between 1320 and 1330, there was an increased volume of smoke in a draw in the eastern portion of the unit. Whereas smoke had previously been light and dissipated at the treetops, it was now moving up the slope and across the east line north of DP5, traveling to the northeast. Winds continued to increase, reaching 15-20 mph with strong gusts.

At about 1340, a 10’x10’spot fire was discovered across the road on the southern portion of the eastern perimeter (Figure 17). Personnel in the location of this third spot reported numerous small embers crossing the road in the saddle above one of the southernmost draws (Figure 18). They were not able to ascertain exactly where the embers were originating, only that these

embers were coming from the draw within the unit and crossing the control line above the draw.

The area in which the embers were landing, and the new spot fire started, consisted largely of masticated fuels. These fuels were now burning aggressively with the change in weather conditions. Within 15 minutes, the spot had grown to 1.5 acres and was "growing fast." By 1430, the spot had grown to 7 acres. Strong winds pushed the fire downslope from the control line, then up-canyon in a northerly direction.

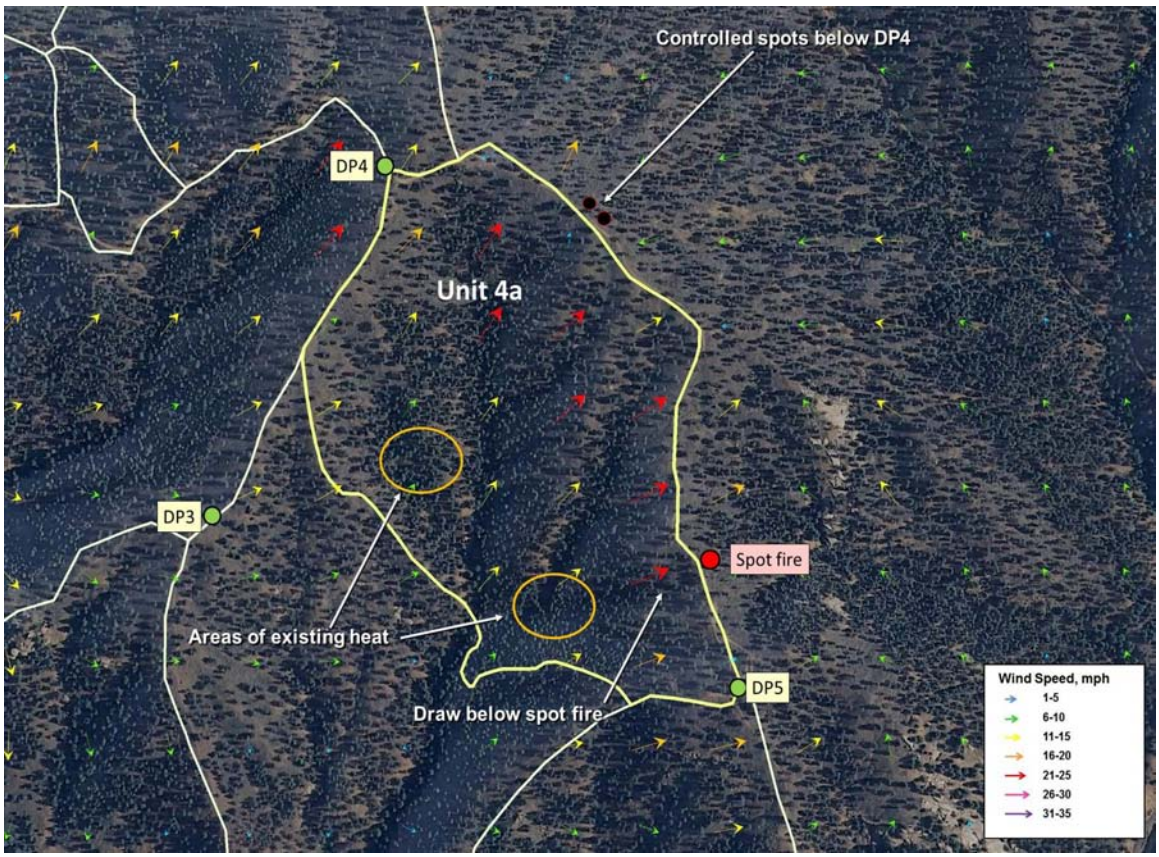

Figure 17. Location of spot fires, areas of residual heat in the unit, and simulated winds at 1400 on March 26, 2012.

Figure 18. View downslope into the draw from which personnel reported embers emanating while they were working on the new spot fire north of DP5 ("Spot fire"). View is from the road near the spot fire location looking downslope to the west-southwest. Photo Source: April 6, 2012 site visit. (K. Close).

Analysis of the Prescribed Fire Plan for Consistency with Policy

Table 4. describes each element of the Lower North Fork Prescribed Fire Plan and provides an evaluation consistency with Colorado State Forest Service policy and potential contribution to the escape.

Table 4. Lower North Fork prescribed fire plan elements, compliance, and potential contributions.

PRESCRIBED FIRE PLAN ELEMENTS:	COMPLIES WITH CSFS POLICY?	COMMENTS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
1. Signature page	Yes	All preparers and technical reviewers signed as appropriate per CSFS policy, approved on 10/9/09 and valid through 10/9/14. This plan was reviewed by another burn boss as well as the district forester. Approving official is the Prescribed Fire Program Manager and while not an "agency administrator" by definition, CSFS policy specifies that this position has approval authority for prescribed fire plans.	No
2. Project Objectives	Yes	Clearly defined objectives stated in measurable terms. One objective is to create a mosaic pattern of burned and unburned patches in the areas that were not masticated earlier, thus reducing wildfire risk while still leaving a healthy overstory, adequate protection for soil on the steep slopes, and a more visually appealing landscape with a mix of green and burned vegetation in the Unit. Potential for protracted burning may be increased when some fuels are intentionally left unburned inside the treatment area, so there is a trade-off between meeting goals for forest health/aesthetics and mitigating the risk posed by longer duration of burning within the burn unit. The objective of reducing wildfire risk is achieved in part by controlling the fire edge while allowing the interior of the Unit to burn itself out rather than put it out directly. This maximizes the removal of fuels that would be available to a future wildfire.	Potential Factor
3. Complexity Analysis Summary	Yes	Used early version of Complexity Guide and noted this in the plan. Original analysis of Moderate was made in 2006 and was re-affirmed as part of the plan update in 2009. Original plan to burn Unit 4 as a 100+ acre unit was revised as planners agreed that the organization and technical difficulty of doing so would push it up to High complexity, thus the handline was put in to create a smaller burn unit (Unit 4A) that would be more easily managed as a Moderate complexity burn.	No
4. Scheduling and Notification	Yes	Part of a multi-phased project and scheduled during acceptable air quality time periods. All notification information requested is provided;	No

PRESCRIBED FIRE PLAN ELEMENTS:	COMPLIES WITH CSFS POLICY?	COMMENTS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
		broad list of contacts on the list which was updated periodically throughout the project as new contact information was made available.	
5. Burn Area Description	Yes	Adequate descriptions of general location and burn units. A Maximum Manageable Area (MMA) is identified in the project planning and depicted on maps.	No
6. Fuels Description	Yes	Adequate description of fuel loading for both target area and adjacent area including photos. One piece of useful information not included was a map showing the distribution of fuels outside the Unit and beyond the MMA which would provide an initial indication of where the fuel type changes occurred across the landscape in the event of an escape.	No
7. Prescription Parameters	Yes	Prescription and Guidance parameters are provided and properly displayed; adjustments to parameters based on experience from previous burns were well documented and those changes were reviewed and approved as the plan was updated each year.	No
8. Smoke Management	Yes	Smoke Management is complete with very detailed information provided by both prescribed fire planners and the air quality regulatory agency as part of the annual permitting process. Managing smoke was an influential factor in planning and executing this project because acceptable wind directions and atmospheric conditions and burn unit size were limited to meet smoke production and down-wind impact objectives. Day of ignition all smoke related objectives were met.	No
9. Workforce & Equipment Requirements	Yes	Workforce and equipment needs are defined for all phases of the operation including blackline, burning and mop-up/patrol. Assignment of a Type 2 Burn Boss is consistent with complexity. Number and type of resources planned are appropriate for the scope of each phase of the project.	No
10. Safety Plan	Yes	All standard elements are addressed including special instructions for lookouts, communication, escape routes and safety zones. Safety of public driving roads that could be obscured by smoke is a high concern. Mitigation measures for both	No

PRESCRIBED FIRE PLAN ELEMENTS:	COMPLIES WITH CSFS POLICY?	COMMENTS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
		firefighter and public safety are outlined.	
11. Medical Plan	Yes	Thorough and provided necessary information but hospital address was incorrect.	No
12. Communications Plan	Yes	Complete and updated with new information and adequate for the scope of the planned project including note that cell phones do not work well in the area.	No
13. Ignition Plan	Yes	Provides adequate description of intent leaving discretion to the burn boss, firing boss and holding boss to adjust patterns based on wind, fuels, and terrain on the day of the burn.	No
14. Holding Plan	Yes	Contains general directions and specific instructions for individual burn units detailing the number and type of resources required for each phase on each unit.	No
15. Mop-Up Plan	Yes	Optional guidelines based on Keetch/Byram Drought Index, but the responsiveness of this index to daily fire danger in this area is not well established and local managers are not sure of its utility. Regardless, the maximum level of interior mop-up specified in the plan (200 feet) was met or exceeded throughout Unit 4A by the end of shift Friday March 23, 2012. The 200 foot mop-up standard meets or exceeds standard practices for most prescribed fire operations, and in fact, a 200 foot buffer is widely used in wildfire operations as a reasonable measure of security under most conditions. Special Wind section places considerable discretion on the burn boss/incident commander and does not require a minimum number of resources to patrol once the 200 foot mop-up standard is met.	Potential Factor
16. Escape Fire Analysis and Action Plan	Yes	Meets policy and provides clear direction for a case of a prescribed fire being declared a wildfire. There are several actions detailed to guide transfer of command once a prescribed fire is declared a wildfire.	No
17. Monitoring Plan	Yes	Thorough and complete.	No
18. Briefing Checklist	Yes	All critical briefing points are included and go beyond most basic briefing checklists	No

PRESCRIBED FIRE PLAN ELEMENTS:	COMPLIES WITH CSFS POLICY?	COMMENTS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
19. Go/No-Go Checklist	Yes	Elements in the check list match those required by CSFS policy and are consistent with accepted interagency standards.	No
20. Test Fire	Yes	Matches the agency template	No
21. Prescribed Fire Report	Yes	Matches master template form, and it was included in the plan for completion once the Prescribed Fire was declared out. The report was incomplete at the time of this analysis because the Prescribed Fire was converted to a wildfire	No
22. Attachments	Yes	A – Fire Behavior modeling was completed and model outputs were factored into the development of the prescription guidance.	No
	Yes	B – Smoke Analysis appears to be the same as the Smoke Management portion of the plan. Current Colorado Department of Public Health and Environment - Air Pollution Control Division (CDPHE-APCD) procedures do not require smoke modeling to be complete by the applicant and any smoke modeling and analysis for this project was to be conducted by CDPHE-APCD.	No
	Yes	C – Smoke Permit Application is filled out completely and a permit was issued by CDPHE-APCD.	No
	Yes	D – Project costs are well defined and a Service Agreement is in place between CSFS and Denver Water. The funding provided by the land owner to execute the project does not factor in potential contingency resources should additional resources be needed during execution of the plan, thus any unforeseen expenses fall to CSFS and the area cooperators to fund through their own limited operating funds. Interviews did not indicate there was any hesitancy to order additional resources due to funding concerns	No
	Yes	E – Actual Cost form matches master template form and was included in the plan for completion once the fire was declared out. The report was incomplete at the time of this analysis because the Prescribed Fire was converted to a wildfire	No
	Yes	F – Organizational Charts were completed for each operational period with specific names and assignments made each day	No

PRESCRIBED FIRE PLAN ELEMENTS:	COMPLIES WITH CSFS POLICY?	COMMENTS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
	Yes	G – Project Maps were included in the plan and provided as part of operational briefing packets	No
	Yes	H – Project Photos section is reserved for photos of pre and post implementation and those photos were available	No
	Yes	I – Documented Changes to Approved Plan is a standard form that was used each time the plan was altered. These adjustments underwent technical review and approval before being included in the updated plan.	No
	Yes	J – Service Agreement is in place between CSFS and Denver Water, and was included in the plan documentation	No

Compliance and consistency with the prescription, actions, and procedures set forth in the Prescribed Fire Plan

MARCH 22 – IGNITION OF LOWER NORTH FORK PRESCRIBED FIRE UNIT 4A

Test Fire:
Go/No Go Checklist was reviewed and completed as appropriate. All conditions set forth in the plan were met and were considered ideal (see Table 5 below). Extended forecast was for cooler weather Sunday with some increase in wind Monday, but there was no indication of any extreme fire weather in the area. Test Fire was executed according to plan and met objectives.

Table 5. Comparison of Prescribed Fire Plan Prescription , parameters and observed conditions.

PRESCRIPTION MUST BE MET *Or Guidance- USeful but not required*	Parameters from Prescribed Fire Plan for Broadcast Burning	Observed Conditions on 3/22/12 Unit 4A
MID-LAMES WIND (MPH)	0 - 12	3-6 Gust to 9
RELATIVE HUMIDTY (%)	>9	22
AVERAGE FLAME LENGTH IN FEET	1 - 8	1 to 5
Temperature (F)	45 - 70	54
Conifer Live Fuel Moisture (%)	>95%	Unavailable
Rate of Spread (ch/hr)	0 – 20	<10

PRESCRIPTION MUST BE MET *Or Guidance- USeful but not required*	Parameters from Prescribed Fire Plan for Broadcast Burning	Observed Conditions on 3/22/12 Unit 4A
Spotting Distance (miles)	0.1 – 0.2	<10 ft
Scorch Height (ft.)	1 – 16	N/A
Transport Wind Direction	Any	N
Transport Wind Speed (mph)	10 – 40	12 - 20
Cloud Cover (%)	0 – 30	Partly Cloudy

Ignition & Holding Plan:

Objectives set forth in the plan were met including those for smoke dispersal, fuel consumption, and control. All indications are that the fire was executed as planned.

Initial Mop-Up Plan:

The burn plan states: *"Following completion of primary ignitions, the RXB2 & Holding Specialist will assign all holding resources to patrol and mop-up activities. Ignitions resources will be assigned to mop-up operations as available.*

Primary focus on day one will be on security of the burn unit. Secondary focus will be on reducing smoke generation. Initial mop-up will be focused on spotting, creeping, or other escape threats within 2 chains of the unit boundary and on any significant spotting threats in the interior of the unit. Continue patrolling the unit on a regular basis.

Additional mop-up on the first day will be conducted based on available time, resources, and smoke production, and will be focused on heavier, smoke-producing fuels in timber areas. Burning materials may be chunked and bone-piled to facilitate rapid combustion. The remainder of the unit will be allowed to burn out overnight, provided there are no significant down-drainage smoke impacts."

After ignitions were completed at approximately 1700 hours all resources on scene began mop-up of the burn perimeter. Mop-up efforts targeted the first 100' to 120' inside the burn perimeter. Additional actions included "grid" searches of the area outside the perimeter of the burn and no spot fires were found. The Burn Boss Trainee indicated there were no holding or smoke management concerns when resources were released between 1900 and 2000 hours. A substantial buffer of "cold black" had been established of between 40' and 130' around the entire unit. These actions were consistent with burn plan requirements.

MARCH 23 -25, EXTENDED MOP-UP AND PATROL STATUS

Burn Unit in Extended Mop-up status:

March 23 Staffing

- Unit 4 Extended Mop-Up: 12 persons and 2 engines required
- Resources On-Scene: 34 persons and 5 engines

Each engine refilled at least twice and the port-a-tank refilled once which amounted to well over 6,000 gallons of water used for mop-up that day which is a very significant effort on this size area. The number of resources on the burn unit March 23 well exceeded burn plan requirements for extended mop-up staffing.

March 23 Operations

The Spot Weather Forecast issued March 23 for the LNF project included a minimal discussion with no mention of upcoming wind event or red flag warnings. Conditions that day were forecasted to be "*clear through the afternoon with light winds and poor dispersal much of the day... 20' Winds SW 6-7 mph until 1200, then SE.*"

The burn plan contains mop-up and patrol guidelines tied to Keetch-Byram Drought Index (KBDI) values. The KBDI index ranges from 0 – 800 with lower values indicating wetter conditions and higher values indicating increasing levels of drought. Modeled values for the week of March 22 were less than 300, however the mop-up standard used equaled that for a much drier condition where KBDI would have exceeded 500. Final mop-up standard of 200 ft. "cold black" edge was achieved around the entire perimeter of the burn by end of shift. These actions actually exceeded burn plan requirements.

Mop-up activities concentrated on areas within 2 chains (132') of the road and by the end of the day mop-up had progressed to approximately 200 feet within the burn perimeter. One small spot fire (1/10 ac.) had been discovered below the handline that morning. It was quickly contained and extinguished. Other than that, no significant holding concerns or excessive smoke production were noted. Based upon his assessment of the burn unit at the end of the day the ICT4 recommended to the Burn Boss that the unit be placed in patrol status for the following days. These actions were consistent with burn plan requirements which state:

"Active mop-up will occur on the second day as necessary, and will again be focused on security of the unit. Following that, mop-up efforts will focus on any remaining heavy, smoke-producing fuels further interior in the unit.

Active mop-up will continue on additional days based on predicted weather and smoke production. Extended mop-up will be focused on areas with lingering smoke production. Once an RXB2 determines that fire behavior and smoke production have decreased to acceptable levels, the unit will be put into patrol status. The fire will be directly patrolled and monitored for a minimum of 3 days following the initial burn, and then until significant moisture is received or the fire is declared out.

…Possible Patrol Guidelines are based on the Keetch/Byram Drought Index and are established by fuel type. For Timber/litter: ***KBDI <200 =*** *Check control lines @ 0900 the day after the burn and mop-up any hazardous fuel concentrations* ***KBDI 200-500*** *= Check control lines @ 0900 & 1500 the day following ignition until no smokes are seen within 100 feet of the line. Mopup smokes within 50 feet of the line by 2nd day after ignition.* ***KBDI >500*** *Check control lines @ 0800 and 1800 each day and extinguish all smokes within 200 feet of the line. Continue to monitor each day until the 200 foot zone is smoke free, then patrol once daily for four days."*

MARCH 24

Burn Unit in Patrol status:

The ICT4 from the previous day performed the burn area patrol. A Spot Weather forecast was not requested that day and the burn plan contains no requirement that one be obtained for patrol operations. Burn managers and patrol personnel had the NWS zone fire weather forecast which provided the specific daily fire weather information necessary for the operations they were engaged in. While driving into the project area the ICT4 saw no smoke until arriving at the top of the burn unit near DP-4. He reported two visible smokes, both well within the interior of the unit. One was in the lower portion of the eastern half of the burn in a shallow drainage and the other in the western half.

The ICT4 then patrolled the area on foot and on ATV. He reported that he did not observe any heat within the 200 feet of the unit perimeter. The ICT4 finished his patrol and left the unit at approximately 1300. Later that afternoon he discussed his observations with the District Forester and Burn Boss. All believed that the burn was secure and that patrol would not be necessary on Sunday, March 25. They decided to send a patrol to the unit again on Monday, March 26. The actions were consistent with burn plan requirements.

"Once an RXB2 determines that fire behavior and smoke production have decreased to acceptable levels, the unit will be put into patrol status."

MARCH 25

Burn Unit in Patrol status:

No patrol operations occurred on Sunday, March 25. The burn was unstaffed. Leaving the burn unstaffed on the third day following ignition is **not consistent** with burn plan requirements.

The Extended Mop-up and Patrol plan states: *"The fire will be directly patrolled and monitored for a minimum of **3 days** following the initial burn, and then until significant moisture is received or the fire is declared out."*

The NWS issued a Red Flag Warning for wind and low relative humidity at 1215. This was received by Jefferson County Dispatch who forwarded an alert to CSFS personnel. CSFS personnel considered the warning and determined that their mop up standard of 200 ft. was already achieved and that additional mop up was not needed. Timing of the wind event was late enough in the day on Monday that additional patrol beyond that already planned for Monday morning seemed unwarranted. The burn plan does allow for this discretionary decision to be made after the 200 foot mop-up standard has been achieved; therefore this action is consistent with the plan.

"SPECIAL WIND NOTE: If high winds are predicted (CSFS personnel will be notified via radio or pager by NWS or Jeffco Dispatch) or are actually occurring in the area, the RXB2 or ICT4 will be immediately notified. The RXB2/ICT4 will direct resources to focUS mop-up efforts on the downwind edges of the unit(s). Additional resources will be ordered at the RXB2/ICT4's discretion. Resources will remain on scene until a minimum of 200 foot mop-up has occurred and/or the wind event has subsided."

MARCH 26 – PATROL & ESCAPED PRESCRIBED FIRE PROCEDURES

Patrol Actions:

The course of action agreed to on Saturday, March 24 was to send out a final patrol to Unit 4A on Monday morning. If the patrol found that the burn was still secure with no heat within 200 feet of the perimeter then they would backhaul the remaining water handling equipment.

The NWS Zone Forecast issued 0551 AM MDT on March 26 contained a *"Red Flag Warning in effect from 10 AM until 7 PM for fire weather Zones 215… 216… and 238 through 251 for strong winds and very low humidity…20-foot winds / Valleys and Lower Slopes … southwest 8-13 mph with gusts to 25 mph increasing to 22-32 mph with gusts to 60 mph in the afternoon."*

The ICT4 arrived on the burn unit with two firefighters around 1000. All control lines were patrolled and the lower handline was mapped. No holding concerns were noted. The same interior smokes that were noted on Saturday were still visible. No mop-up needs were observed around the perimeter of the burn. Additional resources were requested after winds and fire activity had increased. This action is consistent with the Prescribed Fire plan direction in the *Special Wind Note* states that *"Additional Resources will be ordered at the RXB2/ICT4's discretion."*

Events leading up to Wildfire Declaration:

The ICT4 discovered a spot fire across the control line in a small saddle near DP-5 and reported it to the Burn Boss in Golden at approximately 1340. Additional contingency resources were ordered at 1347. The spot fire was reported to be 1.5 acres at 1350 and growing fast. After conferring with the Burn Boss and District Forester the ICT4 declared that the prescribed fire had become a wildfire at 1430. At that time, the fire was not outside of the Maximum Manageable Area (MMA), but was approximately 7 acres in size and expected to breach the MMA under the current conditions. The declaration of escaped fire was consistent with the Prescribed Fire plan as the declaration was made well before the fire crossed the MMA. See Escape Fire Triggers: *"Any fire outside the MMA that is not fully contained within 1 hour of discovery will be declared an escaped fire….The RXB2 may declare an escaped fire at their discretion prior to the fire exceeding the MMA…"*

Table 6. Summarizes compliance and consistency with the prescription, actions and procedures set forth in the prescribed fire plan.

KEY ACTIONS:	COMPLIED WITH PLAN &/OR SOP:	INCREASED OR DECREASED RISK OF EVENTUAL OUTCOME	COMMENTS
Ignition of Lower North Fork Prescribed Fire Unit 4A - March 22			
Test Fire	YES	NEUTRAL	All conditions set forth in the plan were met and were considered ideal. Sufficient resources were present to extinguish the test fire if conditions were not favorable.
Ignition & Holding	YES	INCREASED	All indications are that the ignition and holding was executed as planned and the objectives of the prescribed fire plan were met. The decision to

KEY ACTIONS:	COMPLIED WITH PLAN &/OR SOP:	INCREASED OR DECREASED RISK OF EVENTUAL OUTCOME	COMMENTS
			ignite a prescribed fire always increases the short-term risk of an escape which is necessary to achieve the long-term benefits of a successful treatment.
Mop-up	YES	DECREASED	Initial mop-up efforts focused on security of the burn unit while secondary focus was placed on reducing smoke by mopping up larger materials. A depth of nearly 2 chains (132 ft.) was secured across the top of the Unit which was most susceptible to escape.
Extended Mop-Up and Patrol of Unit 4A - March 23			
Mop-up & Patrol	YES	DECREASED	Personnel assigned exceeded minimum required by the plan (34 personnel w/5 engines, plan required 13 personnel w/2 engines). Maximum prescribed mop-up standard of 200 feet was achieved around the entire perimeter of the fire by end of shift.
Patrol Actions Unit 4A - March 24			
Patrol	YES	NEUTRAL	Only 1 person (Type 4 Incident Commander) was assigned to patrol. Mop up standards had been met (200 ft.) and it is speculative whether additional personnel assigned would have engaged in further mop-up as it is standard procedure to allow the interior fuels to continue burning so long as the perimeter is judged to be secure
Actions Unit 4A - March 25			
Patrol	NO	NEUTRAL	Plan required patrol for 3 days following the initial burn. Impact is judged to be Neutral because mop-up standards were already met (200 ft.) and it is speculative whether continued patrol would have engaged in further mop-up.
Response to Red Flag weather warning	YES	NEUTRAL	Actions are in compliance with discretion allowed in the plan and did not result in any increase or decrease in response, thus the impact to risk is neutral. While this decision did represent a missed opportunity to take action, it would be speculative to say that increased response would have resulted in reduced risk because we cannot estimate how many additional resources would have been assigned or what their assignment would have been
Patrol & Escape Prescribed Fire Procedures - March 26			

KEY ACTIONS:	COMPLIED WITH PLAN &/OR SOP:	INCREASED OR DECREASED RISK OF EVENTUAL OUTCOME	COMMENTS
Patrol	YES	NEUTRAL	Patrol complete with no problems detected. No further mop-up performed so no change to potential risk.
Patrol left engine at station, only Pick-up and UTV on scene	YES	INCREASED	The additional capability provided by the water on the engine would have been a minimal advantage given the severity of the wind and the large area experiencing control problems with only three firefighters present
Taking apart pump and hose	YES	INCREASED	The additional capability provided by the water and hose would have been a minimal advantage given the severity of the wind and the large area experiencing control problems with only three firefighters present
Initial request for engine to assist	YES	DECREASED	The additional capability provided by the engine added minimal advantage to controlling the Fire given the severity of the wind and the large area experiencing control problems with only three firefighters present
Initiation of Escape Fire Action Plan and Declaration of a Wildfire	YES	NEUTRAL	The procedures and actions taken from initial recognition of fire across the control line up to the declaration of a wildfire were consistent with the plan and were taken well before established trigger points were reached. The actions are judged to have had neither a positive or negative effect on the outcome as that eventuality was set in motion well before the escape fire procedures were initiated.

Review of the Qualifications, Experience, and Involvement of Key Personnel Involved In the Prescribed Fire

Approving Agency Official's Qualifications, Experience and Involvement;

"The CSFS Prescribed Fire Program Manager (or other individuals designated by the Fire Division Supervisor) fulfills the role of Agency Administrator in the (*burn plan*) review process... An agency review ensures that the plan is complete, so all components of the plan, including Service Agreement or MOU are required unless prior arrangements have been made by the plan preparer." *(CSFS Prescribed Fire Program Guidelines and Procedures; October 18, 2011).*

In the Colorado State Forest Service Fire Division the position of Assistant Staff Forester, Fuels Mitigation and Prescribed Fire Program Manager is the agency official who is responsible for final review and approval of prescribed fire burn plans. This position is relatively new having been established in 2007. In addition to managing the prescribed fire program the incumbent oversees State Fire Assistance (SFA) grants and manages portions of the preparedness account including specifically the Engine program.

The incumbent has wildland fire experience beginning in 1982, with the National Park Service including working as a Yellowstone Helitack firefighter during the 1988 fires. The majority of this person's wildland fire experience is in aviation with current qualifications including Air Support Group Supervisor (ASGS), Helibase Manager Type 1 (HEB1) and Air Operations Branch Director trainee (AOBD/t). This individual has completed NWCG training for prescribed fire including Prescribed Fire Plan Preparation (RX-341), Prescribed Fire Implementation (RX-301) and Smoke Management (RX-410).

During Agency Administrator review of Colorado State Forest Service prescribed fire burn plans this individual works from a checklist of items which includes ensuring the plan has received a technical review from an appropriate level RX Burn Boss, that the project has been issued a smoke permit from CDPHE and that the public/media information plan is complete and appropriate. This process is consistent with established interagency practices for Agency Administrator review as described in the *Interagency Prescribed Fire Planning and Procedures Guide.*

Qualifications and Experience of Key Personnel Involved in the Prescribed Fire

The Colorado State Forest Service adheres to accepted interagency standards for wildland and prescribed fire qualifications. These standards are described in the *National Interagency Incident Management System Wildland Fire Qualification System Guide, PMS 310-1;* developed under the sponsorship of the National Wildfire Coordinating Group (NWCG).

The *PMS 310-1* Guide establishes minimum requirements for training, experience, physical fitness level and currency standards for wildland fire positions. All participating agencies have agreed to meet these requirements for national mobilization. The guide also establishes minimum qualifications for personnel involved in prescribed fires where resources of more than one agency are utilized—unless local agreements specify otherwise.

The qualifications and experience of the key personnel involved with the Lower North Fork Prescribed Fire were reviewed based on individual master records contained in the Incident Qualifications System (IQS) Database. Key positions on the prescribed fire and their qualifications are listed in Table 7.

Table 7. Qualifications of key personnel involved in the Lower North Fork Prescribed Fire.

Position	Qualification Date	Meets Requirements	OTHER QUALIFICATIONS
Burn Boss Type 2	2011, Sept. 20	Yes	ENGB, FIRB, ICT4, TFLD(t)
Burn Boss Type 2 , Trainee	RXB2(t) Task Book initiated 2009, Sept. 24	Yes	ENGB, FIRB, ICT4, TFLD(t)
Incident Commander,	2007, Aug. 20	Yes	ENGB, FIRB, TFLD(t), RXB2(t)

Position	Qualification Date	Meets Requirements	OTHER QUALIFICATIONS
Type 4			
Ignitions Specialist	FIRB – 2010, Dec. 14	Yes	CRWB, FALB, ICT5, RXB3
Holding Specialist	TFLD - 2011, Feb. 24 (not specified in burn plan)	Yes	CRWB, ICT4, STEN, DIVS(t)
Holding Specialist, Trainee	CRWB – 2006, Mar. 01	Yes	STEN,ENGB, FIRB, ICT4
Fire Effects Monitor*	FEMO(t) Task Book initiated 2010, May 20	Yes	ENGB, ICT5, RXB3
Field Observer	2002, Aug. 01	Yes	TFLD, ICT4, RXB2, DIVS(t)
Engine Boss	2008, Sept. 08	Yes	CRWB, FALB, RXB3
Engine Boss	2008, Dec. 30	Yes	ICT5, FALB, HECM
Engine Boss Trainee	ENGB (t) Taskbook, initiated 2011, June 15	Yes	FFT1, HMGB, ICT4
Engine Boss Trainee	ENGB (t) Taskbook 2011, April 27	Yes	FFT1, FALB, EMTB
Crew Boss	1995, Sept. 30	Yes	DIVS, FBAN, ICT4, RXB2
Crew Boss	2005, June 15	Yes	ENGB, FALC, ICT5
Smoke Monitor	1998, Sept. 30	Yes	RSUL, RXB2, ICT4, FIRB

*FEMO position optional in burn plan, note (t) indicates trainee.

SUMMARY OF FACTORS POTENTIALLY CONTRIBUTING TO THE PRESCRIBED FIRE ESCAPE

Several other factors contributed to the Prescribed Fire escape. Each of these factors individually would not have caused the escape, but together created a cascading effect that set the stage for the events of March 26, 2012. These factors are discussed below.

CRITICAL FIRE WEATHER EVENT

After ignition on March 22, 2012, the area continued to experience mild weather. As the atmosphere became drier over the course of several days, fuel moisture in unburned fuels decreased. This in combination with unburned fuel pockets and residual heat remaining on the Unit created circumstances conducive to increased combustion under the influence of high winds. Such a wind event occurred on March 26, 2012, and was the catalyst that set in motion the Prescribed Fire escape. As stated earlier in this document, the meteorological conditions that occurred on March 26, 2012, were similar (if not identical) to features that occurred on the South Canyon Fire in 1994.

UNBURNED FUELS AND RESIDUAL HEAT LEFT IN THE BURN UNIT

Due to a number of reasons including project design, burn plan objectives, moisture gradients, ignition pattern, and mop-up standards, Unit 4A continued to hold residual heat as well as unburned fuels within the perimeter of the control lines. The overall project design was to perform a combination of mastication treatments and prescribed fire. Due to slope constraints for the mastication equipment, only gentle slopes and ridge-tops were treated. This left Unit 4A with a mixture of masticated and natural fuels. The objectives set forth in the plan specifically call for a burn that would remove the majority of the material created by the mastication treatment but also create a burn pattern that left a mosaic of burned and unburned areas where mastication did not take place to improve forest health. This has the added benefit of producing less smoke and providing a more aesthetically pleasing visual effect by leaving smaller visible burn scars on the landscape. Previous burning experience in these masticated areas produced results that were felt to be too hot and the desire for this unit was to burn under cooler conditions to reduce the potential harm to the soil and overstory (Figure 19).

During the ignition operations on March 22, 2012, there was concern initially among firefighters that the interior of the Unit posed a hazard in terms of generating too much heat and throwing spots out of the Unit. Later in the day there was a feeling that because they had to move very slowly through the masticated fuels, they needed to concentrate ignitions along the fires edge to secure the Unit and did not introduce much fire into the center of the Unit, instead hoping that the fire would consume the interior on its own. Later on during mop-up of the Unit on March 23, 2012, firefighters recognized the safety hazard posed by fire weakened trees falling which were heard repeatedly crashing down throughout the day. For this reason, it was decided that the best strategy would be to avoid mop-up within the interior beyond the 200 foot buffer allowing the center to consume on its own inside of the cold black buffer. This technique is consistent with normal prescribed fire practice of controlling the perimeter while allowing the center to consume as much as possible to further reduce fuels.

One notable product resulting from the mastication treatment is that the stumps left over throughout the Unit provide a source for long-term ground fire. This area was masticated at least six years prior to the prescribed fire so the stumps had ample time to dry allowing fire to smolder in the root system for several days, possibly even weeks after ignition.

The topography on this Unit had a mixture of narrow draws and several hundred feet of elevation difference from top to bottom in addition to the masticated treatment allowing more sunlight onto the upper end of the Unit while the lower end that was not masticated remained shaded. This resulted in a moisture gradient where the masticated areas along the top were much drier and the shaded natural fuels at the bottom were wetter and initially did not burn very well. Much of the natural fuel area had significant duff from the fuels on site and debris from earlier mastication which had flowed downhill over the past several years.

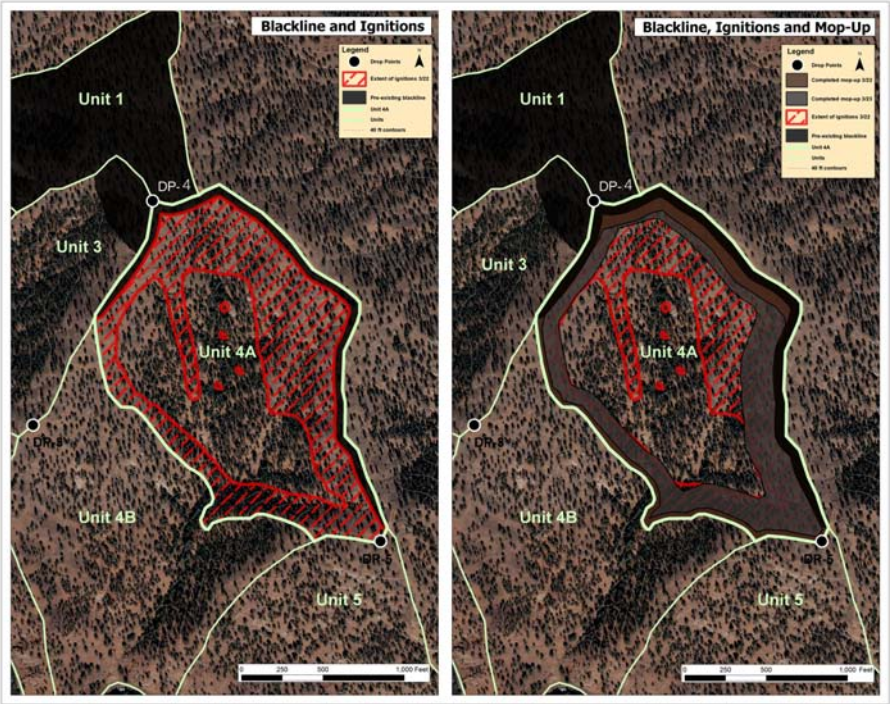

Figure 19. Lower North Fork Unit 4A Ignition Pattern and Subsequent Mop-Up Standard

OPERATIONAL ACTIONS DRAWN FROM COMMON PRACTICES AND EXPERIENCE

There are a number of standard operating procedures (SOP's) that are both common to the fire service as a whole, and some particular to this work group that may have been a factor in the outcome. The first and most prominent is the use of a 200 foot buffer as a standard for mop-up. This standard is widely used throughout the nation in many fuel types and is generally thought to be a reasonable standard of vigilance for securing a fire's edge. Case in point, the incident action plan for fighting the Lower North Fork Wildfire used the same 200 foot buffer as a mop-up standard on April 1, 2012. The problem with this standard lies in the fact that it is a reasonable measure of security under "most" fire behavior conditions, but not under all conditions. The key participants in this case were vigilant in attaining this standard and the group as a whole believed that the buffer would be sufficient enough to contain the Prescribed Fire under the Red Flag conditions predicted for March 26, 2012.

A local procedure which may have been a factor was the decision to take a pick-up truck to remove gear on March 26, 2012, and leave the engine at the station. Because of this, there was delay in taking action to control the Fire while the engine was shuttled from the station. Without hindsight, however, this action could make sense for various reasons. Earlier patrols and past experience prompted personnel to favor use of the pick-up over the engine to facilitate the removal of water handling equipment. It should also be said that the standard scenario for Colorado State Forest Service during a Red Flag day is they will be called to assist cooperating agencies with wildfire response. Because there was full confidence in the established 200 foot buffer, the first concern on March 26, 2012, was in retrieving the hose and other equipment off the Prescribed Fire in a timely fashion so they could return to the engine to be prepared for timely wildfire response. It is not unusual for this Unit to leave their engine behind as the Colorado State Forest Service does not have primary fire suppression responsibility on any lands, and are typically called in as support to wildland fires rather than first response. Additionally, during the mop-up operations on March 23, 2012, one of the crew vehicles broke an axle along the dirt road leading to the burn. Managing wear and tear on expensive equipment such as a fire engine was a consideration in planning daily activities.

LIMITATIONS OF WEATHER & FIRE BEHAVIOR FORECASTS

At various points in the chain of events, the forecasts made for weather and/or fire behavior either by computer models or human intuition did not accurately predict actual conditions. The first instance is in the long range forecasts issued prior to ignition on March 22, 2012. At that time, the forecast indicated a slight cooling trend for March 25, 2012 with only a minor disturbance and moderate winds on Monday, March 26, 2012. As the week went on, the forecast continued to improve until the critical weather event became evident on Saturday, March 24, 2012, when a Fire Weather Watch was issued.

There was wide-spread cloud cover at the time of the first assessment and a moderate but steady wind. The perception by the firefighters on patrol on the morning of March 26 was that even with the Red Flag conditions predicted, there was an extensive cold-black buffer around the entire unit and very little heat within the unit so no control problems were anticipated. This condition changed very rapidly as the front moved through the area and the cloud cover moved away, direct sun shine and drier air hit the burn area drying out the fuels, and stronger winds and a more unstable air mass impacted the area (Appendix F).

In creating the Prescribed Fire Plan, fire behavior model output did predict spotting distances in excess of 300 ft. with winds above 15 mph which was an indicator that fire control problems could be experienced whenever tree torching is a possibility under those winds. Tree torching from the interior of the burn unit is one possible source of embers that could have led to an escape. Firefighters however, did report that the fire was also propagating by embers blown across the ground into previously cold black reigniting any available fuels which were also blown across the ground igniting more spots ahead. This was described by one observer as looking like “little burning fleas moving across the ground”. This is a very rare mode of fire spread that is not normally experienced and indeed none of those who witnessed it report ever seeing such fire behavior previously. There are currently no models available that would provide an accurate estimation of how far a burning ember can travel across the ground in a high wind or how spotting can propagate via ground-blown debris

LESSONS LEARNED

Lessons Learned by Participants

These lessons learned were those identified by participants in the events during interviews and the site visit on Friday, April 6, 2012. Some participants felt that more lessons learned may come after more time has passed as they were still overwhelmed by the magnitude of the events surrounding the escape.

FUEL CONDITIONS and FIRE BEHAVIOR

- Chunks of charred material in the black can reignite on a hot windy day when exposed to ember wash. Fuel types having this type of material warrant greater awareness.
- In treatment units with a combination of masticated and natural fuels consider burning the masticated fuels separately from the natural fuels. Alternate treatment options could be considered for the natural fuel areas.
- Consider extending blacklines in masticated fuels to depths of 300' or more.
- Recognize that an area that gave you a problem during blacklining could be a problem area during subsequent ignitions or mop-up.

WEATHER

- Pay closer attention to the weather; request more frequent Spot Weather forecasts maybe through entire patrol / monitoring phase until burn is declared "out".

BURN PLAN IMPLEMENTATION

- Could use a better step-up procedure for patrol and mop-up
- Consider use of infra-red technology (heat-seeker) to identify hot spots during mop-up

Lessons Learned by Review Team

FUEL CONDITIONS and FIRE BEHAVIOR

- There was a lack of recognition of the amount of unburned fuels remaining in the interior of the Unit. Overall consumption within the unit was less than assumed.
- Extended burning and smoldering within the burn area leads to increased exposure to adverse weather events. Residual heat sources can be an escape threat during high winds.
- A 200 foot buffer is not sufficient in a high wind event with continued burning inside the line.
- Recognize that an area that presented holding problems during blacklining could be a problem area during subsequent ignitions or mop-up. In this case a spot fire occurred during blacklining operations on October 19, 2011, in the same location where the spot fire that resulted in the escape occurred on March 26, 2012.

BURN PLAN

- Patrol and monitoring needs to be more responsive and adaptive to changing conditions.

WEATHER

- The better the communications with the local National Weather Service office the better the understanding of weather conditions by the local manager; managers who use prescribed fire on a regular basis should ask more questions of and provide more feedback to their fire weather forecasters.
- Besides the 1 – 5 day forecast products from the National Weather Service, there are also products available from National and Geographic Area Predictive Services that may augment the ability of manager's to make better mid-range strategic decisions (3 – 10 day).
- Portable weather stations are a great source of site-specific weather information; need to make sure they are properly maintained, calibrated so the data can be relied on.

RECOMMENDATIONS

Recommendations have been synthesized from key observations and analyses conducted by the Review Team. These recommendations are not confined to site -specific scale planning and implementation but extend to include up through the programmatic scale. Some recommendations may warrant attention and/or actions by other agencies or even multiple agencies and organizations. Recommendations developed from review of the Lower North Fork Prescribed Fire include:

- The WIMS-RAWS-NFDRS program needs to be improved to insure safe and more effective fire operations across jurisdictions throughout the year. Inconsistent procedures must be resolved in the Rocky Mountain Area (RMA) between fire management agencies, co-operators and the supporting agencies involved with weather data collection, National Fire Danger Rating System (NFDRS), and information dissemination. The interagency Rocky Mountain Coordinating Group (RMCG) includes the Colorado State Forest Service, whose personnel rely on accurate and timely weather observations, NFDRS outputs, fire weather forecasts (NWS) and long term large fire risk assessments (Predictive Services). NFDRS output from some weather stations were erroneously moist during this period. Maintenance of weather stations is variable by agencies and this can degrade data outputs. Red flag watch and warning criteria are interpreted differently by the Predictive Services specialists and the National Weather Service which directly led to the issuance of a SAFENET for events that occurred during the time period under review.

- Colorado State Forest Service prescribed burn plans have a sound staffing plan based upon measures of fire danger and cumulative drought. However, consider replacing the Keetch-Byram Drought Index (KBDI) with indices such as NFDRS indices of Energy Release Component (ERC) and/or 1000 hour timelag fuel moisture. These two are in common use by in the interagency fire community. Ensure all prescribed fire plans include up-to-date information prior to implementation.

- CSFS prescribed fire operations need to be strengthened with specific attention to mop-up standards tied to fuel consumption and residual heat remaining in the burn unit. Consider adding an element of long-term patrol and monitoring to the existing table of organization. Patrol and monitoring activities should be maintained on prescribed fires in Wildland-Urban Interface (WUI) areas at a level commensurate with the risks until heat sources are minimal or non-existent or the fire is declared out.

- Refine the Prescribed Burn Plan Technical Review process. An outside reviewer from outside the area or another agency for more complex burns, particularly those within multiple jurisdictions, may be helpful to CSFS in this next phase of organizational recovery.

- Segregate mastication fuels from un-masticated and/or natural fuels by sub dividing or redesigning treatment units to address fuel moisture and potential fire behavior variation.

- Update the Medical Plan to list the new address of St. Anthony's Hospital and its helipad coordinates.

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APPENDICES

Appendix A. Delegation of Authority

STATE OF COLORADO

OFFICE OF THE EXECUTIVE DIRECTOR
Department of Natural Resources
1313 Sherman Street, Room 718
Denver, Colorado 80203
Phone: (303) 866-3311
Fax: (303) 866-2115
dnr.state.co.us

COLORADO
DEPARTMENT OF NATURAL RESOURCES

John W. Hickenlooper
Governor

Mike King
Executive Director

MEMORANDUM

To: Bill Bass, Prescribed Fire Review Team Leader

From: Mike King M.K.

Date: April 2, 2012

Subject: Delegation of Authority, Lower North Fork Prescribed Fire Review

This letter delegates authority to you to serve as team leader and to direct a team in the conduct of a thorough review of the Lower North Fork Prescribed Fire which preceded the Lower North Fork Wildfire (LNFW) in Jefferson County, Colorado (March 26, 2012). Please note the Origin and Cause Investigation Team for the LNFW has yet to complete its work. I ask that you conduct your review of the prescribed fire accordingly.

Your team will be made up of the following individuals: Tom Zimmerman, Frankie Romero, Grant D. Hamrick, an information officer, and a writer/editor. Resource Order CO-COS-000002 contains the related details of the named individuals (above) for this assignment. You may wish to consider additional staff support as needed.

The amount of information to be included and displayed in your analysis will correspond to the scale and complexity of the prescribed fire and be detailed enough to foster a factual understanding of the event, in a context appropriate for multiple audiences, and for trend analysis and syntheses. Your review report should be appropriate within and across agencies.

The goals of this review are to: (1) guide future program actions by minimizing future, unintended outcomes and (2) while cause and origin of the LNFW have not yet been determined, identify actions necessary to reduce the likelihood of escapes from prescribed fires generally. Factual information collection during the review is to be centered on policy, protocols, and performance.

Your report should include the following elements:

- Executive Summary
- Setting: Environmental, Social and Political
    - Prescribed Fire Objectives
    - Prescribed Fire Prescription

- Prescribed Fire Outcomes
- Discussion of seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.

- Chronology, Timeline
- Lessons Learned, Identified by Project Participants
- Lessons Learned, Identified by your Team
- Recommendations, including potential need for policy modifications
- Maps and Photos

In addition to the items listed above, I ask that your appendix to the final report include:

1. The approving agency official's qualifications, experience, and involvement;
2. The qualifications and experience of key personnel involved;
3. Compliance of the Prescribed Fire Plan with existing State policy and guidance related to prescribed fire planning and implementation;
4. Compliance with the prescription, actions, and procedures set forth in the Prescribed Fire Plan; and
5. Context to provide information on how frequently prescribed fires may escape.

I ask that your draft report be submitted to me no later than 30 days from the time you receive this delegation.

Should you have any questions or comments, please feel free to contact me at (303) 506-8696. You may also contact my Deputy Director, Bob Randall, at (303) 319-6832 when I am unavailable.

Appendix B: Significant Colorado Wildfires Since 1989

Fire Name	Year	Significance (fires in bold are particularly noteworthy)
Duckett	2011	FEMA FMAG
Indian Gulch	2011	FEMA FMAG
Crystal	2011	FEMA FMAG
Sand Gulch	2011	
Snyder	2011	
Maxwell	2011	
Left Hand OHV Area Fire	2011	
Four Mile Canyon	**2010**	**FEMA FMAG,** ***most costly wildfire in terms of private property loss in Colorado history***
Reservoir	2010	FEMA FMAG
Church's Park	2010	
Cow Creek	2010	
Olde Stage	2009	FEMA FMAG
Nash Ranch	2008	FEMA FMAG
Left Hand	2008	
Nash Ranch (Park County)	2008	
Newcastle	2007	FEMA FMAG
Mauricio Canyon	2006	FEMA FMAG
Malo Vega	2006	FEMA FMAG , *one of the 30 largest wildfires in Colorado history*
Red Apple	2006	FEMA FMAG
Mason	2005	FEMA FMAG ,*one of 30 largest wildfires in Colorado history.*
Picnic Rock	2004	FEMA FMAG, *one home destroyed*
McGruder	2004	FEMA FMAG
Cloudy Pass	2003	FEMA FMAG
Cherokee Ranch	2003	FEMA FMAG *two homes destroyed*
Buckhorn Creek	2003	FEMA FMAG
Overland Fire	2003	
Big Elk	2002	Three deaths (airtanker pilots, one helicopter pilot)
Schoonover	2002	13 structures destroyed.
Hayman	**2002**	**Largest fire size and most costly in terms of suppression costs in Colorado history.** 133 homes destroyed
Bobcat	2000	One of 30 largest wildfires in Colorado history. 18 homes destroyed.
High Meadow	2000	One of 30 largest wildfires in Colorado history. 51 homes destroyed.
Big Turkey	1998	
Buffalo Creek	**1996**	**Caused substantial erosion and sedimentation in Denver Water facilities in Denver metropolitan area.** One of 30 largest wildfires in Colorado history. 10 homes destroyed.
Hourglass	1994	Burned CSU's Mountain Campus, Pingree Park
Black Tiger	1989	44 homes destroyed.
Olde Stage Road	1989	10 homes destroyed.

Appendix C. Prescribed fire program framework documents, sources, and applicability to prescribed fire planning and implementation.

Source Document	Type of Document	Applicable Information to Prescribed Fire Planning and Implementation
Interagency Prescribed Fire – Planning and Implementation Procedures Guide (NWCG 2008)	Interagency (includes National Association of State Foresters (NASF) as a signatory)	General goals for the prescribed fire program include: • Provide for firefighter and public safety as the first priority. • Ensure that risk management is incorporated into all prescribed fire planning and implementation. • Use prescribed fire in a safe, carefully planned, and cost-efficient manner. • Reduce wildfire risk to communities, municipal watersheds and other values and to benefit, protect, maintain, sustain, and enhance natural and cultural resources. • Utilize prescribed fire to restore natural ecological processes and functions, and to achieve land management objectives.
Quadrennial Fire Review (NWCG 2009)	Interagency (includes National Association of State Foresters as a signatory)	• Land-use plans and tiered fire management planning should contain strong and effective linkages to Community Wildfire Protection Plans (CWPP) and reflect relative costs, values, and landscape resiliency associated with proposed actions, alter- natives and decisions. • Create community defensible space/fuels reduction zones for the WUI
A National Cohesive Wildland Fire Strategy (DOI-USDA 2011)	Interagency (includes National Association of State Foresters as a member of Wildland Fire Executive Council (WFLC))	Provides an overall cohesive strategy for the wildfire problem. Three primary factors are identified that present the greatest challenges and the greatest opportunities for making a positive difference in addressing the wildland fire problems: • Restoring and maintaining resilient landscapes – ensuring that management activities address the current decline in ecosystem health. • Creating fire-adapted communities – utilizing all options and opportunities to engage communities and work with them to become more resistant to wildfire threats. • Responding to Wildfires - this area considers the full spectrum of fire management activities and recognizes the differences in agency missions and capabilities. Guiding principles, crafted through discussions with Federal, state, tribal, and local governmental and non-governmental organizational representatives, create a set of overarching principles applicable to all stakeholders in

Source Document	Type of Document	Applicable Information to Prescribed Fire Planning and Implementation
		the wildland fire management community and also reach across different elements, from resilient landscapes and fire-adapted communities to wildfire response. • Reducing risk to firefighters and the public is the first priority in every fire management activity. • Sound risk management is the foundation for all management activities. • Actively manage the land to make it more resilient to disturbance, in accordance with management objectives. • Improve and sustain both community and individual responsibilities to prepare for, respond to and recover from wildfire through capacity-building activities. • Rigorous wildfire prevention programs are supported across all jurisdictions. • Wildland fire, as an essential ecological process and natural change agent, may be incorporated into the planning process and wildfire response. • Fire management decisions are based on the best available science, knowledge and experience, and used to evaluate risk versus gain. • Federal agencies, local, state, tribal governments support one another with wildfire response, including engagement in collaborative planning and the decision-making processes that take into account all lands and recognize the interdependence and statutory responsibilities among jurisdictions. • Where land and resource management objectives differ, prudent and safe actions must be taken through collaborative fire planning and suppression response to keep unwanted wildfires from spreading to adjacent jurisdictions. • Safe aggressive initial attack is often the best suppression strategy to keep unwanted wildfires small and costs down. • Fire management programs and activities are economically viable and commensurate with values to be protected, land and resource management objectives, and social and environmental quality considerations
Colorado Revised Statutes (State of Colorado 2007, 2008, 2009)	Specific to State of Colorado (only those elements pertinent to prescribed fire are listed)	**23-31-202 Powers and duties of board of governors of the Colorado state university system.** 1). The authority granted to the board by section **23-31-201** shall include the following powers and duties: a) To provide for the protection of the forest resources of the state, both public and private, from fire, insects, and

Source Document	Type of Document	Applicable Information to Prescribed Fire Planning and Implementation
		diseases; (c) To carry on an educational program with landowners, in the application of the practice of forestry on forest lands, by the growing, harvesting, and marketing of forest products from such lands. **23-31-311. Watershed protection and forest health protection projects.** 1). "The Colorado state forest service, representing the state of Colorado, shall, in consultation with the governmental agencies participating in such projects, identify watershed protection projects and forest health projects that will use moneys received pursuant to section 37-95-112.5, C.R.S., including, but not limited to, the harvesting of trees infested with beetles." **23-31-312. Community wildfire protection plans – county governments – guidelines and criteria – legislative declaration – definitions.** **23-31-313. Healthy forest – vibrant communities – funds created.** **1). Short title.** This section shall be known and may be cited as the "Colorado Healthy Forests and Vibrant Communities Act of 2009". **2). Legislative declaration.** The general assembly hereby declares that addressing the wildfire risk in Colorado and the development of community wildfire protection plans to bring together federal, state, and local interests, including nongovernmental entities such as electric, gas, and water utilities, to address wildfire risk to life, property, and infrastructure in Colorado is a matter of statewide concern. **3). Definitions.** (g) "Wildfire risk mitigation" or "fuel mitigation treatments" means preventive forest management projects or actions, which meet or exceed forest service standards or any other applicable state rules, that are designed to reduce the potential for unwanted impacts caused by wildfires, including: (I). The creation of defensible space around structures; (II). The establishment of fuel breaks; (III) The thinning of woody vegetation for the primary purpose of reducing risk to structures from wildland fire; (IV). The secondary treatment of woody fuels by lopping and scattering, piling, chipping, removing from

Source Document	Type of Document	Applicable Information to Prescribed Fire Planning and Implementation
		the site, or prescribed burning; and (V). Other nonemergency preventive activities designed to reduce the unwanted impacts caused by wildfires that the forest service may deem to be risk reduction or fuel mitigation treatments. **6). Community watershed restoration.** (a) In order to support communities and land managers in moving from risk reduction to long-term ecological restoration so that the underlying condition of Colorado's forests supports a variety of values, particularly public water supply and high-quality wildlife habitat, the forest service shall: (II). Facilitate and work collaboratively with landowners, local governments, including conservation districts created pursuant to article 70 of title 35, C.R.S., and county noxious weed program administrators and other appropriate parties, including any electric, gas, and water utilities in the affected area, to design and safely implement prescribed fire projects and to encourage increased responsible use of prescribed fire as a tool for restoring healthy forest conditions consistent with programs established pursuant to section 25-7-106 (7) and (8), C.R.S. The forest service shall emphasize providing training and technical assistance for landowners, local communities, and state agencies.
Services Agreement – Colorado State Forest Service and Denver Water Board (2011)	Agreement between Colorado State University /CSFS and City and County of Denver, Board of Water Commissioners, Denver Water	**Excerpted from:** **Exhibit A to Services Agreement. Scope of Work.** "Denver Water grants the University/CSFS the right of access to Denver Water properties within Jefferson County for the following purposes provided by University/CSFS: C. Prescribed Fire Planning and Implementation. i. Develop prescribed fire plans as needed for fuel hazard reduction, wildlife habitat, forest management, and other purposes on properties of Denver Water. ii. Individual prescribed fire projects implementation plan will be included in an Annual Work plan under a separate agreement which will be submitted to Denver Water for review and approval.
North Fork Fire Protection District Community Wildfire Protection Plan (Jefferson County 2011)	Local, area-specific	This is a strategic plan that identifies values, hazards, and recommended mitigation practices for the North Fork Fire Protection District (NFFPD) area of Jefferson County. Decades of absence of fire and other natural disturbances coupled with years of persistent drought have resulted in altered vegetation and fuel complexes with a net result of significant hazardous fuels within the district and risk of higher than normal fire intensity. The CWPP provides wildfire hazard and risk assessments

Source Document	Type of Document	Applicable Information to Prescribed Fire Planning and Implementation
		for neighborhoods and subdivisions identified as Wildland-Urban Interface (WUI) and Intermix zones within the NFFPD. Due to highly dispersed housing density and location combined with limited infrastructure adjacent to large and remote wildland areas, there is high potential for loss of life and property from wildfire. This CWPP builds upon previous plans completed for the Lower North Fork and South Platte areas, which provide specific hazard assessments and recommendations for individual homes within those smaller assessment areas. This plan identifies actions to reduce risks and includes a fire behavior analysis and community wildfire hazard rating as a comprehensive, scientifically-based assessment. The actions recommended in this CWPP are designed to lower wildfire hazards to neighborhoods, economic, and ecological values at risk. The plan identifies treatment options that include: shaded fuelbreaks, machine mowing, prescribed fire, brush mastication, timber mastication, manual thinning and felling, and feller buncher removal of larger diameter trees.

Colorado State Forest Service Prescribed Fire Procedures (2009)	Agency-specific procedures	This information contains agency procedures for the following areas:
		• Prescribed Fire Participation Guidelines and Procedures
		  o Prescribed Fire Participation
		• Prescribed Fire Program Guidelines and Procedures
		  o Prescribed Fire Procedures
		• Prescribed Fire Desk Guide
		  o Prescribed Fire Plan

Appendix D. Team Biographies

William (Bill) Bass *(Review Team Lead)*: Bill Bass has been the Forest Supervisor on the Bighorn National Forest located in Sheridan, Wyoming since 2000. He is responsible for all aspects of National Forest Management on over 1million acres. During his 35 year tenure with the U.S. Forest Service he has worked on National Forests in Utah, Idaho, Colorado and Wyoming. He has spent the last 22 years of his career in a leadership role as a Line Officer and Agency Administrator.

Bass has been actively involved in fire management since 1975, and is a former Division Group Supervisor, and Supply Unit leader. Bass holds a Bachelor of Science in Range Science from Utah State University (1979).

Thomas (Tom) Zimmerman *(Review Team Planning Section Chief):* Tom Zimmerman retired in 2011 after 32½ years of federal service. Since his retirement he has stayed active in wildland fire management through training, conference presentation, consulting, and is currently serving on the Board of Directors of the International Association of Wildland Fire (IAWF).

During his career he worked for the Bureau of Land Management, the U.S. Forest Service, and the National Park Service. His assignments spanned all organizational levels (field, state, regional, and national offices) as well as both functional areas of land management (operations, research and development).

Zimmerman is a leader in all aspects of fire management, both nationally and internationally. His accomplishments include program management, training, policy development and technology transfer. His work focused on wildland fire use, prescribed fire, incident management, fire ecology, fire behavior, long-term risk assessment, decision support, and other field operational activities. His efforts resulted in the development of Fire Use Management Teams and Fire Use Modules; fire behavior training course consolidation; creation of the Wildland Fire Implementation Plan (WFIP) for documentation and implementation of wildland fire use decisions; development of the Wildland Fire Decision Support System (WFDSS) and the Wildland Fire Management Research, Development, and Application program (WFM RD&A).

Zimmerman has worked in incident management for over 30 years, serving as both an Incident Commander and Area Commander on wildland fire, prescribed natural fire, and wildland fire use events; and all hazard emergency responses, including six hurricanes. He has published over 50 articles, technical reports, and professional papers on fire ecology, fire management, fire economics, wildland fire use, fire management policy, science application and integration, risk assessment, decision making, and change management. He also worked on the 1995, 2001, and

2009 reviews, clarification, or modifications to the Federal Wildland Fire Management Policy, and co-authored the Wildland Fire Use Implementation Procedures Reference Guide.

Zimmerman's work includes serving as a review team leader or member on 17 reviews, including the South Canyon Fire, Cerro Grande Prescribed Fire and the Twin Prescribed Fire. He has also served on a multitude of after incident, after action reviews and programmatic reviews.

Zimmerman earned a Bachelor of Science in Forestry from the University of Montana, a Master of Science in Forestry and Fire Ecology from the University of Idaho, and a Ph.D. in Forest Fire Science from Colorado State University.

Francisco (Frankie) Romero (*Review Team Fire Behavior Analyst*)*:* Frankie Romero is the USDA Forest Service, National Applied Fire Ecologist. One of his primary duties is to oversee the Prescribed Fire Program for the U.S. Forest Service which averages 4,000 prescribed projects treating nearly 1.2 million acres annually. He is responsible for policy updates, agency-wide workforce planning and training; monitoring program accomplishments and performance including escaped prescribed fires agency-wide. Romero's review experience includes the Salt Fire Shelter Deployment Review, and the Breaks One Escape Prescribed Fire.

Romero has 27 years of fire management experience, across all western states, as well as Alaska, Florida, Oklahoma, Mexico, Indonesia, and throughout Central America. His experience includes handcrews, helitack, heli-rappel (Gila National Forest), smokejumper (Payette National Forest), Assistant Fire Management Officer (Payette National Forest), and Zone Fire Management Officer (White River National Forest), Smoke Jumper Base Manager (Payette National Forest). Romero is qualified as a Type 3 Incident Commander, Type 1 Prescribed Fire Burn Boss, Fire Behavior Analyst, Long-Term Fire Analyst, and Strategic Operations Planner.

Romero holds a Bachelor of Business Administration with majors in Computer Information Systems and Business Management from New Mexico State University (1989) and a Master of Science in Forestry - Fire Science from Colorado State University (1997).

Grant (Dave) Hamrick (*Review Team Operations Chief):* Dave Hamrick has served as the North Zone Fire Management Officer for the Arapaho and Roosevelt National Forests' Canyon Lakes Ranger District and Pawnee National Grassland since 2007.

Hamrick began his fire career in 1989 with the Alpine Interagency Hotshot Crew, a National Park Service crew based (then) in Zion National Park in Utah. In 1991 Dave accepted a promotion to

an Engine Captain position in Sequoia – Kings Canyon National Park where he later served as Foreman of the Park Initial Attack Handcrew before returning to the Alpine Hotshots as Logistics Foreman in 1996. Hamrick became the Alpine IHC Assistant Superintendent in 2000 before moving to the U.S. Forest Service in 2003 to become Superintendent of the Roosevelt IHC.

Hamrick was the Chair of the U.S. Forest Service Region 2 and Region 4 Interagency Hotshot Crew Working Group from 2005 to 2007 and is currently serving as the U.S. Forest Service Region 2 Chainsaw Program Coordinator. He was a Division Supervisor on the Rocky Mountain Area Type 1 Incident Management Team (IMT) from 2008-2011 and is currently an Operations Section Chief Type 2 trainee on the RMA Type 2 IMT "A". Hamrick has also served on two prior review teams. Lonetree 3 Escaped Prescribed Fire Review and the Crandall Ranger Station Felling Accident.

Hamrick is qualified as an Incident Commander Type 3 (ICT3), Operations Section Chief Type 2 trainee (OPS2/t) and Prescribed Fire Burn Boss Type 2 (RXB2).

Hamrick holds a Bachelor of Arts in English, from Washington & Lee University (1984) and Technical Fire Management, from Washington Institute (2001).

Tammy Williams (*Review Team Public Information Officer*)*:* Tammy Williams has been a Public Affairs Specialist on the Arapaho and Roosevelt National Forests and Pawnee National Grassland (ARP) since September 1998 and the facilitator of the ARP Leadership Team since 2001.

Williams has worked for the U.S. Forest Service for 22 years. Prior to becoming a Public Affairs Specialist, Williams was a Lands Forester for the ARP for five years. Williams has also worked in the Washington Office as a Fire Prevention Specialist and on the Coconino National Forest in Flagstaff, Arizona as a Zone Fire Prevention Officer. Williams started her career in natural resources in 1981 with the Colorado State Forest Service where she held positions as a Student Forester in Fort Collins and Forester on both the Fort Morgan and La Veta Districts.

Williams is qualified as a public information officer Type 2 and has been actively involved in fire management since 1982. She formerly served as a Strike Team Leader Trainee and Crew Representative.

Williams holds a Bachelor of Science degree from Colorado State University (CSU) in Outdoor Recreation (1984) and a Master of Science in Technical Communication and Journalism (2005) which focused on crisis communication.

Jace Ratzlaff (*Review Team Public Information Officer*)*:* Jace Ratzlaff has been a Public Affairs Specialist on the Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands (PSICC) since 2009. Ratzlaff also serves as the partnership coordinator and the web master for the PSICC.

Ratzlaff has worked for the U.S. Forest Service for almost three years and has worked in Region 2 and Region 3. Prior to becoming a Public Affairs Specialist, Ratzlaff served for nine years for two Members of Congress as Area Director specializing in small business, education, and agriculture. Ratzlaff has worked as the initial attack Public Information Officer for many fires on the PSICC. Ratzlaff has placed focus on internal communication across the PSICC, and he has led the effort to integrate social media into the PSICC and Cibola fire information methods.

Ratzlaff holds a Bachelor of Science degree in Business Management from American University (2008) with a minor in English.

Lester (Dean) Clark (*Technical Specialist):* Clark has worked in fire management in the western United States for 43 years. Clark retired in 2008 after 34 years of federal service encompassing positions in both the U.S. Forest Service and the National Park Service. He began his career in 1969 as firefighter at Mariposa for the State of California and most recently served as the National Park Service Deputy Fire Management Officer for the Intermountain Region which includes Montana, Wyoming, Utah, Colorado, New Mexico, Arizona, Oklahoma, and Texas. In this position he reviewed Fire Management Plans for policy compliance, site specific prescribed burn plans for adequacy, planned and conducted interagency operations, led and participated in a variety of fire reviews.

Clark has been involved in prescribed burning since 1972 starting as a Foreman (crew boss) for experimental burn projects in the Giant Sequoia Kings Canyon National Park. He has been the Fire Boss and project leader on more than 100 controlled burns in California Chaparral vegetation type from 1976-1982 at Pinnacles National Monument. He was the Prescribed Fire Manager for Yosemite National Park from 1995-1999, and was assigned to Bandelier National Monument as Fire Management Officer in the aftermath of the Cerro Grande fire from 2001-2003. Clark was one of the first certified federal Burn Bosses in 1984 and served on the national federal training cadre until 1990.

Clark is qualified as a Type 1 Burn Boss.

Kelly Close (*Fire Behavior Analyst):* Kelly has been a Captain with the Poudre Fire Authority (PFA) since 2004. Close has 24 years of experience in wildland fire management and for 14 years has been involved in PFA's Wildland/Urban Interface program in ongoing efforts involving training, response guidelines, operational directives, annual training, and managing the department's red card program. He has also assisted the U.S. Forest Service, National Park Service, and City of Fort Collins' Natural Areas in prescribed fire implementation.

Close has held a variety of fire positions, including PFA Firefighter and Emergency Medical Technician from1995 - 2003, Rural Fire Coordinator for Montana Department Of Natural Resources from1990-1995, and Fuels Technician for the U.S. Forest Service on the Powell Ranger District of the Clearwater National Forest from 1988-1990.

Close holds a Bachelor of Science in Botany from the University of California, Davis (1980) and a Master of Science in Forestry and Fire Management from the University of Montana. His thesis research focused on the use of geographic information systems (GIS) for fire management planning in the wildland/urban interface

Close is qualified as Fire Behavior Analyst, a Long-term Analyst, Division Group Supervisor, and an Incident Commander Type 4. He has worked on a variety of wildfires and participated in three review teams: Monument Fire entrapment investigation, Hayman Fire Case Study Interagency review, and the Cramer Fire Fatality Investigation. Additionally Close has participated in the analysis and review of fire behavior for the "Backfire 2000" case in western Montana, the analysis and review of fire behavior and spread of the Canberra (Australia) fires of 2003 and was a keynote speaker for the Fire Behavior Specialist course for the Canadian Forest Service. Close served for seven years on of the National Wildfire Coordinating Group Fire Behavior Committee, and is an instructor and steering committee member for the Advance Fire Behavior Interpretation Course (S-590).

Timothy O. Mathewson (*Review Team Fire Weather and Predictive Services*): Mathewson has been with the Bureau of Land Management as the interagency Fire Weather Program Manager/Fire Meteorologist for the Rocky Mountain Area since 2001. One of his primary duties includes oversight of the Rocky Mountain Area Predictive Services program, a decision support group for the Rocky Mountain Area Coordination Center that helps determine current and future resource needs and strategic allocation. He is responsible for issuing a variety of Fire Potential/Risk products for a daily and seasonal time scale that covers Wyoming, South Dakota, Nebraska, Kansas and Colorado.

Mathewson's fire weather experience expands beyond the United States. In 2007, he was selected for a thee-week assignment to provide international fire weather support to the Bureau of Meteorology in Melbourne, Australia during an historic fire period (December 2006–

March 2007).

In 2003, Tim was selected to provide subject matter expertise (Fire Weather) and co-author the national rewrite of introduction to Wildland Fire Behavior (S190) and Intermediate Wildland Fire Behavior (S290).

Prior to his employment with BLM, Mathewson worked as a Forecaster and Incident Meteorologist for eight years for the National Oceanic and Atmospheric Administration (NOAA) – National Weather Service in Cheyenne, Wyoming; Waterloo, Iowa; Goodland, Kansas and Missoula, Montana. Mathewson holds a Bachelor of Science in Earth Science (Emphasis in Meteorology) from the University of Northern Colorado (1995).

Mathewson is a veteran of the Armed Forces, having served as a Medic in the United States Air Force from 1988-1992.

Appendix E. Glossary of Acronyms and Terms

The main reference glossary for this guide is the NWCG glossary, which is updated periodically: http://www.nwcg.gov/.

Blackline/Blacklining – Preburning of fuels adjacent to and within a control line before igniting a prescribed burn. Blacklining is done prior to main ignitions to reduce heat on holding crews and lessen chances for spotting across control line.

Broadcast Prescribed Burning – Prescribed burning activity where fire is applied generally to most or all of an area within defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.

Chain – Unit of measure equaling 66 feet.

CRWB (Crew Boss) – A person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare.

Cutoff-Low – A closed upper-level low which has become completely displaced (cut off) from basic westerly current, and moves independently of that current. Cutoff lows may remain nearly stationary for days, or on occasion may move westward opposite to the prevailing flow aloft (i.e., retrogression).

"Cutoff low" and "closed low" often are used interchangeably to describe low pressure centers aloft. However, not all closed lows are completely removed from the influence of the basic westerlies. Therefore, the recommended usage of the terms is to reserve the use of "cutoff low" only to those closed lows which clearly are detached completely from the westerlies.

Escaped Prescribed Fire – A prescribed fire that has exceeded or is expected to exceed prescription parameters or otherwise meets the criteria for conversion to wildfire. Criteria are specified in "Interagency Prescribed Fire – Planning and Implementation Procedures Reference Guide".

ENGB (Engine Boss) – The Fire Effects Monitor is responsible for collecting the onsite weather, fire behavior, and fire effects information needed to assess whether the fire is achieving established resource management objectives.

Fire Duty Officer (FDO) - Individual working for a jurisdiction or agency responsible for coordinating that agency (Wildland Fire Response) on a give day.

FIRB (Firing Boss) – The Firing Boss reports to the Prescribed Fire Burn Boss and is responsible for supervising and directing ground and/or aerial ignition operations according to established standards in the Prescribed Fire Plan.

ERC (Energy Release Component) – Index of the National Fire Danger Rating System (NFDRS) relating to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. It is a cumulative or "build-up" type of index and is an indicator of potential fire intensity.

FEMO (Fire Effects Monitor) – The Fire Effects Monitor is responsible for collecting the onsite weather, fire behavior, and fire effects information needed to assess whether the fire is achieving established resource management objectives.

FFT1 (Fire Fighter) – A working leader of a small group (usually not more than seven members), who is responsible for their performance, safety, and welfare.

FOBS (Field Observer) – This position is responsible for collecting and reporting situation information for an incident.

Haines Index – Is an index developed by meteorologist Donald Haines in 1988 that measures the potential for large fire growth (Plume-Driven). The index is derived from the stability (temperature difference between different levels of the atmosphere) and moisture content (dew point depression) of the lower atmosphere. The data may be acquired from radiosonde information. The index is calculated over three ranges: low elevation (950-850mb), mid elevation (850-700mb), and high elevation (700-500mb).

A Haines index of 6 means a high potential for large fire growth. 5 means medium potential, 4 low potential, and anything less than 4 (2 and 3) means very low potential.

Helibase – The main location within the general incident area for parking, fueling, maintenance, and loading of helicopters.

HECM (Helicopter Crew Member) – An individual assigned to an agency or call-when-needed helicopter to support helicopter operations.

HEB2 (Helibase Manager Type 2) – This position is responsible for controlling helicopter take-offs and landings at a helibase, managing helibase assigned helicopters, supplies, fire retardant mixing and loading.

HEB1 (Helibase Manager Type 1) – This position is responsible for controlling helicopter take-offs and landings at a helibase, managing helibase assigned helicopters, supplies, fire retardant mixing and loading.

Incident – An occurrence either human-caused or natural phenomenon, that requires action or support by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources.

ICT1/ICT2/ICT4/ICT5 (Incident Commander) – The Incident Commander position is responsible for overall management of the incident. The Incident Commander reports to the Agency Administrator for the agency having incident jurisdiction.

Maximum Management Area (MMA) – The maximum geographic limits of spread within which a wildland fire use fire is allowed to spread.

MOP-UP – Extinguishing or removing burning material near control lines, felling snags, and trenching logs to prevent rolling after an area has burned, to make a fire safe, or to reduce residual smoke.

National Wildfire Coordinating Group (NWCG) – An operational group designed to coordinate programs of the participating wildfire management agencies.

Pile Burning – Cut material piled either by hand or mechanical – resulting from logging or fuel management activities – are burned during the wetter months to reduce damage to residual stand and to confine fire to the size of the pile. Piling allows for the material to cure, producing less smoke and rapid consumption when burned.

Prescribed Fire Burn Boss – Type 1 (RXB1) – Person responsible for supervising a prescribed fire from ignition through mop-up. See definition for "Type" below.

Prescribed Fire Burn Boss – Type 2 (RXB2) – Person responsible for supervising a prescribed fire from ignition through mop-up. See definition for "Type" below.

Prescribed Fire Plan – A plan required for each fire application ignited by management. It must be prepared by qualified personnel and approved by the appropriate agency administrator prior to implementation. Each plan will follow specific direction and must include critical elements and how to mitigate each element.

Prescription Guidelines – Guidelines used to show upper and lower reaches of a prescription.

Safety Officer Type 2 – Person responsible for monitoring and assessing hazardous and unsafe situations and developing measures for assuring personnel safety.

Standard Operating Procedure (SOP) – Rules for the operation of a fire department, such as how to respond to varioUS types of emergencies, training requirements, use of protective equipment, radio procedures; often include local interpretations of regulations and standards. In general, "procedures" are specific, whereas "guidelines" are less detailed.

Strike Team – Specified combinations of the same kind and type of resources, with common communications, and a leader.

STCR (Strike Team Leader Crews) – This position is responsible for supervising a strike team of crews and report to the Holding Boss.

STEN (Strike Team Leader Engines) – This position is responsible for supervising a strike team of engines and report to the Holding Boss.

SOPL (Strategic Operational Planner) – Primary task of this position is to coordinate the development of the course of action for a wildfire (unplanned ignition).

Task Force – Any combination of single resources assembled for a particular tactical need, with common communications and a leader. A Task Force may be pre-established and sent to an incident, or formed at an incident.

1,000-hr (thousand-hour) timelag fuel moisture – an index of the NFDRS relating to moisture content of large, dead fuels. It provides an indication of longer-term seasonal drying trends.

TFLD (Task Force Leader) – The Incident Command position responsible for supervising a Task Force. This position reports to the Holding Boss.

Type (1/2/3) – Refers to resource capability. Resource typing provides managers with additional information in selecting the best resource for the task.

Wildfire – An unwanted wildland fire.

Wildland Fire – Any nonstructural fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

Wildland Urban Interface (WUI) – The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels.

Appendix F. Climate, Weather and Fire Behavior

Introduction

The Colorado Front Range is historically prone to large fires. Fires can occur anytime of the year but are *most* frequent during three distinct periods; late winter and early spring (March-early April) prior to green up, the early summer warm season (June through mid- July) prior to the onset of the Southwest Monsoon; and the Indian Summer period of late September through October.

The majority of *large fires* (100 acres in timber and 300 acres in grass fuels) along the Colorado Front Range burn under critical meteorological patterns (Break Down of Upper Ridge) that produce strong westerly component winds, above average temperatures, low humidity, and unstable atmospheric conditions in combination with receptive fuels (Bobcat Gulch 2000, Hayman 2002, Overland Trail 2003, Fourmile Canyon 2010, and Crystal 2011).

Fire behavior is ultimately determined by the interaction between three main environmental elements: Fuels, Weather and Topography. All three are equally important when determining fire behavior. However, weather and fuels are the most variable in time and space, and weather is typically the most difficult to predict.

Fire Weather and Climatology

This section provides an analysis and chronology of climatological and meteorological conditions that contributed to rapid fire growth on the Lower North Fork Incident in Jefferson County Colorado on Monday, March 26, 2012.

Data Collection and Considerations

Data collection and considered for this analysis includes:

- NOAA- National Weather Service Boulder Fire Weather Planning Forecast (FWF)
- NOAA- National Weather Service Boulder Spot Forecasts (Site Specific Forecasts)
- NOAA- National Weather Service Radiosonde Data for DNR (Denver)
- NOAA- National Weather Service Cooperative Observer Data
- NOAA- National Climate Data Center Archived Upper Charts
- NOAA- Hydrologic Prediction Center (HPC) Data
- Rocky Mountain Area Predictive Service 7-Day Outlook
- Rocky Mountain Area Predictive Service Daily Fire Potential Outlooks
- Department of Agriculture Natural Resource Conservation Service (NRCS)
- Archived U.S. Forest Service Remote Automated Weather Station (RAWS) Data
- USDA-United States Drought Monitor

- Colorado State Cooperative Institute for Research in the Atmosphere
- University of Wyoming- Archived Upper Air Data

Seasonal Severity Assessment-

Strong low pressure systems brought near record snowfall and cooler than average temperatures to the Colorado Front Range in February, however and abrupt pattern shift in resulted in the driest and one of the warmest March on record was the driest and one of the warmest on record. The record warmth and dryness leading up to March 26th quickly depleted February's snowfall gains below 9000 feet MSL, leaving fine and heavy fuel types dry and receptive to burn. Additionally, the weather pattern supported a high frequency of wind events, exacerbating the drying of fuels along the Front Range.

The Percent of Average Precipitation provides a good assessment of long-term dryness (Drought) or wetness. Percentages are calculated by comparing long-term averages to amounts that have fallen over periods ranging from 30 days up to 5 years. The regional maps below (Figure 1) depict the Percent of Average Precipitation (liquid) for a 90-Day period (January through March 2012) and 30-Day period (March 2012). The precipitation information displayed reveals wet (125% to 250% of average) conditions along the central and northern Colorado Front Range for the January through March period, a result of near record snowfall (Figure 2) during the Month February. In contrast, unprecedented dryness occurred in March across much of the state, but especially along the Front Range. Denver (DIA) only received 0.03 of an inch precipitation finishing as the driest March on record and the second warmest on record.

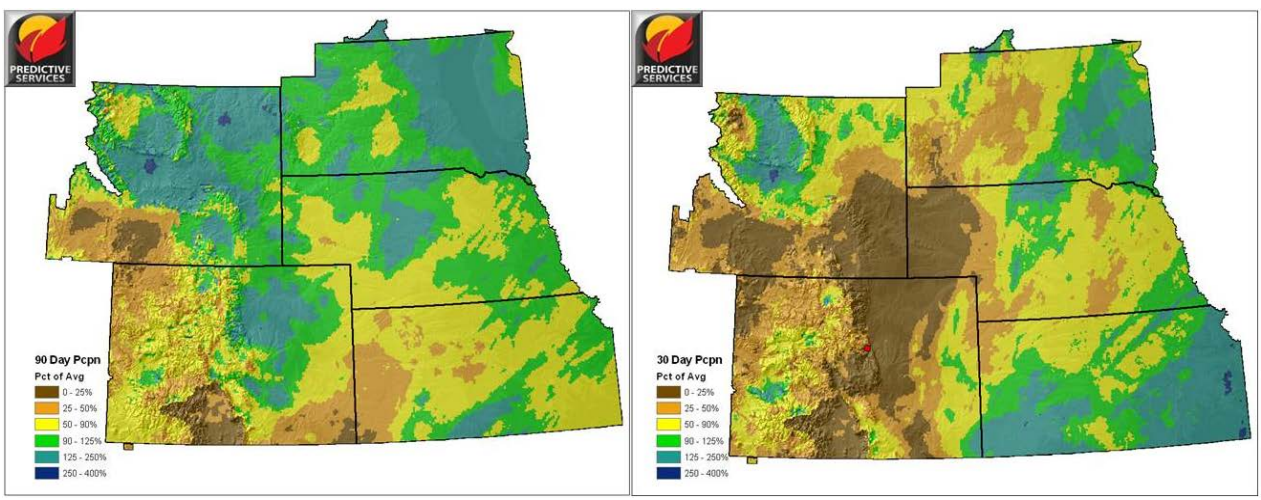


Figure 1. *January through March 2012 (left) and March 2012 (right) Percent of Average Precipitation. Dark brown colors indicate percent of average precipitation ranging from 0% to 25%, orange 25% to 50%, yellow 50% to 90%, green 90% to 125%, light blue 125% to 250%, and 250% to 400%. Data was extracted from NOAA's Hydrologic Prediction Center and displayed using ArcGIS.*

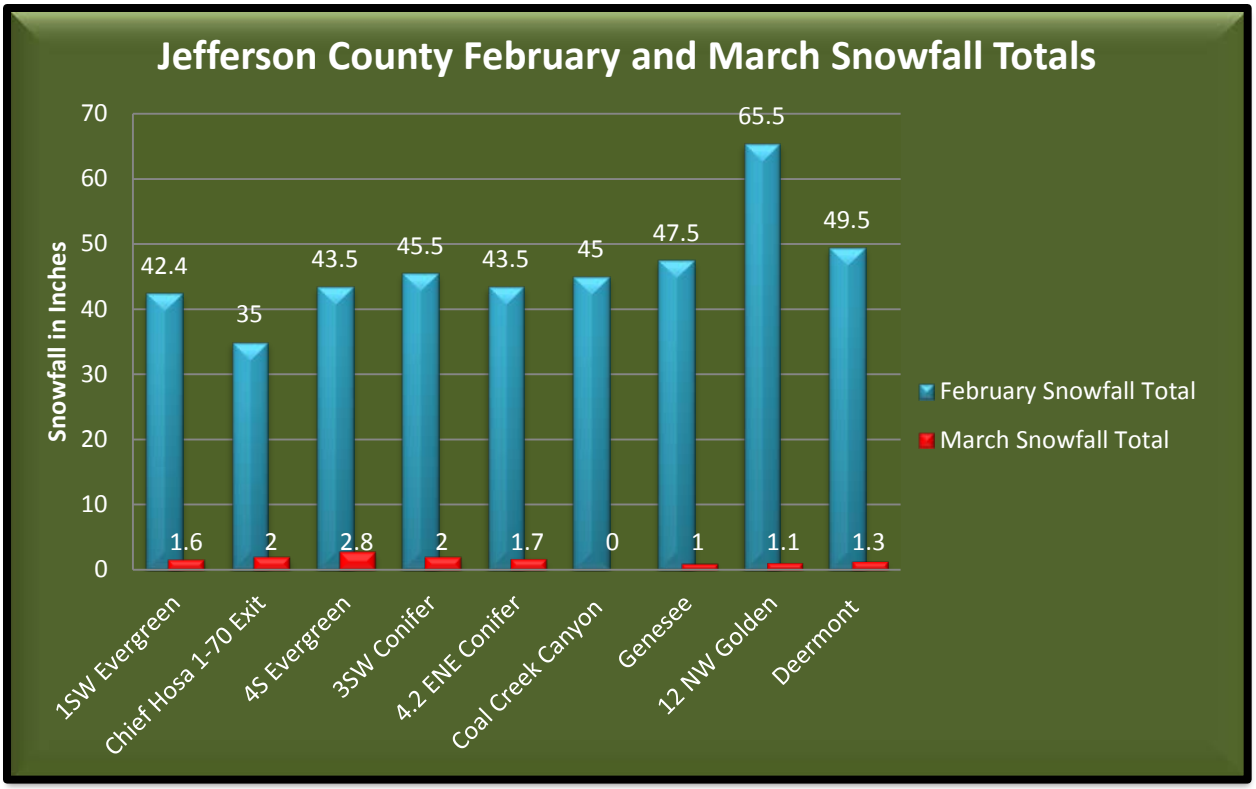


Figure 2. *Jefferson County snowfall totals for February and March. Notice the significant drop in snowfall totals from February to March (typically the snowiest month along the Colorado Front Range). Data displayed from the NWS Cooperative Observer Network.*

Precipitation amounts on the Lower North Fork Unit were consistent with conditions represented in the 30-Day Percent of Average Precipitation map in Figure 1. Precipitation amounts measured at Remote Automated Weather Stations (RAWS) in Jefferson, Douglas and Park counties were consistent with amounts recorded for the month of March at Denver (DIA) (Figure 3).

RAWS	County	March Precipitation Amounts
Bailey	Jefferson	0.00
Polhemus	Douglas	0.02
Lookout Mountain	Jefferson	0.00
Cheeseman	Jefferson	0.00
Lake George	Park	0.02

Figure 3. *Data collected from the RAWS Archive- Western Region Climate Center (WRCC)*

In addition to above average snowfall across much of the Colorado Front Range in February, temperatures were cooler than normal (-2°F to -4°F temperature anomalies). The cooler than average temperature pattern continued into the first few days of March before an abrupt weather pattern shift resulted in anomalous warm periods for the remainder of the month.

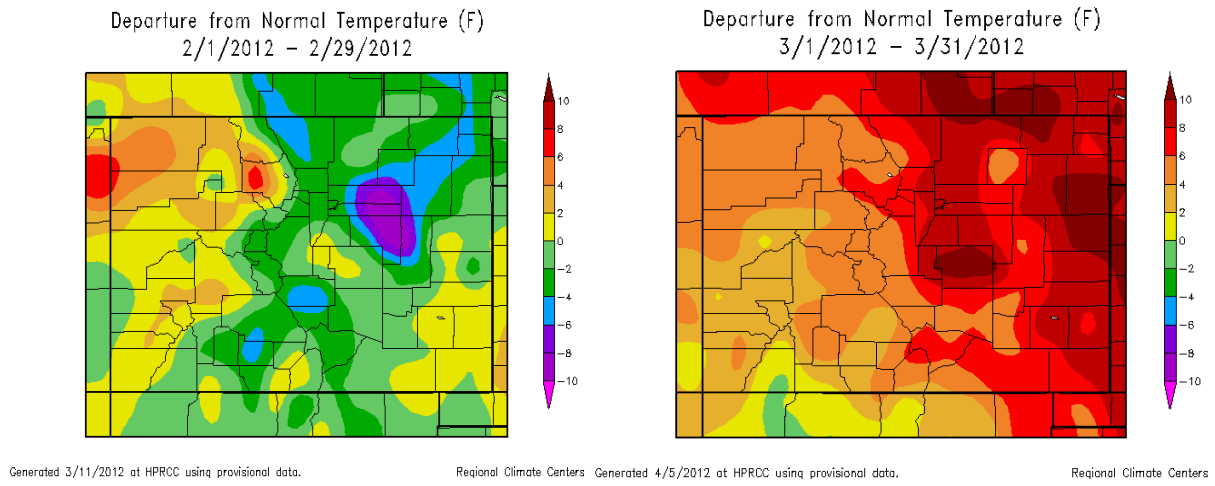


Figure 4. *Colorado temperature departure from normal for February 2012 (left) and March 2012 (right), developed by the Western Region Climate Center (WRCC). Temperatures were 2°F to 4°F below average (depicted by the blue and green colors) along the Front Range in February, but were 6°F to 10°F above average (depicted by the red and maroon colors) in March, including Jefferson County.*

Polhemus RAWS temperature observations near the Lower North Fork Unit were consistent with conditions observed along the entire Front Range. Figure 5 depicts daily observed maximum temperatures during the month of March vs. an approximate 7-year average (station data period 6/2005 to present). Cooler than average temperatures were observed during the first few days of March, on the 7th and 8th, and again on the 19th, 20th and 21st. Importantly, observation data shows a substantial temperature increase beginning on March 23rd.

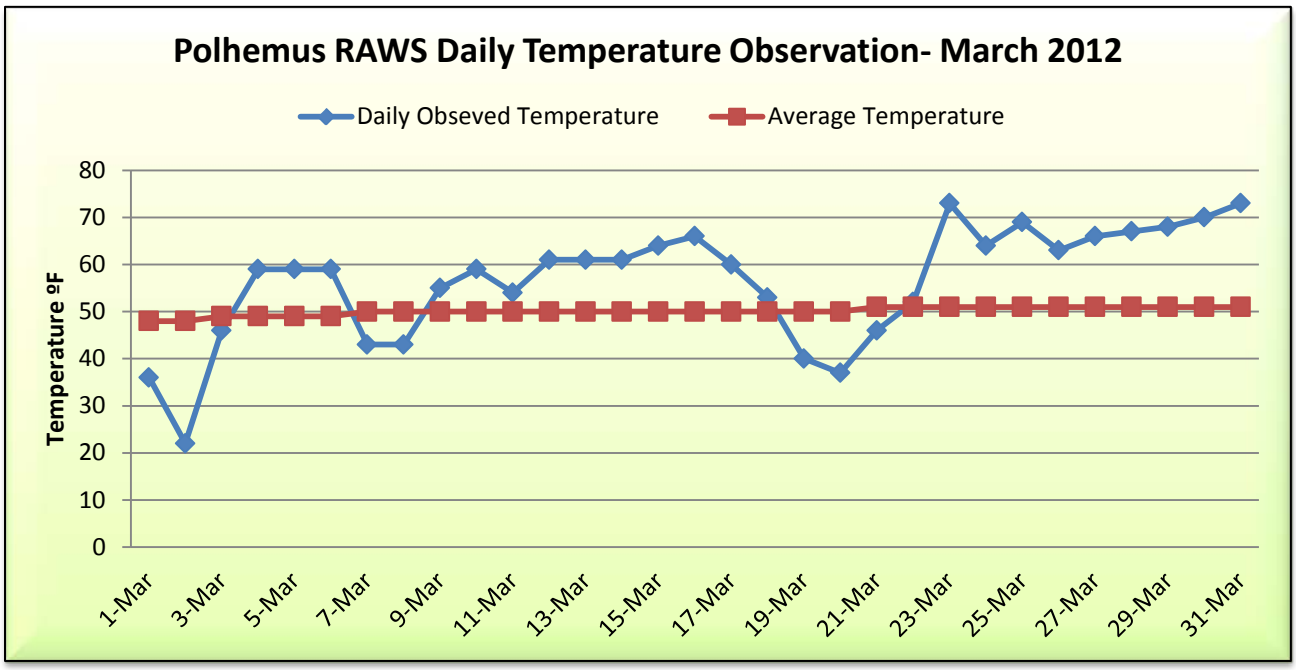


Figure 5*. Polhemus RAWS observed daily temperatures for March 2012 vs. Average Temperature.*

Finally, The U.S Drought Monitor reflects both short-term (1 to 3 month) and long-term (6 to 60 months) precipitation trends. Other indices that contribute to the monitor during the growing season include, the USDA/NASS Topsoil Moisture, Keetch-Byram Drought Index (KBDI), and NOAA/NESDIS satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West include snow water content, river basin precipitation, and the Surface Water Supply Index (SWSI). Other indicators include groundwater levels, reservoir storage, and pasture/range conditions. Though the maps are based on the key indices and other measures of moisture, the final maps are tweaked to reflect real-world conditions as reported by numerous experts throughout the country. *(Source: National Drought Mitigation Center)*

Drought indices at the end of February (Figure 6) ranged from Abnormally Dry to Moderate across western Colorado, and Abnormally Dry to Extreme in southeast Colorado. Drought conditions over southeast Colorado are part of long-term dryness that developed in the fall of 2010. Drought conditions over western Colorado develop during the last 3-months (January through March).

Drought Severity

D0 - Abnormally Dry D1 Drought - Moderate D2 Drought – Severe D3 Drought - Extreme

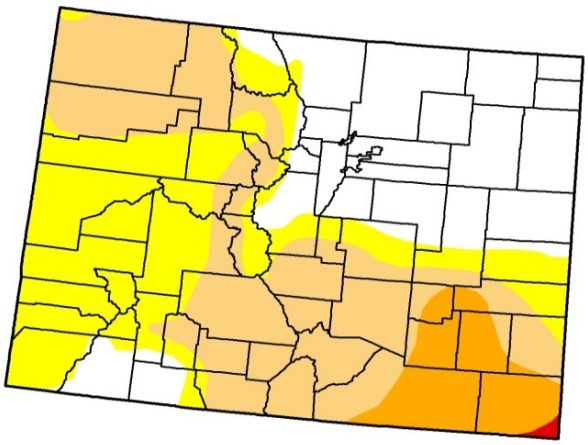


Figure 6. *Colorado Drought Monitor- February 28, 2012*

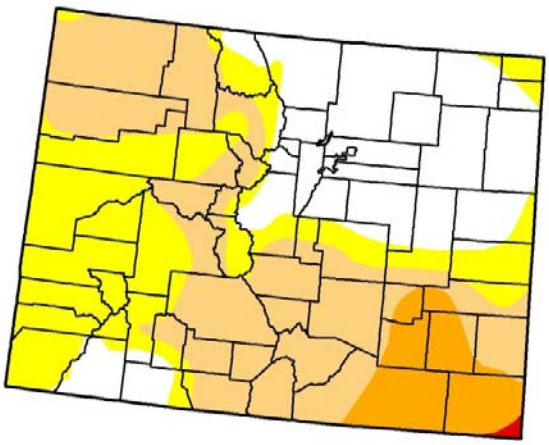


Figure 7. *Colorado Drought Monitor- March 20, 2012*

Contributing Meteorological Factors and Findings-

Nationally recognized fire behavior courses refer to critical fire weather patterns as atmospheric conditions that encourage *extreme fire behavior* resulting in large wildland fires. “Extreme Fire Behavior” (as defined in the NWCG glossary of wildland fire terminology) -

implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, and strong convective column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

Atmospheric conditions that contributed to rapid fire growth (extreme fire behavior) of the Lower North Fork Fire on March 26th were consistent with historic critical fire weather patterns and related fire events that have occurred across Colorado (South Canyon 1994, Bobcat Gulch 2000, Hayman 2002, Overland Fire 2003) and the western United States.

Meteorological Conditions on Monday, March 19, 2012- Lower North Fork Blacklining

Blacklining operations on March 19th on the Lower North Fork Unit was performed and completed under non-critical fire weather conditions. On-Site observations (Figure 7 and Figure 8) from fire personnel during blacklining operations indicate a prevailing south-southwest wind of 3 to 6 mph with gusts of 8 to 10 mph, and good lift and dissipation of smoke. On-site temperature readings were consistent with Remote Automated Weather Station (RAWS) observations at similar elevations (6800-7100 ft. msl); however relative humidity readings were 10% to 12% higher.

Date	Time (MDT)	Dry Bulb	Wet Bulb	RH %	Wind Speed (MPH)	Wind Direction
3/19	1100	42	30	24	2-4	SW
3/19	1200	48	34	23	4-6 G8	SSW
3/19	1245	50	35	21	4-6 G8	NNW
3/19	1345	51	35	21	4-6 G10	SSW
3/19	1445	45	33	29	4-6 G8	SSW
3/19	1545	41	31	34	6-8 G10	N

Figure 7. *On-site weather observations for on ridgeline, blacklining operations. March 19, 2012.*

Date	Time	Elevation	Wind Speed	Wind	Elev. Smoke Column Above Ground	Column Direction
3/19	1110	6900	3-5	SSW	200-300	ENE
3/19	1130	6900	3-5 G7	NNE	300-400	WSW
3/19	1135	6900	4-8 G8	SSW	300-400	ENE
3/19	1200	6900	4-6	SSW	400-500	ENE
3/19	1245	7100	N/A	SSW, NNW	900	ENE
3/19	1300	N/A	N/A	N/A	SSW	N/A
3/19	1315	7100	N/A	SSW	300-400	NNE
3/19	1415	7100	N/A	SSW	200	NNE

Figure 8. *Wind and smoke observations from the Lower North Fork Unit. March19, 2012.*

Meteorological Conditions on Tuesday and Wednesday, March 20-21, 2012

No on-site weather observations were taken on the Lower North Fork Unit; however maximum temperature readings from local RAWS observations ranged from the mid-40s to low 50s. Minimum relative humidity range from 19% to 22%, with prevailing wind from the East to Northeast at 7 to 10 mph with gusts 16 to 21 mph. Manual calculations of the Haines Index from Denver (DNR) radiosonde data yields a value of 3 on the afternoon of March 20th and a 2 the afternoon of March 21st. Much of the Colorado Front Range was under the influence of a "Cut Off" low pressure system (Figure 9) centered over Texas, Oklahoma, and Kansas. No precipitation was recorded at the unit.

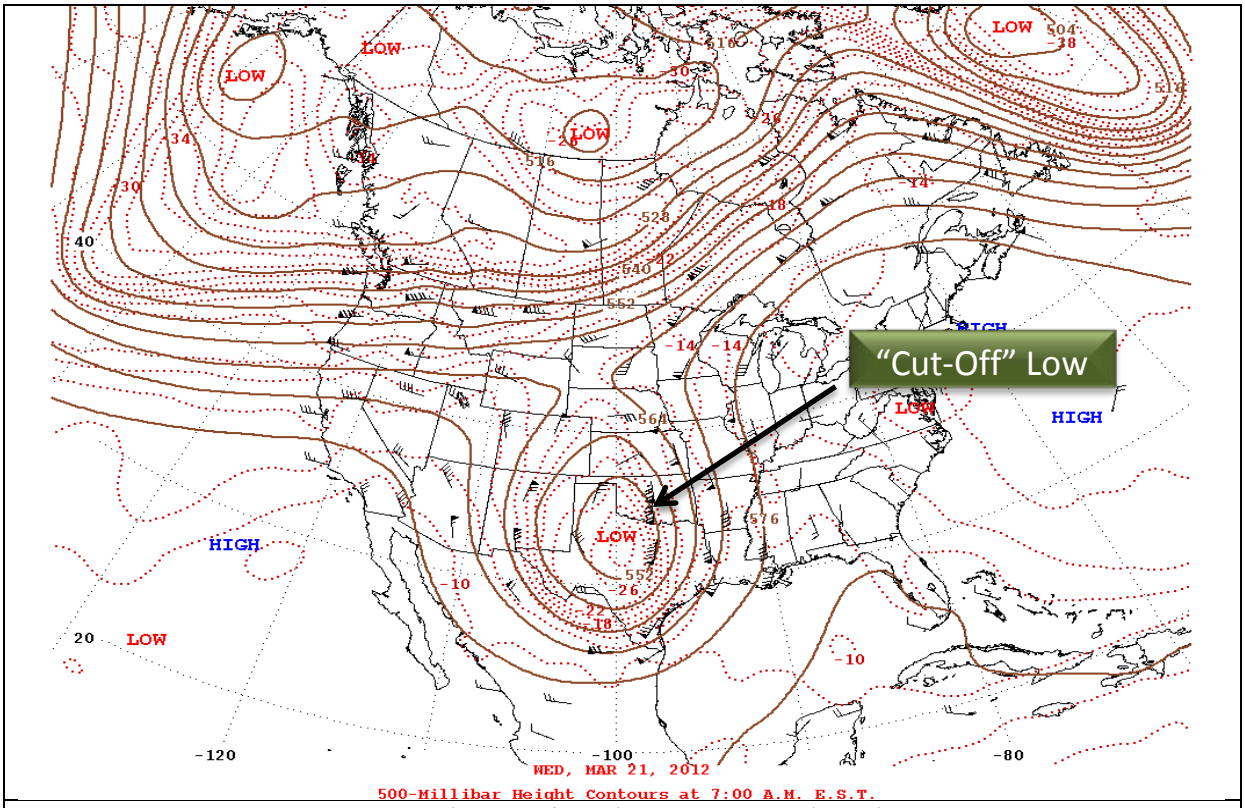


Figure 9. *500 hPa Geopotential Height (~18,000 ft. msl) and Wind Barbs (Knots) -Valid Wednesday, March 21, 2012 6:00 A.M. MDT. "Cut Off "upper low over Texas and Oklahoma with a new trough taking shape over the Gulf of Alaska.*

Meteorological Conditions on Thursday, March 22, 2012- Lower North Fork Burn

The eastern plains and Front Range of Colorado remained under the influence of a "Cut Off" low pressure system center over southern Kansas and Oklahoma. Heavy precipitation extended across much of Kansas (>1.00"), with light to moderate rainfall totals (.025" to 0.45") across extreme eastern Colorado. A deep and broad northeast flow extended west and into the Lower North Fork burn area.

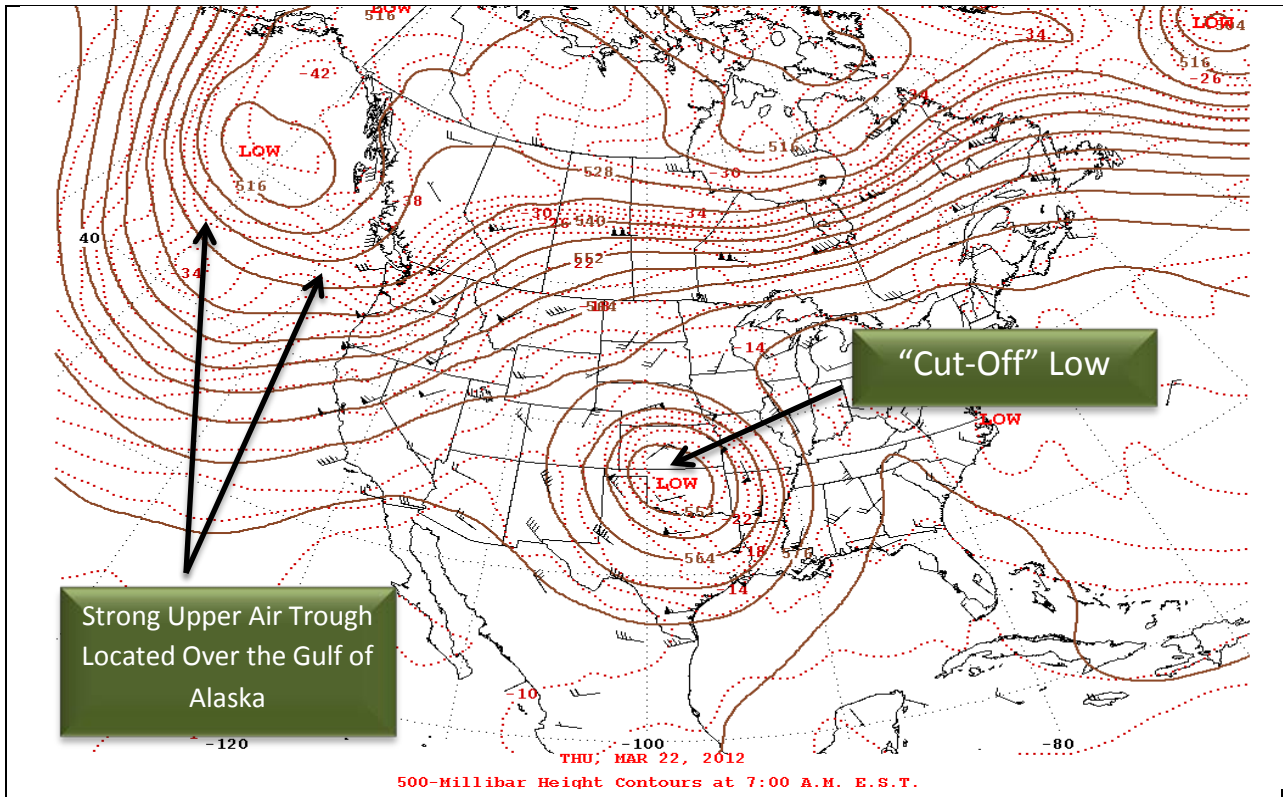


Figure 10. *500- hPa Geopotential Height (~18,000 ft. msl) and Wind Barbs (Knots)- Valid Thursday, March 22, 2012 6:00 A.M. MDT.*

On-site wind observations from fire personnel (Figure 11) measured an east to northeast (at times variable) wind direction with maximum sustained wind speeds ranging 5 to 9 mph and maximum gusts of 10 to 12 mph. Maximum temperatures reached 59°F with a minimum relative humidity of 21%. On-site observations were consistent with meteorological conditions at local RAWS (Bailey, Polhemus, and Cheeseman) observations.

Date	Time (MDT)	Temperature (F)	RH (%)	Wind Speed (MPH)	Wind Direction
3/22	1045	54	22	3-6 G9	NE
3/22	1115	54	26	3-6 G9	Variable
3/22	1215	56	25	4-7 G10	ESE-ENE
3/22	1245	56	25	5-8 G12	ESE-ENE
3/22	1315	56	25	5-8 G12	ESE-ENE
3/22	1430	58	23	6-9 G12	Variable
3/22	1545	58	23	6-9 G12	Variable
3/22	1600	59	21	N/A	ENE

Figure 11. *On-site weather observations on the Lower North Fork Prescribed Burn- March 22, 2012*

The Haines Index relates the *potential* for large fire growth (plume-driven) to atmospheric stability and dryness, and does not consider wind as an input. The Haines Indices for March 22, 2012 (2-very low at 0600 MDT and 3- very low at 1800 MDT) were manually calculated using

High Elevation layers to determine stability (T700 mb – T500 mb) and atmospheric moisture (T700 mb – T700 Dpd) from Denver (DNR) radiosonde data.

Friday through Monday, March 23-26, 2012- Changing Meteorological Conditions and the Lower North Fork Prescribed Fire and Wildfire

Meteorological Conditions on Friday, March 23, 2012

March 23rd marked the beginning of changing atmospheric conditions that became more conducive to fire activity. On the 23rd, a ridge of high pressure extended (Figure 12) from New Mexico, northward into Colorado, eastern Wyoming and the Black Hills of South Dakota, as a new trough of low pressure began to take shape off the Pacific Northwest coast.

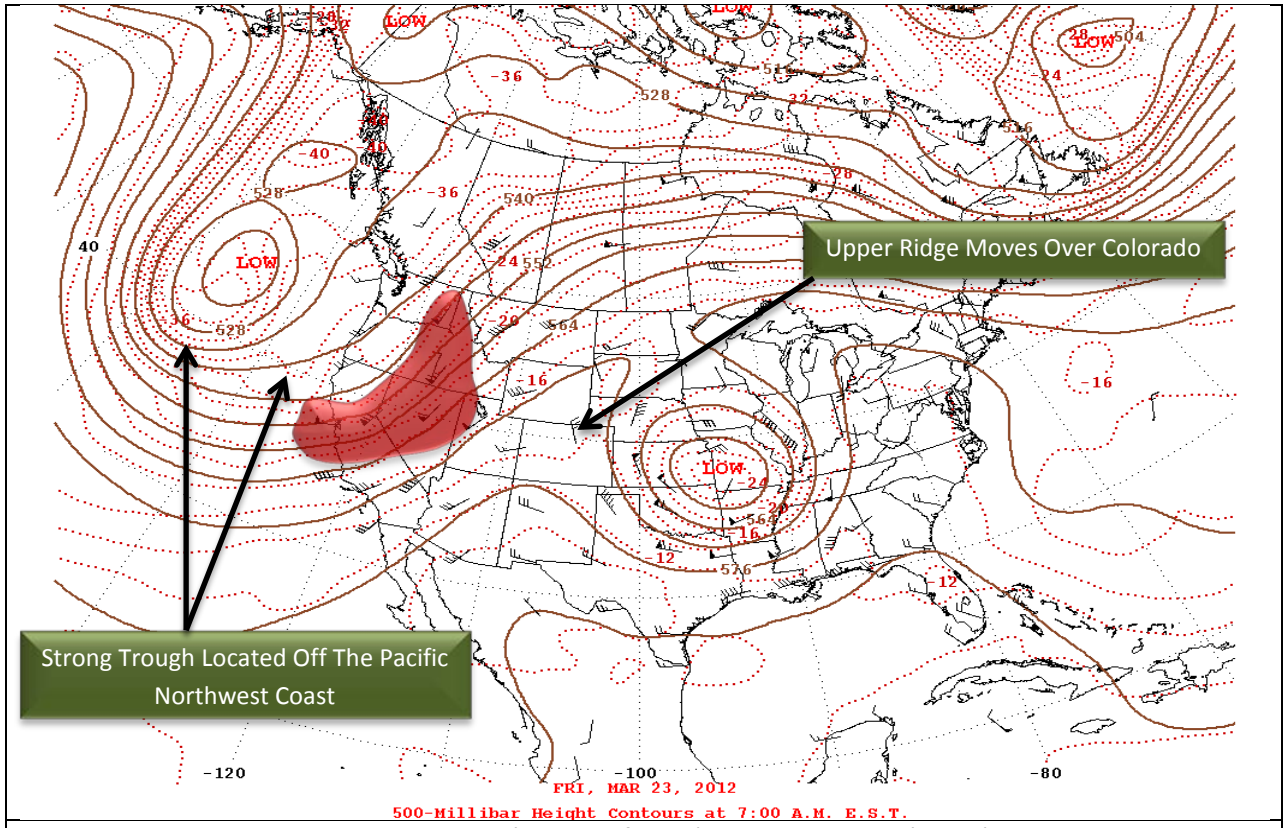


Figure 12. *500- hPa Geopotential Height (~18,000 ft. msl) and Wind Barbs (Knots)- Valid Friday, March 23, 2012 6:00 A.M. MDT. Highlighted (Red) area depicts wind 50 knots or greater.*

The shift in the pattern resulted in a significant air mass change across Colorado including the Front Range. Temperatures increased 15 to 20 degrees from the previous day (March 22, 2012- The Day of the Burn), with maximum readings in the low 70s at the Bailey and Polhemus RAWS near the Lower North Fork. Denver, Colorado set a new record high that afternoon of 76 degrees. Local RAWS also showed a steady decrease in relative humidity during the early

morning hours, with values dropping into the single digits by 1400 MDT on the 23rd. Diurnal wind flow (upslope-upvalley) was apparent at most observation sites with wind speeds ranging from 4 to 7 mph and gust reaching 18 mph (Polhemus RAWS). Manual calculation of the Haines Index yields a value of 5-Moderate at 0600 MDT and 6-High at 1800 MDT.

Meteorological Conditions on Saturday and Sunday, March 24-25, 2012

The air mass along the Front Range and over the Lower North Fork Unit became more precarious March 24th and 25th leading up to the critical fire weather pattern on March 26th. The upper ridge that extended across Colorado on the 23rd (Figure 13) had shifted into the plains as an upper air trough and associated surface front migrated east into California and Nevada by the end of the day on the 25th.

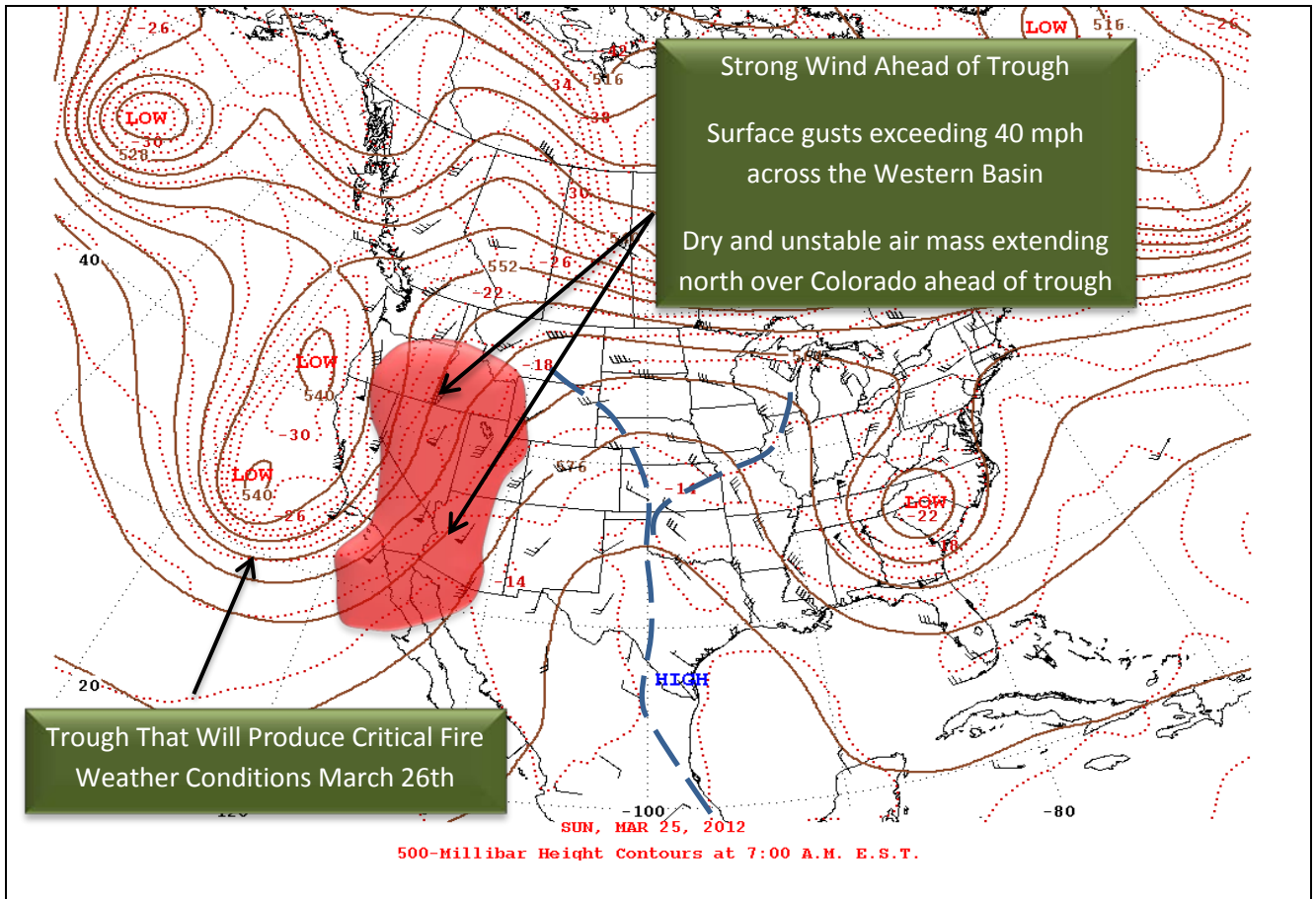


Figure 13. *500- hPa Geopotential Height (~18,000 ft. msl) and Wind Barbs (Knots)- Valid Sunday, March 25, 2012 6:00 A.M. MDT. Highlighted (Red) area depicts winds 50 knots or greater.*

The shift in the ridge resulted in a slightly cooler temperature, but still above average with readings in the mid-60s to around 70 at the Bailey and Polhemus RAWS sites. Importantly, relative humidity dropped into the single digits on the afternoon of the 24th and 25th. The air

mass remained unstable and dry with calculated Haines Indices of 5 to 6, supportive of large fire activity.

Meteorological Conditions on Monday, March 26, 2012- Lower North Fork Wildfire

Analysis of upper air (500 hPa Geopotential Heights and Wind) and surface pressure charts (Figure 14 and 15) on March 26th showed an eastward shift of the upper ridge into the high plains as an upper air trough and associated cold front migrated into Utah early in the day (Similar to meteorological features outlined in the South Canyon Fire Investigation published in August 1994). The "Break Down of the Upper Ridge" (or shift eastward ahead of an upper trough and surface front) is recognized as a "critical fire weather pattern" that produce strong gusty winds, warm temperatures, low humidity (drying of fuels), enhance vertical lift (unstable atmosphere (Haines of 6), and an ultimate increase in fire behavior. Complex terrain can further exacerbate fire weather conditions and fire behavior as descending air on the lee-ward side warms and dries through compression at a rate of 5.5 F/1000 (9.9 C/km). Additionally, terrain can alter direction of wind flow by channeling and increasing speeds through constrictions associated with canyons and narrow drainages.

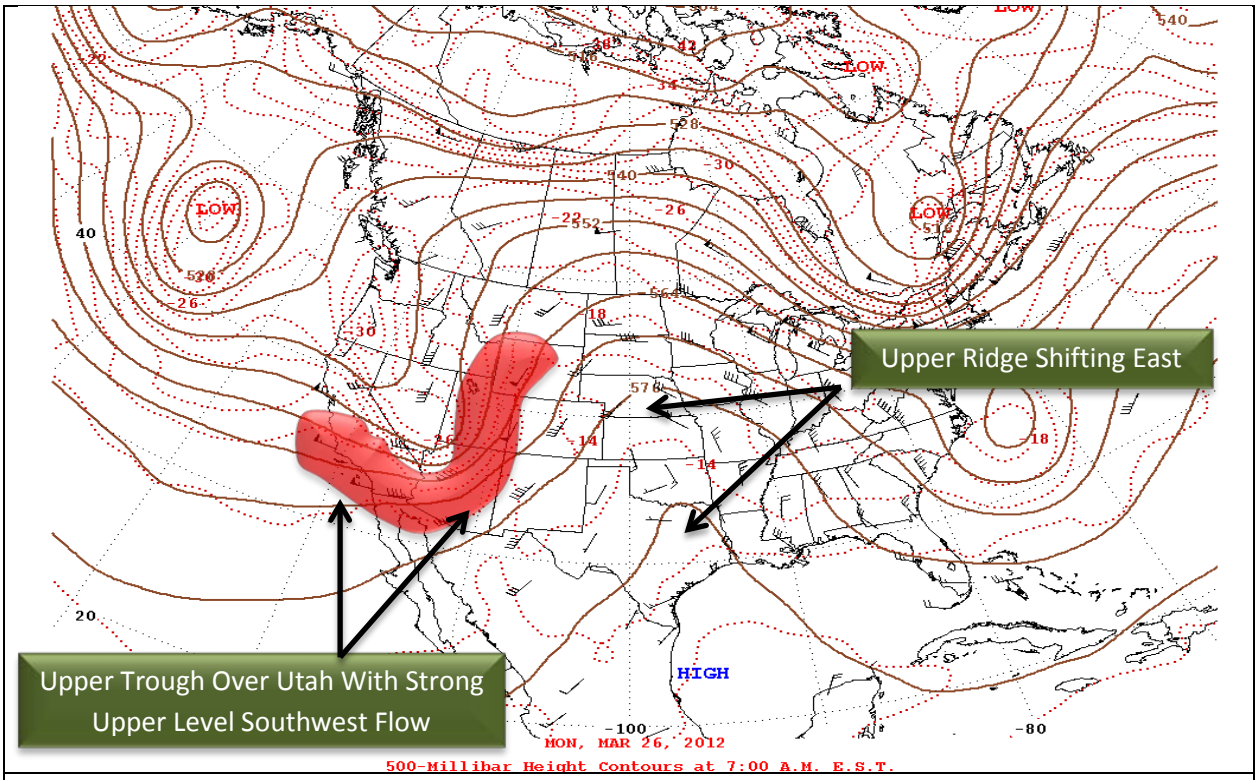


Figure 14. *500-Millibar Height Contours (~18,000 ft. msl) and Wind Barbs (Knots) - Valid Monday March 26 2012 6:00 A.M. MDT. Highlighted (Red) area depicts strong winds 50 knots or greater.*

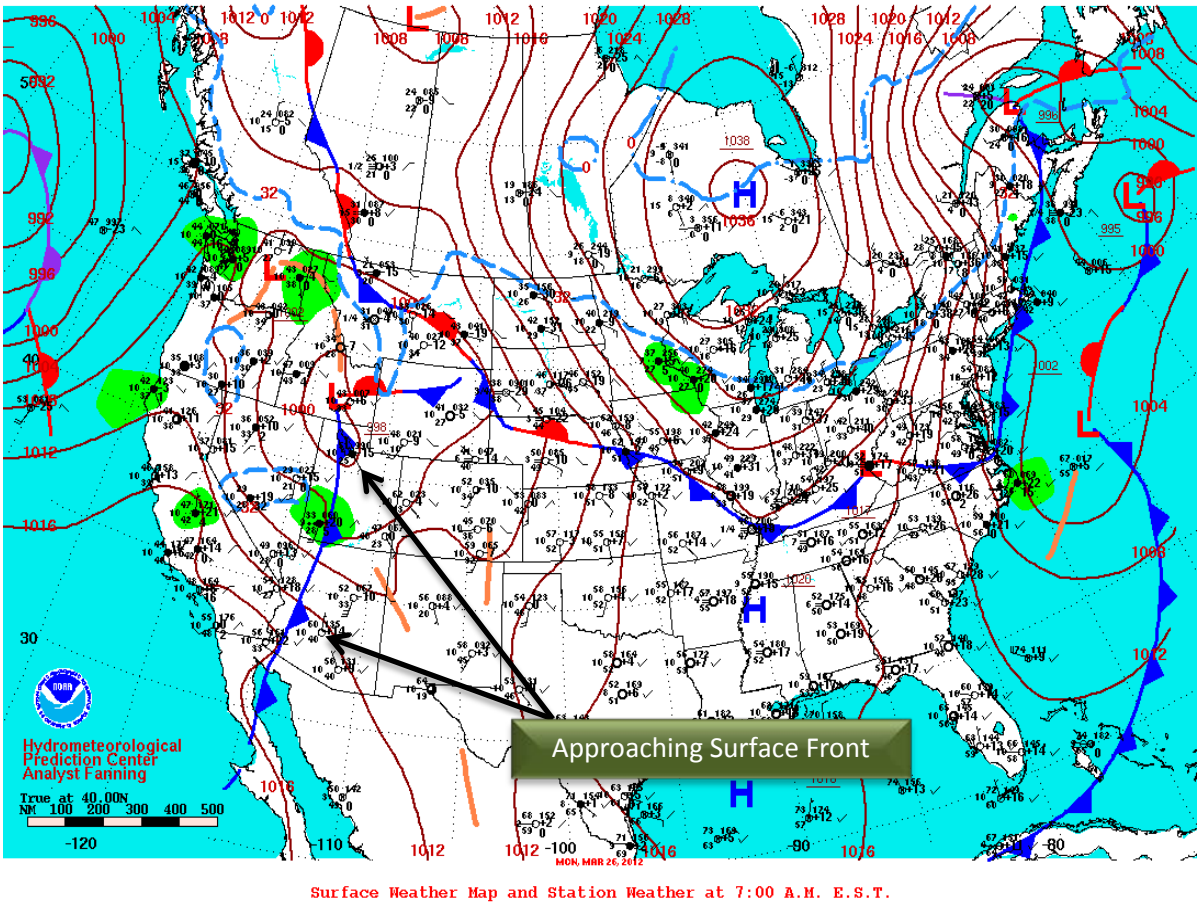


Figure 15. *Surface Pressure Chart and Station Plots Valid Monday, March 26 2012 6:00 A.M. MDT. Surface front extending from southeast Idaho, south into Utah and Arizona.*

Meteorological Conditions during the Morning (Midnight to 1200 (Noon) MDT) of Monday, March 26, 2012.

The Polhemus RAWS observations (ridge top) during the early morning hours (Midnight-0800) of the 26th showed steady temperatures (48°F-50°F), poor overnight relative humidity recovery (23%-28%), south-southwest winds 8 to 11 mph with gusts 20 to 24 mph. The Bailey RAWS data for the same time also showed steady temperatures overnight (44-46), moderately dry relative humidity recoveries of 36%-40%, and light west to northwest winds of 2 to 4 mph.

Early morning 1-KM visible satellite sequence (Figure 16) and local observations also revealed dense mid and high level cloudiness over the Lower North Fork unit, ahead of the upper trough and surface front. Steady temperatures and poor relative humidity recovery are consistent with not only the air mass characteristics in place at the time but known impacts from cloud cover and wind at night (both of which disrupt radiational cooling and corresponding rise in relative humidity).

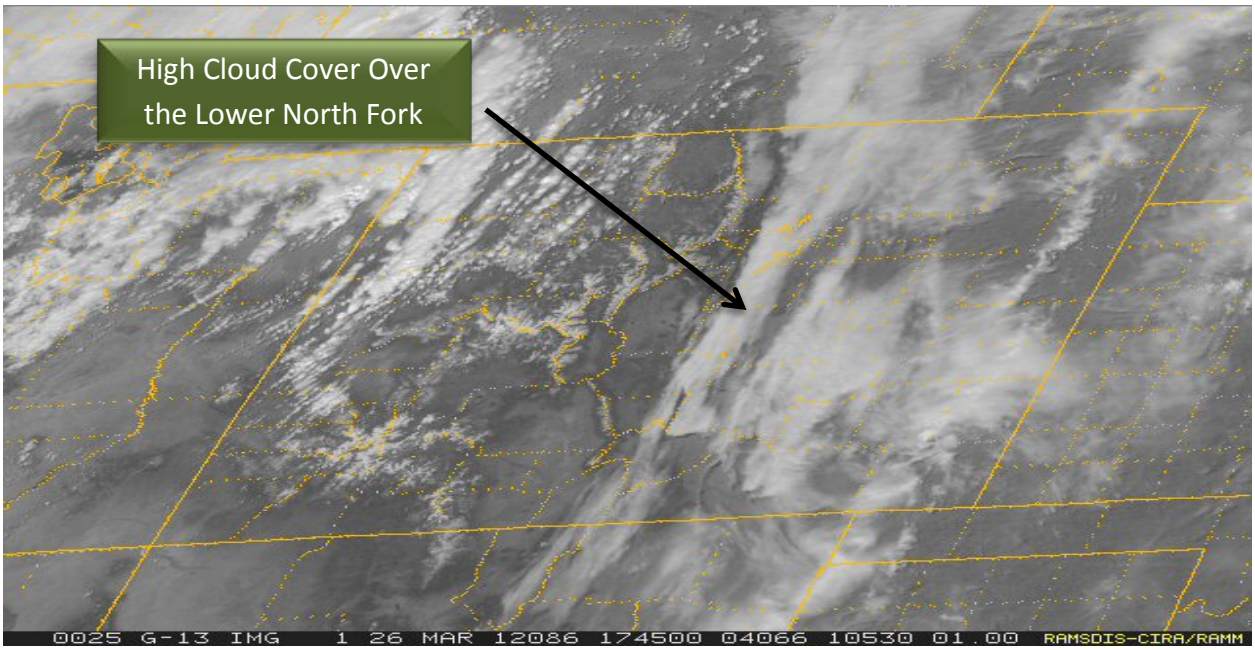


Figure 16. *1-KM Visible Satellite Image from valid March 26, 2012 1745 Z (1145 MDT). High and mid-level cloud shield over the Lower North Fork Fire. Image obtained from* ***Colorado State University Cooperative Institute for Research in the Atmosphere (CIRA).***

Water Vapor (WV) satellite imagery (Figure 17) also revealed mid-level dry air extending northeast from the Desert Southwest into western Colorado at 0900 MDT, just west of the Lower North Fork Unit.

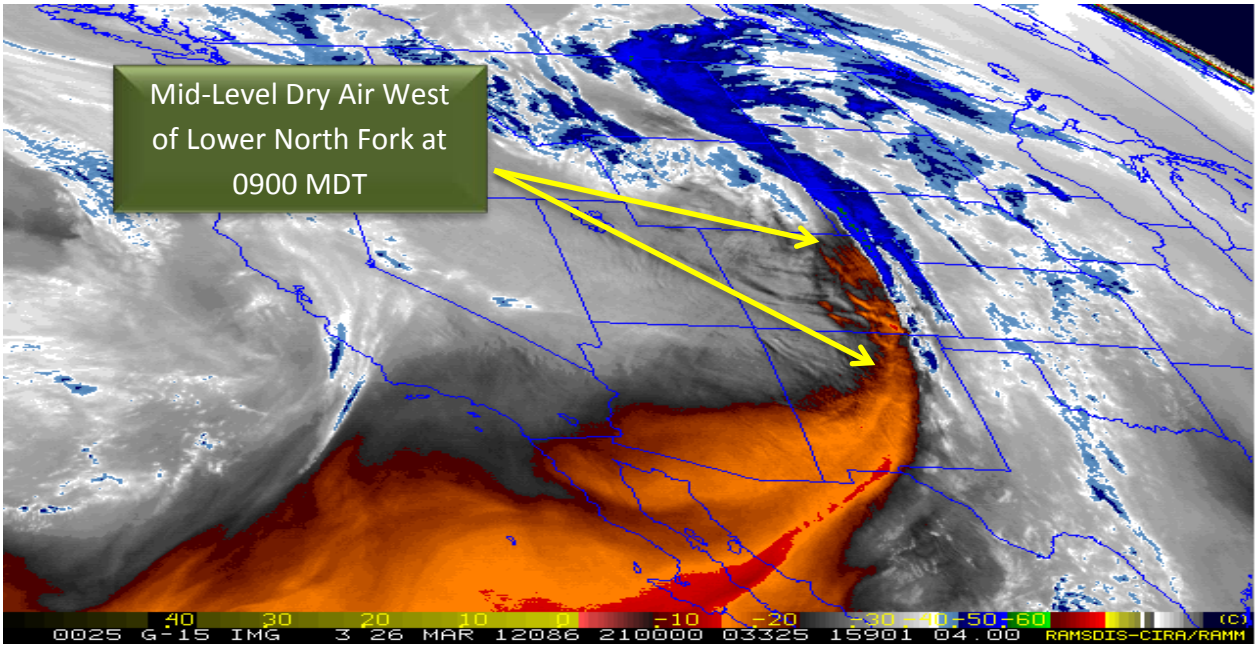


Figure 17. *16-KM Water Vapor Image at 2100Z (0900 MDT) on Monday, March 26, 2012. Dry air at mid-levels extending from the Southwest (Indicated by the Dark and Orange enhancement). Image obtained from* ***Colorado State University Cooperative Institute for Research in the Atmosphere (CIRA).***

Analyzed Denver (DNR) radiosonde data for 12Z (0600 MDT) March 26th and 00Z March 27th (1800 MDT March 26th) generated (manual calculations) Haines Indices of 6 (High Potential for Large Fire Growth (Plume-Driven)). Refer to Figures 18 and 19.

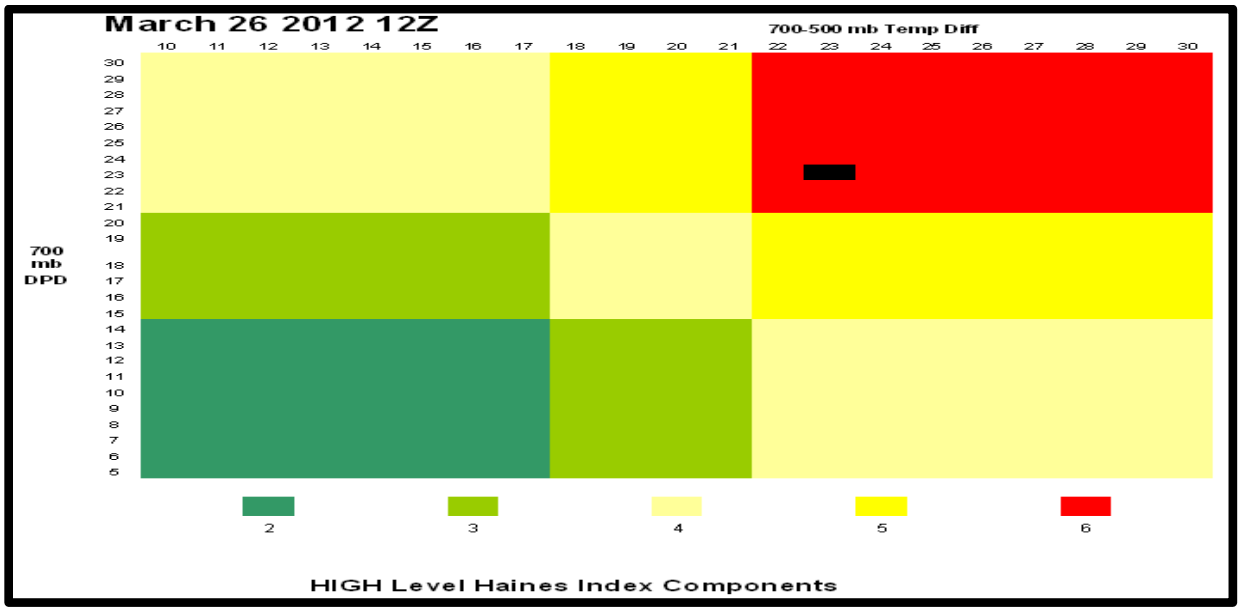


Figure 18. *Haines Index of 6-High (indicated by black pixel) based on radiosonde data from Denver (DNR) valid at 0600 MDT Monday, March 26, 2012. Graphic developed using John Saltenberger (Fire Meteorologist Northwest Coordination Center) Haines calculation excel program.*

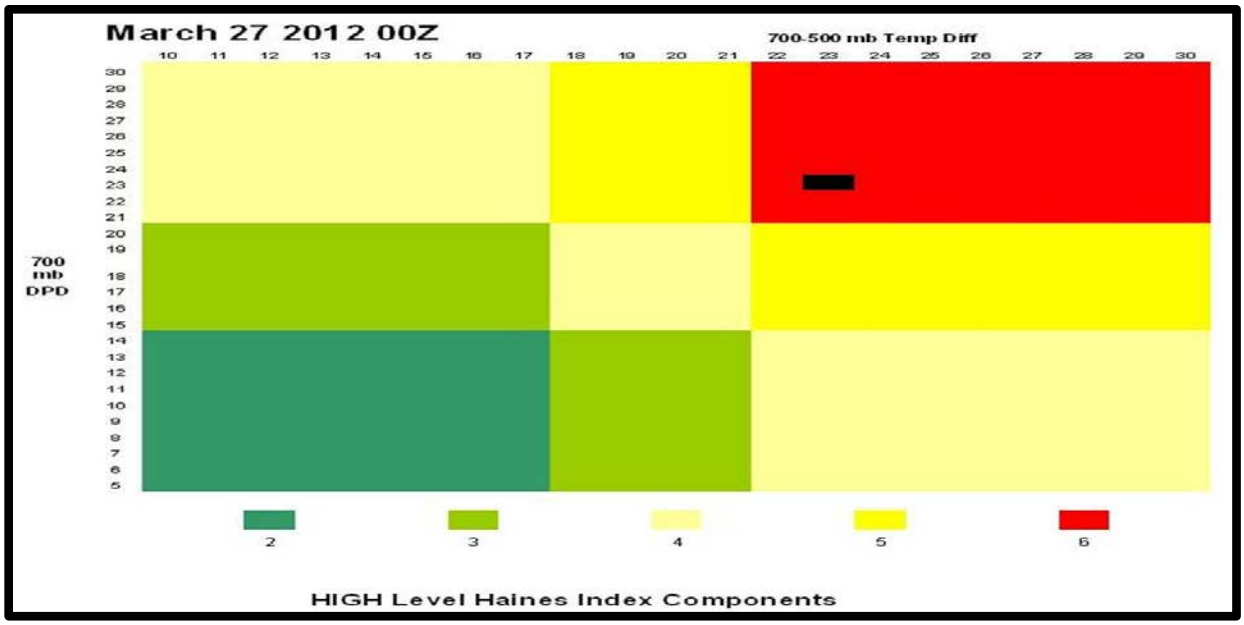


Figure 19*. Haines Index of 6-High (indicated by black pixel) based on radiosonde data from Denver (DNR) valid at 1800 MDT Monday, March 26, 2012 (00Z March 27th). Graphic developed using John Saltenberger (Fire Meteorologist Northwest Coordination Center) Haines calculation excel program.*

Meteorological Conditions during the Afternoon 1200 (Noon) MDT to 1800 MDT of Monday, March 26th

Between 1200 and 1230 1-KM visible satellite imagery (Figure 20) showed that mid and high level cloud cover had moved east of Jefferson County and the Lower North Fork unit. Corresponding Water Vapor (WV) imagery also showed significant mid-level level dryness pushing into the Front Range and Lower North Fork along the back edge of the cloud shield.

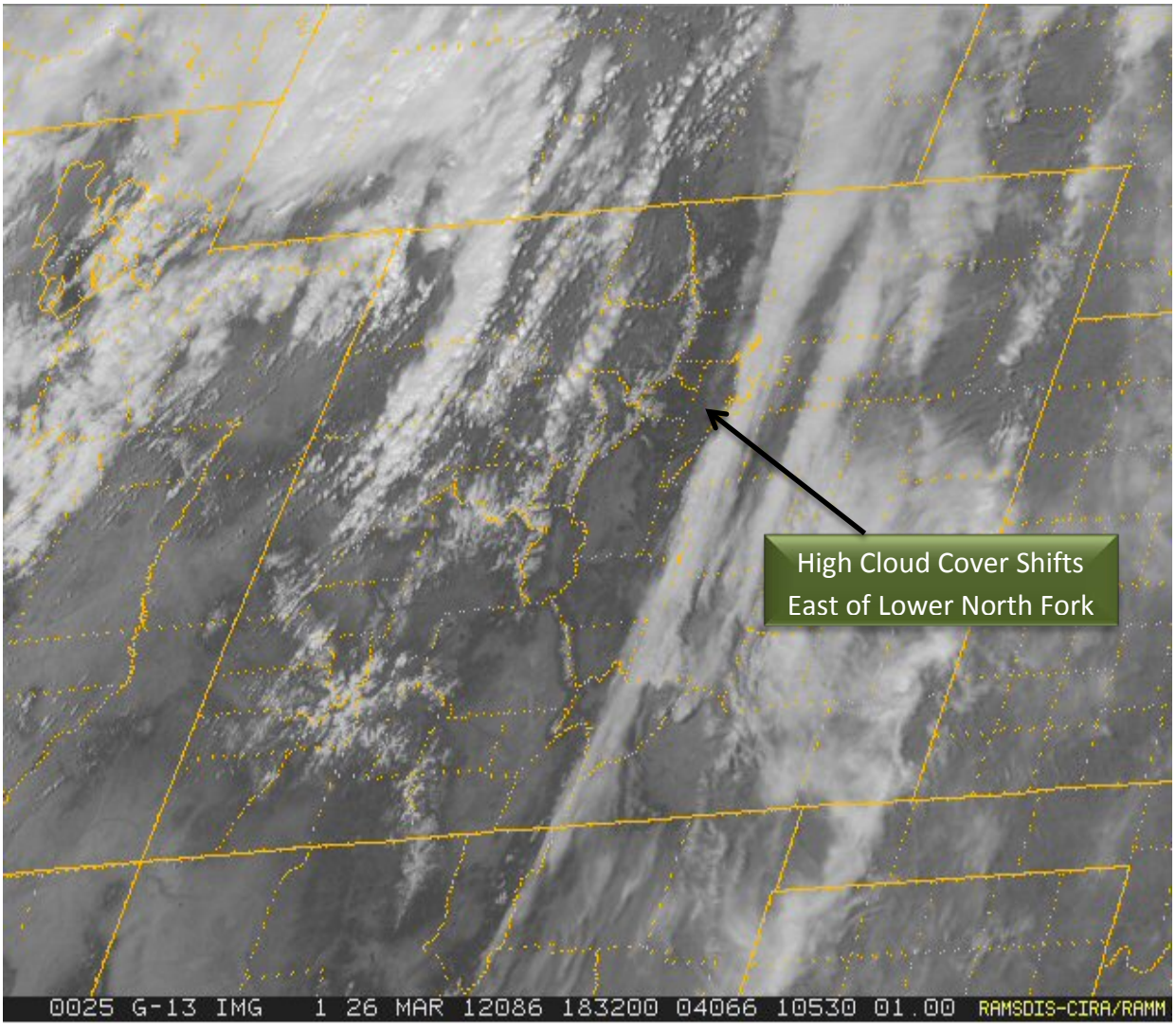


Figure 20. *1-KM Visible Satellite Image at 1832Z (1232 MDT) on Monday, March 26, 2012. Image shows mid and high level cloudiness exiting Jefferson County and the Lower North Fork Unit. Image obtained from* ***Colorado State University Cooperative Institute for Research in the Atmosphere (CIRA).***

At the same time solar sensor data (Figure 21) from Jefferson County RAWS revealed significant increases in radiation values, corresponding to loss of cloud cover. Polhemus solar radiation values from the 11:54 MDT and 12:54 MDT increase from 269 W/m^2 to 875 W/m^2, respectively.

A similar increase was observed at the Bailey RAWS between the 10:22 MDT and 11:22 observation time.

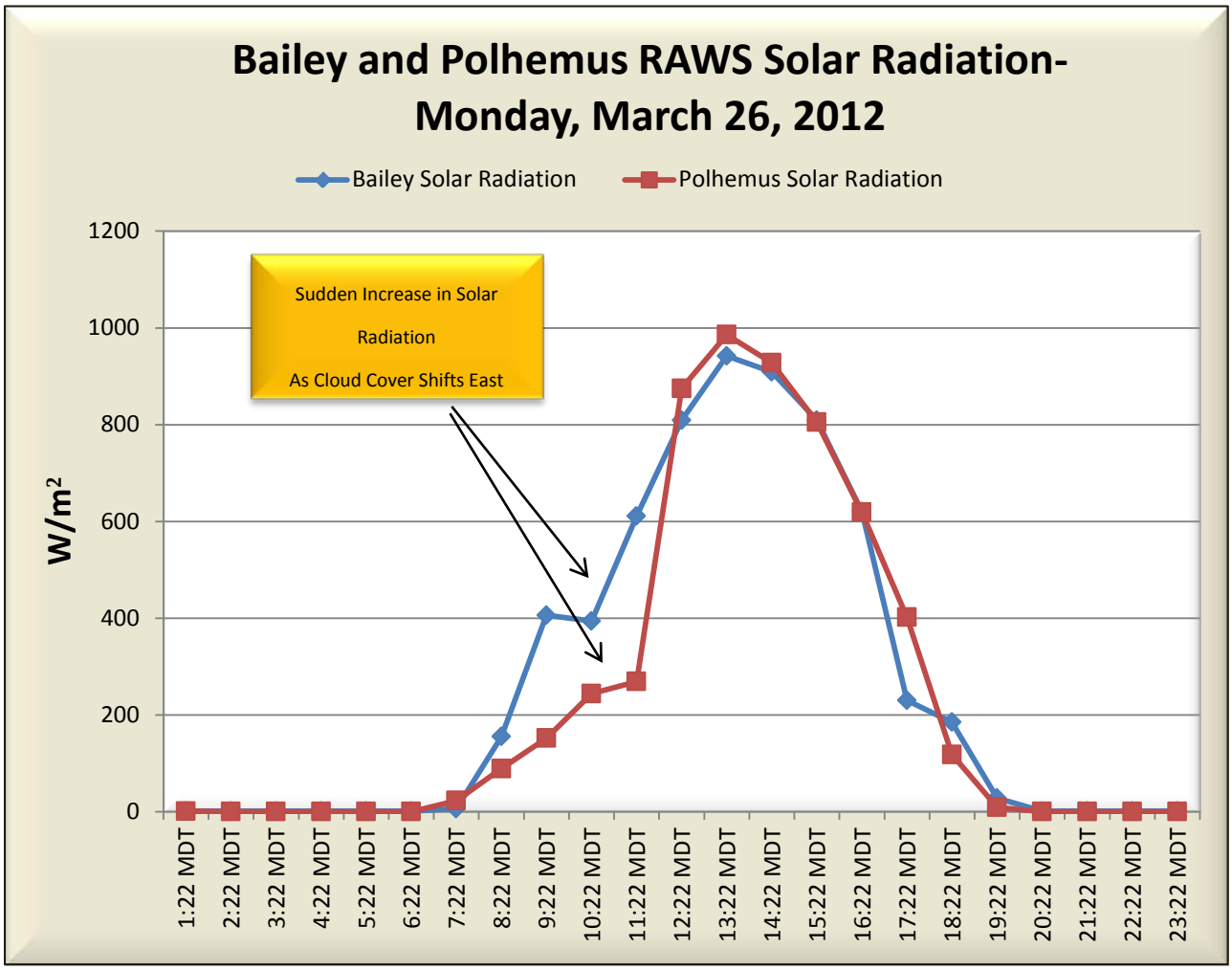


Figure 21. *Bailey and Polhemus solar radiation data for Monday, March 26, 2012. Notice the sudden increase in solar radiation, which is congruent with cloud shield moving east of the Lower North Fork Unit.*

Temperatures during the same time frames increased 6°F with corresponding relative humidity decrease from 17% to 9% at Polhemus and 12% to 9% at Bailey (indicative of increased mixing). Wind during this time were most noticeable at Polhemus with sustained 10 minute average winds increased from 16 mph to 23 mph and gust increase from 36 to 49 mph from the west to southwest (Figure 22 and 23). Wind data from the portable weather station on the Lower North Fork also showed the same increase in wind speed; however the wind direction sensor appeared to be malfunctioning (stuck at 169.9 degrees from March 19th through the 26th).

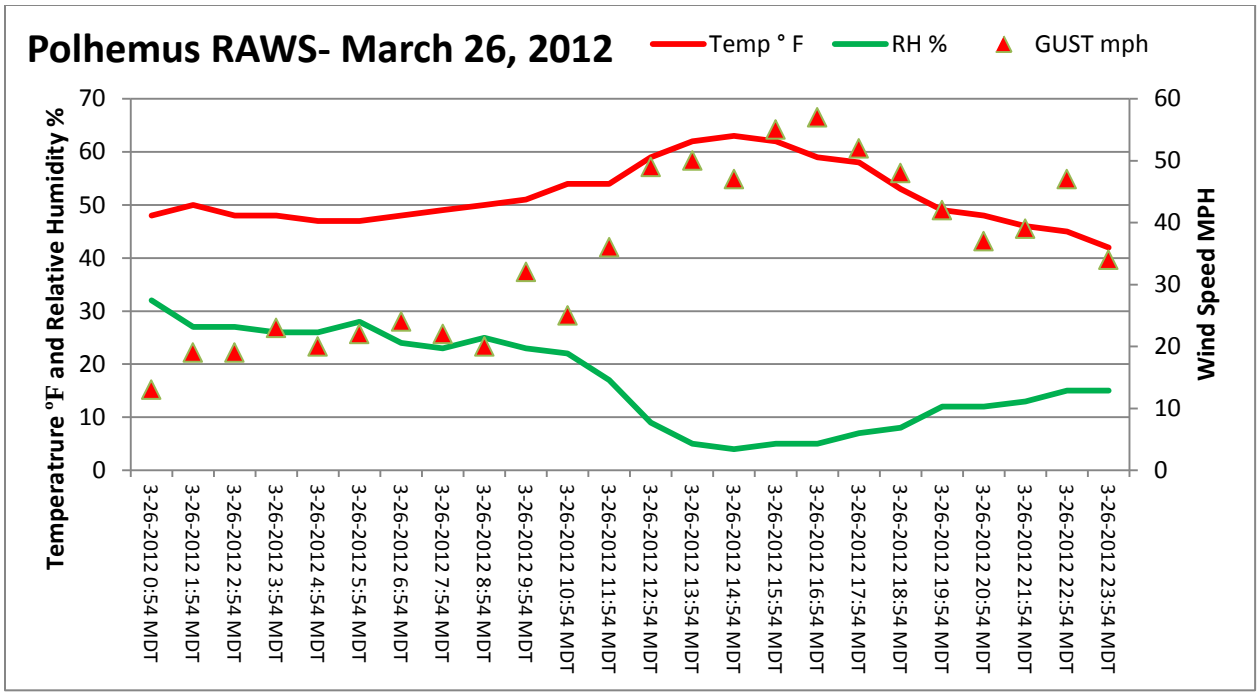


Figure 22. *Polhemus RAWS Temperature °F, Relative Humidity %, and Wind Gusts (MPH) for Monday March 26, 2012. Notice the increase in temperature, drop in relative humidity and wind gusts that increase in speeds between 1154 MDT and 1254 MDT.*

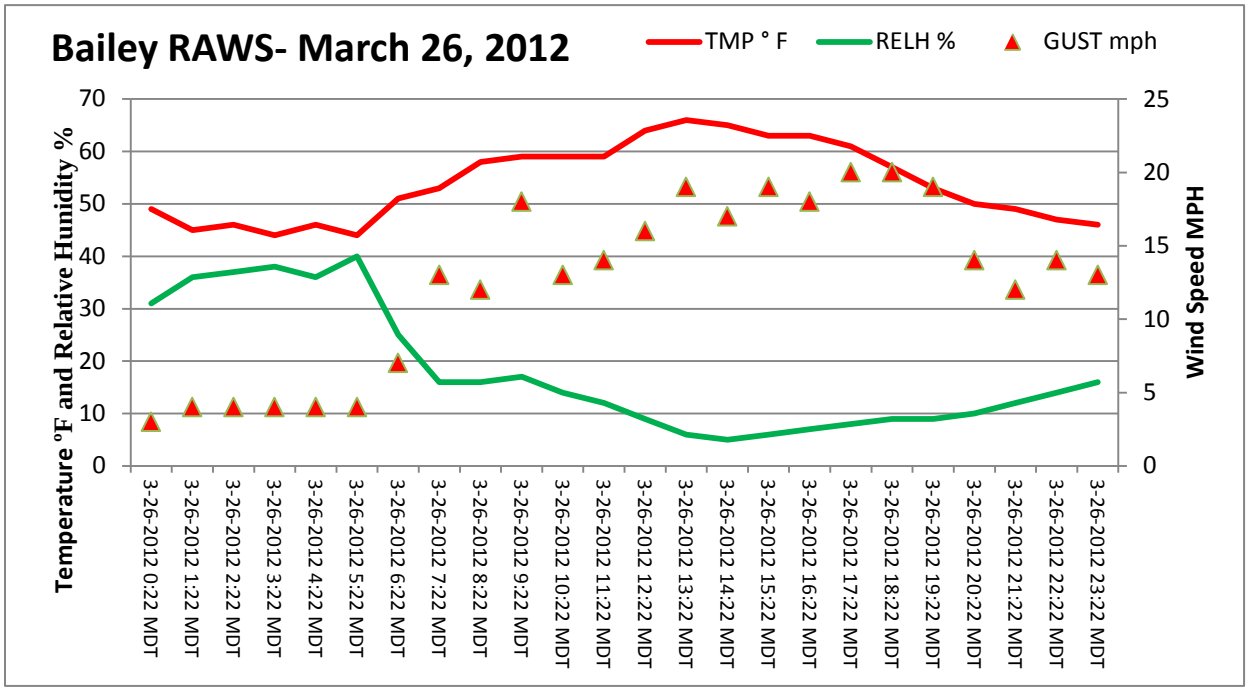


Figure 23. *Bailey RAWS Temperature °F, Relative Humidity %, and Wind Gusts (MPH) for Monday March 26, 2012. Notice the increase in temperature, drop in relative humidity and wind gusts that increase in speeds between 1222 MDT and 1322 MDT, though not as dramatic as Polhemus.*

Critical Fire Weather (Pre-Frontal) conditions (strong and gusty southwest wind, warm temperatures, single digit relative humidity, and unstable atmospheric conditions (Haines 6) continued through 1800 MDT. The Lower North Fork smoke plume (convective column) first became apparent on 1-KM resolution satellite imagery around 1645 MDT and very conspicuous around 1732 MDT (Figure 24.), an obvious increase in fire behavior.

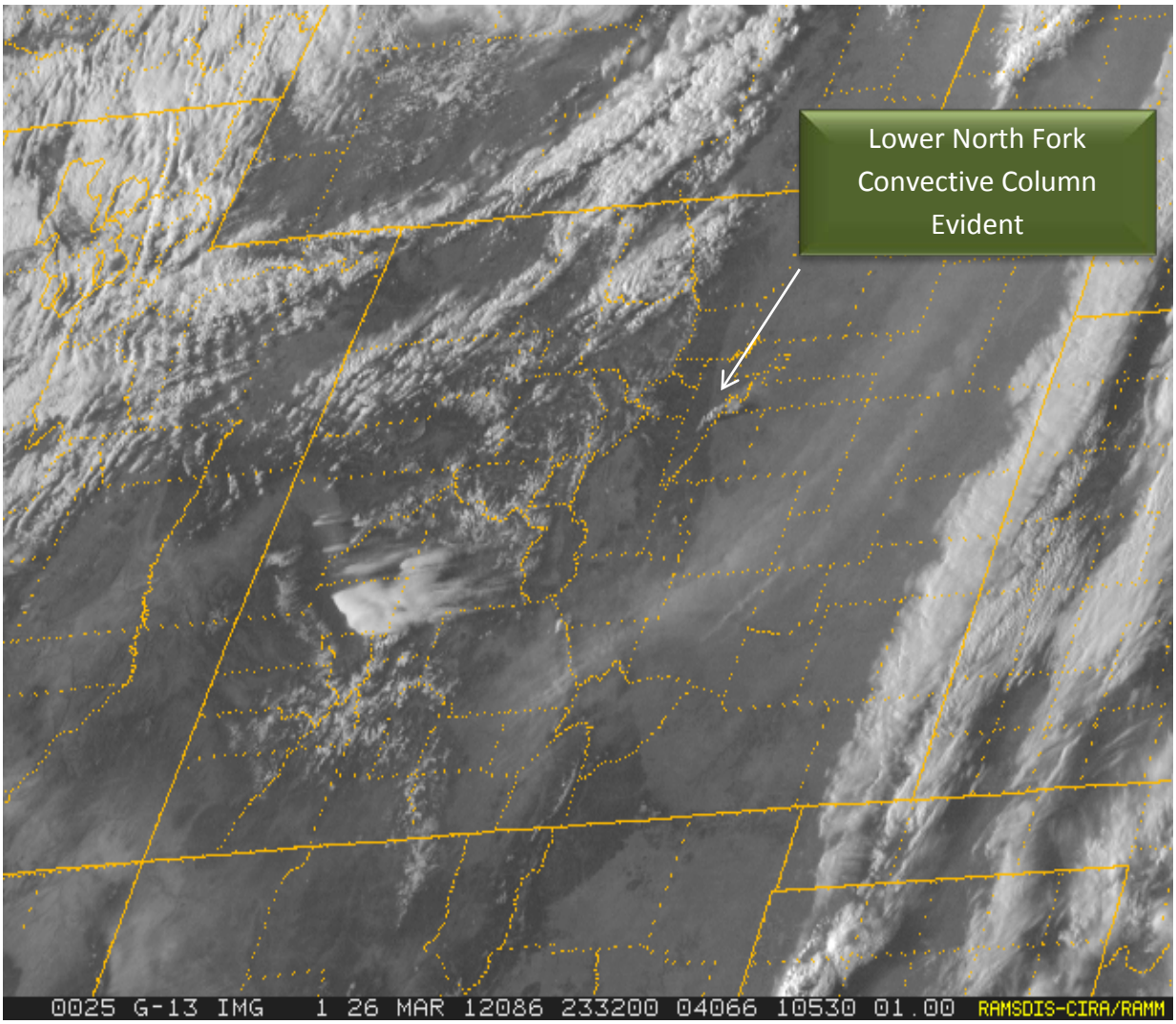


Figure 24. *1-KM Visible Image at 2332Z (1732 MDT) on Monday, March 26, 2012. Lower North Fork convective column is evident, indicative of an increased fire behavior. . Image obtained from Colorado State University Cooperative Institute for Research in the Atmosphere (CIRA).*

Still photography (Figure 25) during this 45 minute window also verified satellite trends, with a bulbous convective column and pyro-cumulus (indicative of unstable atmospheric conditions). Other images around 1725 MDT also showed the column tilted or bent-over toward the east northeast consistent with strong winds that had developed over the area early in the afternoon.

Figure 25. *Still image of the Lower North Fork convective column with pyro-cumulus between 1700 and 1730 MDT (Source Unknown).*

Forecasts and Outlooks Issued-

National Weather Service Boulder Area Forecast Discussions:

Area Forecast Discussions issued by the Boulder National Weather Service highlighted increasing southwesterly wind, warm temperatures, and high fire danger for Monday, March 26, 2012, as early as Tuesday, March 20, 2012. Subsequent Area Forecast Discussions continued to highlight increasing wind and dryness through the event (Monday, March 26, 2012)

National Weather Service Fire Weather Planning Forecast (FWF) for Colorado Fire Weather Zone 216:

Forecasts Issued on Tuesday March 20, 2012 and Wednesday, March 21, 2012

The Fire Weather Planning Forecast (FWFs) issued on March 20th and 21st by the Boulder National Weather Service Office did not incorporate extended periods beyond day 5, and therefore did not included forecasts for Monday, March 26, 2012.

Forecast Issued on Thursday, March 22, 2012

The Fire Weather Planning Forecast (FWF) issued on Thursday, March 22, 2012 at 0409 MDT was the first issuance to include the extended period of Monday, March 26, 2012. The discussion stated:

SOUTHWESTERLY FLOW ALOFT WILL KICK IN SATURDAY CONTINUING THROUGH MONDAY

The extended forecast for Monday, March 26, 2012 (Lower North Fork Incident) was:

.MONDAY...PARTLY CLOUDY. LOWS AROUND 40. HIGHS IN THE MID 60S. SOUTHWEST WINDS 9-15 MPH.

Forecast Issued on Friday, March 23, 2012

The Fire Weather Planning Forecast (FWF) issued on Friday, March 23, 2012 at 0406 MDT highlighted increasing winds in the discussion:

LONG TERM DISCUSSION...SATURDAY THROUGH TUESDAY...SOUTHWESTERLY FLOW ALOFT IS EXPECTED ON SATURDAY AND SUNDAY. BY MONDAY IT WILL INCREASE WITH INCREASED LOW LEVEL WINDS AS WELL.

The extended forecast for Monday, March 26, 2012 (Lower North Fork Incident) was:

.MONDAY...PARTLY CLOUDY. LOWS AROUND 40. HIGHS IN THE LOWER 60S. SOUTHWEST WINDS 13-20 MPH.

Forecast Issued on Saturday, March 24, 2012

The Fire Weather Planning Forecast (FWF) issued on Saturday, March 24, 2012 at 0523 MDT highlighted increasing winds for Monday, March 26, 2012 in the discussion:

FAIRLY STRONG LOW LEVEL WINDS ARE EXPECTED MONDAY...SO FIRE DANGER WILL BE WORSE.

The extended forecast for Monday, March 26, 2012 (Lower North Fork Incident) was:

.MONDAY...BREEZY. PARTLY CLOUDY. HIGHS IN THE LOWER 60S. SOUTHWEST WINDS 16-26 MPH.

Forecast Issued on Sunday, March 25, 2012 at 0526 MDT

The Fire Weather Planning Forecast (FWF) issued on Sunday, March 25, 2012 at 0526 MDT included a Fire Weather Watch for Monday, March 26, 2012 for STRONG WINDS and LOW RELATIVE HUMDITY.

LONG TERM DISCUSSION...MONDAY THROUGH THURSDAY...PRETTY STRONG SOUTHERLY FLOW ALOFT WILL COVER THE AREA MONDAY...WITH A WEAK UPPER TROUGH TO MOVE ACROSS LATE IN THE DAY AND EVENING.

The forecast for Monday, March 26, 2012 (Lower North Fork Incident) was:

```
.MONDAY...
SKY/WEATHER.........MOSTLY SUNNY UNTIL 1200...THEN PARTLY
                    CLOUDY(35-45%).
MAX TEMPERATURE.....57-67.
   24 HR TREND......7-10 DEGREES COOLER.
MIN HUMIDITY........8-18%.
   24 HR TREND......LITTLE CHANGE.
20-FOOT WINDS.......
   VALLEYS/LWR SLOPES...SOUTHWEST 9-15 MPH WITH GUSTS TO 30 MPH
                        INCREASING TO 22-32 MPH WITH GUSTS TO 55
                        MPH IN THE AFTERNOON.
   RIDGES/UPR SLOPES....SOUTHWEST 11-17 MPH WITH GUSTS TO 40 MPH
                        INCREASING TO 24-36 MPH WITH GUSTS TO 60
                        MPH IN THE AFTERNOON.
HAINES INDEX........3 VERY LOW.
LAL.................1.
CWR.................0 PERCENT.
10K FT FREE WINDS...SOUTHWEST 65-75 MPH.
MIXING HEIGHT.......BELOW 1000 FT AGL UNTIL 0700...THEN 9500-
10500
                    FT AGL.
TRANSPORT WINDS.....SOUTHWEST 15-20 MPH UNTIL 0900. 45-55 MPH
                    AFTER 1400.
SMOKE DISPERSAL.....POOR UNTIL 1000. EXCELLENT AFTER 1500.
```

Forecast Issued on Sunday, March 25, 2012 at 1519 MDT

The Fire Weather Planning Forecast (FWF) issued on Sunday, March 25, 2012 at 1519 MDT upgraded the Fire Weather Watch for Monday, March 26, 2012 to a RED FLAG WARNING for STRONG WINDS and LOW RELATIVE HUMDITY.

.DISCUSSION...TONIGHT AND MONDAY...SOUTHWEST FLOW WILL INCREASE TONIGHT AND MONDAY AS AN UPPER LEVEL TROUGH MOVES ACROSS THE CENTRAL ROCKIES. THIS SYSTEM WILL BRING VERY WINDY CONDITIONS MONDAY. SOUTHWEST WINDS WILL INCREASE DURING THE MORNING. BY AFTERNOON...GUSTS TO 50 MPH WILL BE POSSIBLE. WINDS WILL SHIFT TO WEST LATE MONDAY AFTERNOON BEHIND A COLD FRONT. THESE WINDS COMBINED WITH RELATIVE HUMIDITIES VALUES AROUND 10 PERCENT AND DRY FUELS WILL RESULT IN A VERY HIGH POTENTIAL FOR RAPID FIRE GROWTH.

The forecast for Monday, March 26, 2012 (Lower North Fork Incident) was:

```
.MONDAY...
SKY/WEATHER.........PARTLY CLOUDY(40-50%).
MAX TEMPERATURE.....56-66.
   24 HR TREND......4-7 DEGREES COOLER.
MIN HUMIDITY........9-19%.
   24 HR TREND......LITTLE CHANGE.
20-FOOT WINDS.......
   VALLEYS/LWR SLOPES...SOUTHWEST 8-14 MPH WITH GUSTS TO 30 MPH
                        INCREASING TO 22-32 MPH WITH GUSTS TO 55
                        MPH IN THE AFTERNOON.
   RIDGES/UPR SLOPES....SOUTHWEST 11-17 MPH WITH GUSTS TO 40 MPH
                        INCREASING TO 23-33 MPH WITH GUSTS TO 55
                        MPH IN THE AFTERNOON.
HAINES INDEX........3 VERY LOW.
LAL.................1.
CWR.................0 PERCENT.
10K FT FREE WINDS...SOUTHWEST 70-80 MPH.
MIXING HEIGHT.......BELOW 1000 FT AGL UNTIL 0700...THEN 9500-
10500
                    FT AGL.
TRANSPORT WINDS.....SOUTHWEST 15-20 MPH UNTIL 0800. AROUND 55
MPH
                    AFTER 1600.
SMOKE DISPERSAL.....POOR UNTIL 0800...THEN VERY GOOD UNTIL
1000...
                    THEN EXCELLENT.
```

Forecast Issued on Monday, March 26, 2012 at 0551 MDT

The Fire Weather Planning Forecast (FWF) issued on Monday, March 26, 2012 at 0551 MDT included a RED FLAG WARNING for STRONG WINDS and LOW RELATIVE HUMDITY FROM 10 AM UNTIL 7 PM.

.DISCUSSION...TODAY AND TONIGHT...
VERY DANGEROUS FIRE WEATHER CONDITIONS WILL DEVELOP TODAY AS AN UPPER LEVEL TROUGH MOVES FROM NEVADA INTO THE NORTHERN ROCKIES. STRONG SOUTH TO SOUTHWEST WINDS WILL DEVELOP AHEAD OF THE TROUGH BY MIDDAY WITH SHALLOW MOISTURE MIXING OUT. THIS WILL RESULT IN LOW RELATIVE HUMIDITIES. IN ADDITION...VERY DEEP MIXING WILL ALLOW FOR EXCELLENT VENTILATION OF ANY FIRES THAT START. A COLD FRONT WILL MOVE ACROSS THE AREA DURING THE AFTERNOON...WITH WINDS SHIFTING TO A MORE WESTERLY DIRECTION. HUMIDITIES WILL EVENTUALLY INCREASE WITH SOME COOLING BEHIND THE FRONT THIS

EVENING...BUT A MOUNTAIN WAVE WILL KEEP VERY STRONG WINDS GOING OVER THE EAST SLOPES OF THE FRONT RANGE.

IN ADDITION TO THE AREAS COVERED BY THE RED FLAG WARNING...THE MOUNTAIN PARKS WILL ALSO HAVE WARM...DRY...AND VERY WINDY CONDITIONS TODAY. FUELS IN THESE AREAS ARE NOT AS DRY AS AT LOWER ELEVATIONS...BUT RAPID GROWTH OF ANY FIRE THAT DOES START IS ALSO POSSIBLE IN THESE AREAS.

The forecast for Monday (Today), March 26, 2012 (Lower North Fork Incident) was:

```
...RED FLAG WARNING IN EFFECT FROM 10 AM THIS MORNING TO 7 PM
MDT THIS EVENING FOR STRONG WINDS AND VERY LOW HUMIDITY...

.TODAY...
SKY/WEATHER.........MOSTLY CLOUDY(50-60%) UNTIL 1200...THEN
PARTLY
                    CLOUDY(40-50%).
MAX TEMPERATURE.....56-66.
   24 HR TREND......4-7 DEGREES COOLER.
MIN HUMIDITY........10-20%.
   24 HR TREND......2-4% DRIER.
20-FOOT WINDS.......
   VALLEYS/LWR SLOPES...SOUTHWEST 8-13 MPH WITH GUSTS TO 25 MPH
                        INCREASING TO 22-32 MPH WITH GUSTS TO 60
                        MPH IN THE AFTERNOON.
   RIDGES/UPR SLOPES....SOUTHWEST 9-15 MPH WITH GUSTS TO 30 MPH
                        INCREASING TO 23-33 MPH WITH GUSTS TO 60
                        MPH IN THE AFTERNOON.
HAINES INDEX........3 VERY LOW.
LAL.................1.
CWR.................0 PERCENT.
10K FT FREE WINDS...SOUTHWEST 65-75 MPH.
MIXING HEIGHT.......BELOW 1000 FT AGL UNTIL 0700...THEN 8500-
9500
                    FT AGL.
TRANSPORT WINDS.....SOUTHWEST 15-20 MPH UNTIL 0900. AROUND 60
MPH
                    AFTER 1600.
SMOKE DISPERSAL.....POOR UNTIL 1000...THEN GOOD UNTIL
1100...THEN
                    EXCELLENT.
```

Forecast Issued on Monday, March 26, 2012 at 1542 MDT

The Fire Weather Planning Forecast (FWF) issued on Monday, March 26, 2012 at 1542 MDT continued a RED FLAG WARNING for STRONG WINDS and LOW RELATIVE HUMDITY UNTIL 7 PM.

.DISCUSSION...TONIGHT AND TUESDAY...THE STRONG SOUTHWEST WINDS WILL BEGIN TO DECREASE EARLY THIS EVENING AS WINDS SHIFT MORE WEST AND NORTHWEST. WINDS WILL FURTHER DECREASE LATER TONIGHT ALONG WITH SLOWLY IMPROVING HUMIDITIES. TUESDAY...WINDS WILL BE MUCH LIGHTER WITH COOLER TEMPERATURES. THE WINDS WILL REMAIN STRONG TONIGHT OVER THE MOUNTAINS AND NORTHERN FRONT RANGE FOOTHILLS WITH GUSTS UP TO 70 MPH.

The forecast for Monday Evening, March 26, 2012 (Lower North Fork Incident) was:

```
...RED FLAG WARNING IN EFFECT UNTIL 7 PM MDT THIS EVENING...

.TONIGHT...
SKY/WEATHER.........MOSTLY CLEAR.
MIN TEMPERATURE.....33-41.
   24 HR TREND......2-4 DEGREES COOLER.
MAX HUMIDITY........28-38%.
   24 HR TREND......35-50% DRIER.
20-FOOT WINDS.......
   VALLEYS/LWR SLOPES...WEST 24-36 MPH WITH GUSTS TO 60 MPH
                        DECREASING TO 12-18 MPH WITH GUSTS TO 50
                        MPH AFTER MIDNIGHT.
   RIDGES/UPR SLOPES....WEST 28-39 MPH DECREASING TO 15-25 MPH
                        AFTER MIDNIGHT. GUSTS UP TO 60 MPH.
HAINES INDEX........3 VERY LOW.
LAL.................1.
CWR.................0 PERCENT.
10K FT FREE WINDS...WEST 65-75 MPH.
MIXING HEIGHT.......6000-7000 FT AGL.
TRANSPORT WINDS.....WEST AROUND 55 MPH UNTIL 2400...THEN AROUND
40
                    MPH.
SMOKE DISPERSAL.....EXCELLENT UNTIL 2400...THEN VERY GOOD.
```

Forecast Issued on Monday, March 26, 2012 at 1751 MDT

The Fire Weather Planning Forecast (FWF) issued on Monday, March 26, 2012 at 1751 MDT to extend RED FLAG WARNING for STRONG WINDS and LOW RELATIVE HUMDITY UNTIL 9 PM.

```
...RED FLAG WARNING IN EFFECT FOR STRONG GUSTY WINDS...VERY LOW
```

```
HUMIDITIES...AND DRY FUELS UNTIL 9 PM MDT TONIGHT FOR THE FRONT
RANGE FOOTHILLS AND PLAINS OF NORTHEAST COLORADO...FIRE WEATHER
ZONES 215 AND 216...AND 238 THROUGH 251...

.DISCUSSION...TONIGHT AND TUESDAY...
RED FLAG CONDITIONS WILL LIKELY CONTINUE ANOTHER FEW HOURS WITH
STRONG LOW LEVEL PRESSURE GRADIENT AND SUBSIDENCE. IN
ADDITION...HUMIDITY RECOVER WILL BE SLOW DUE TO A VERY DRY
AIRMASS IN PLACE...SO HAVE EXTENDED THE RED FLAG WARNING TIL 9
PM. IT IS POSSIBLE WE'LL NEED TO EXTEND THE FOOTHILLS WARNING
EVEN FURTHER TONIGHT WITH GUSTY WINDS CONTINUING...BUT
HUMIDITIES DO GRADUALLY IMPROVE AND WINDS SHOULD BE MORE
CONFINED TO TYPICAL MOUNTAIN WAVE FAVORED AREAS.
```

The forecast for Monday Evening, March 26, 2012 (Lower North Fork Incident) was:

```
...RED FLAG WARNING IN EFFECT UNTIL 9 PM MDT THIS EVENING FOR
STRONG
GUSTY WINDS...VERY LOW HUMIDITIES...AND DRY FUELS...

.TONIGHT...
SKY/WEATHER.........MOSTLY CLEAR.
MIN TEMPERATURE.....33-41.
   24 HR TREND......2-4 DEGREES COOLER.
MAX HUMIDITY........26-36%.
   24 HR TREND......35-50% DRIER.
20-FOOT WINDS.......
   VALLEYS/LWR SLOPES...WEST 20-30 MPH WITH GUSTS TO 45 MPH...
    DECREASING TO 10 TO 20 MPH WITH GUSTS TO 30 MPH.
   RIDGES/UPR SLOPES....WEST 23-38 MPH WITH GUSTS TO 60 MPH.
HAINES INDEX........3 VERY LOW.
LAL.................1.
CWR.................0 PERCENT.
10K FT FREE WINDS...WEST 65-75 MPH.
MIXING HEIGHT.......6000-7000 FT AGL.
TRANSPORT WINDS.....WEST AROUND 55 MPH UNTIL 2400...THEN AROUND
40
                    MPH.
SMOKE DISPERSAL.....EXCELLENT UNTIL 2400...THEN VERY GOOD.
```

National Weather Service Boulder Fire Weather Watch and Red Flag Warnings:

A Fire Weather Watch was issued by the Boulder National Weather Service Office on Saturday, March 24, 2012 209 PM **for** Monday, March 26th, 2012 from 1200 (Noon) MDT to 1900 MDT,

highlighting increasing winds (Southwest 20 to 30 mph with gusts up to around 45 mph), and low humidity (6%), including fire weather zone 216 that encompasses Lower North Fork unit.

The **Fire Weather Watch** for Monday, March 26th was upgraded to a **Red Flag Warning** by the Boulder National Weather Service office on Sunday, March 25, 2012 at 1215 MDT, highlighting a west to southwest wind of 25 to 35 mph and gusts up to 65 mph, including fire weather zone 216 that encompasses Lower North Fork unit.

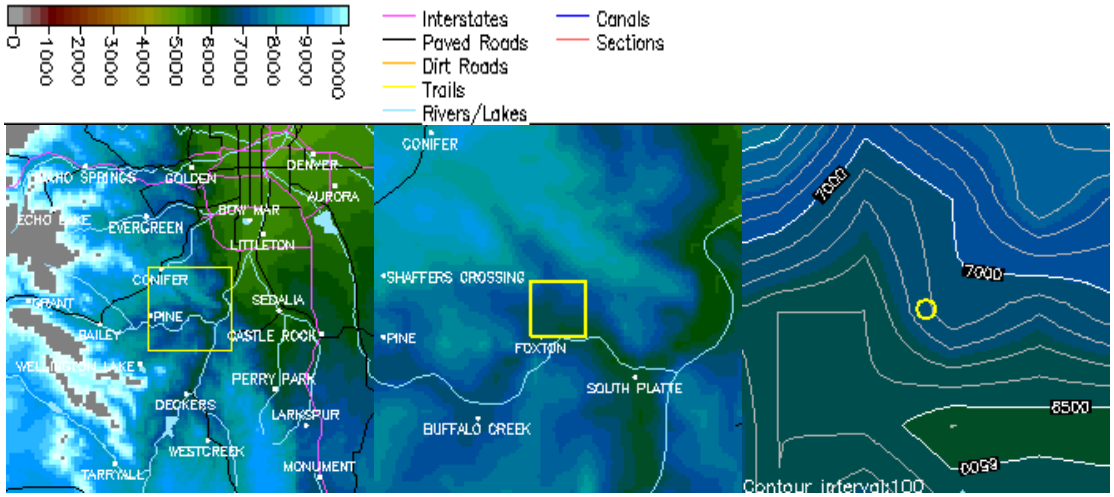
The **Red Flag Warning** was in effect for Monday, March 26, 2012 from 10 AM until 7 PM highlighting a west to southwest wind of 25 to 35 mph, gusts up to 60 mph and low humidity including fire weather zone 216 that encompasses Lower North Fork unit.

The **Red Flag Warning** was updated at 1736 MDT on Monday, March 26, 2012 and extended until 2100 MDT west wind of 20 to 30 mph, gusts up to 50 mph and low humidity including fire weather zone 216 that encompasses Lower North Fork unit.

National Weather Service Boulder Spot Forecasts:

A Spot (Site-Specific) Forecast was requested on Sunday, March 18, 2012 at 1530 MDT for blacklining operation on Monday.

Lower North Fork Rx (Proposed ignition time: 1000 MDT 3/19/12)
(Requested: 1415 MDT 3/18/12)
Forecast complete at 1530 MDT 3/18/12
Requested by: CSFS - GLDS



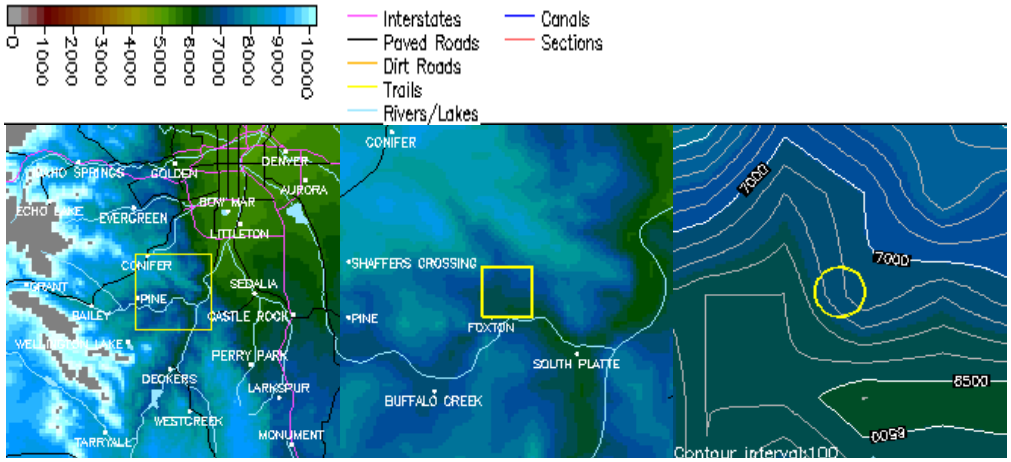
```
.DISCUSSION...THE STRONG UPPER LEVEL DISTURBANCE WILL BE OVER COLORADO
THROUGH MONDAY WITH A SLIGHT CHANCE OF RAIN AND SNOW SHOWERS. TEMPERATURES
WILL BE MUCH COOLER WITH SLIGHTLY HIGHER HUMIDITY LEVELS. THE SOUTWEST WINDS
TONIGHT WILL SHIFT TO THE NORTHWEST ON MONDAY AS THE DISTURBANCE SLOWLY MOVES
EAST.

.MONDAY...
SKY/WEATHER.........MOSTLY CLOUDY. SLIGHT CHANCE OF SNOW. SLIGHT
                     CHANCE OF RAIN AFTER 1200.
MAX TEMPERATURE.....45.
MIN HUMIDITY........16%.
20-FOOT WINDS.......NORTHWEST WINDS 6-12 MPH WITH GUSTS TO 20 MPH
                     UNTIL 1500...THEN NORTH 6-10 MPH.
TRANSPORT WINDS.....WEST 13-24 MPH UNTIL 1200...THEN 8-12 MPH.
MIXING HEIGHT.......5600-6600 FT AGL UNTIL 1000. 12800-13800 FT AGL
                     AFTER 1200.
SMOKE DISPERSAL.....VERY GOOD.
HAINES INDEX........2 VERY LOW.
```

A Spot (Site-Specific) Forecast for the Lower North Fork burn was requested on Wednesday, March 21, 2012 at 1417 MDT) and issued by the Boulder NWS at 0454 MDT on Thursday, March 22, 2012. Temperature, Relative Humidity and 20-ft winds were accurate and validated by on-site observations taken on the Lower North Fork Unit.

Lower North Fork Rx (Proposed ignition time: 1030 MDT 3/22/12) (Requested: 1417 MDT 3/21/12)

Forecast complete at 454 MDT 3/22/12

Requested by: CSFS - GLDS



.DISCUSSION...THERE WILL BE SOME HIGH LEVEL CLOUDS OVER THE AREA THROUGH AFTERNOON BUT IT WILL REMAIN DRY. WINDS SHOULD BE NORTHEAST IN THE 6-12 MPH RANGE WITH DISPERSAL BECOMING GOOD AFTER 1200.

ON FRIDAY IT WILL REMAIN DRY WITH SOUTHWEST WINDS IN THE MORNING BECOMING EAST IN THE AFTERNOON. DISPERSAL WILL BE POOR THROUGH THE DAY.

```
.TODAY...
SKY/WEATHER.........PARTLY CLOUDY.
MAX TEMPERATURE.....61.
MIN HUMIDITY........25%.
20-FOOT WINDS.......NORTHEAST WINDS 6-12 MPH.
TRANSPORT WINDS.....NORTH 12-20 MPH.
MIXING HEIGHT.......BELOW 1000 FT AGL UNTIL 0800. 5400-6400 FT AGL
                    AFTER 1200.
SMOKE DISPERSAL.....POOR UNTIL 1000...THEN FAIR UNTIL 1200...THEN
                    GOOD.
HAINES INDEX........3 VERY LOW.
```

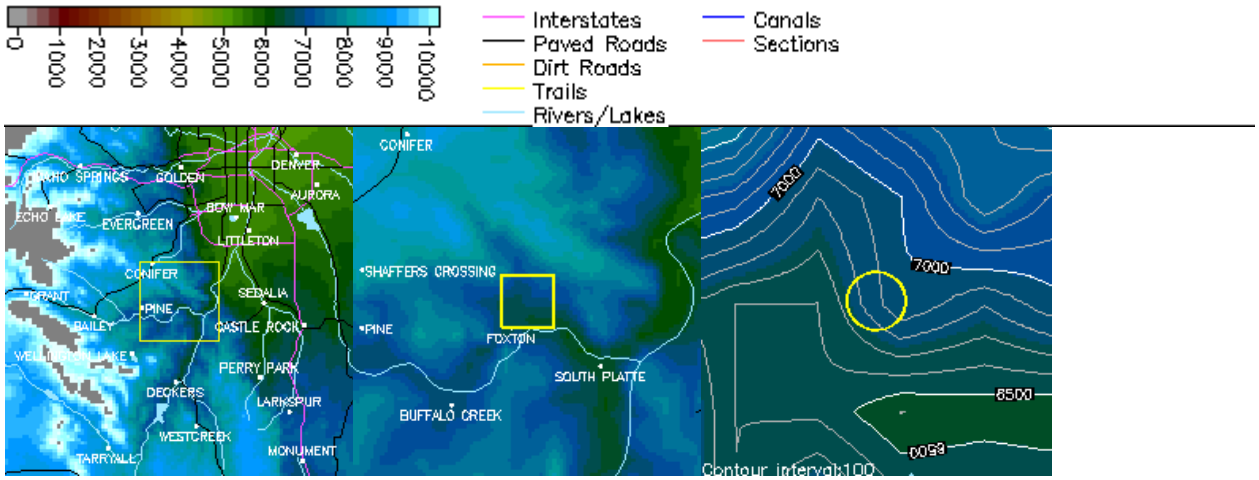
An additional Spot (Site-Specific) Forecast for the Lower North Fork burn was requested on Thursday, March 22, 2012 at 1935 MDT) for Friday, March 23, 2012.

Lower North Fork Unit 4 (Proposed ignition time: 900 MDT 3/23/12)

(Requested: 1935 MDT 3/22/12)

Forecast complete at 416 MDT 3/23/12

Requested by: CSFS - GLDS



DISCUSSION...IT WILL BE CLEAR THROUGH THE AFTERNOON WITH LIGHT WINDS AND POOR DISPERSAL MUCH OF THE DAY.

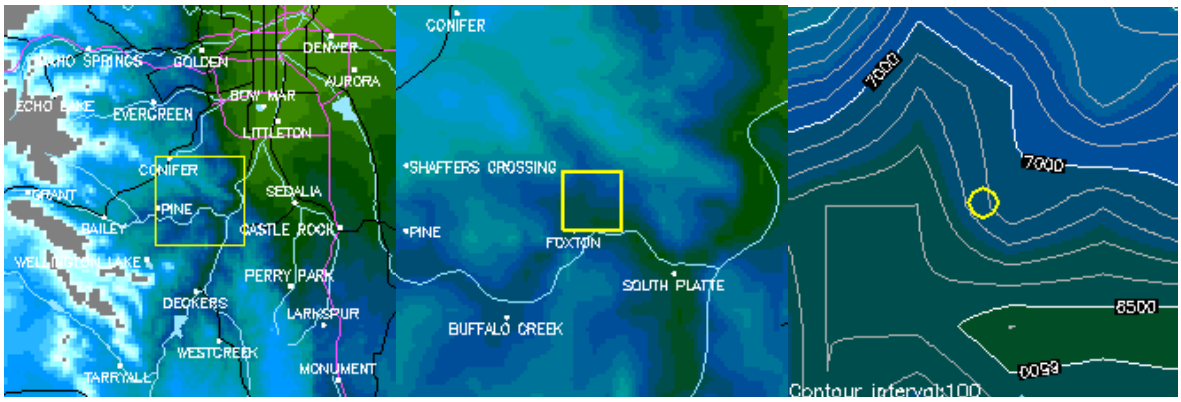
```
.TODAY...
SKY/WEATHER.........MOSTLY SUNNY.
MAX TEMPERATURE.....72.
MIN HUMIDITY........17%.
20-FOOT WINDS.......SOUTHWEST WINDS 6-7 MPH UNTIL 1200...THEN
                    SOUTHEAST.
TRANSPORT WINDS.....SOUTHWEST 4-8 MPH.
MIXING HEIGHT.......BELOW 1000 FT AGL UNTIL 1000. 5600-6600 FT AGL
                    AFTER 1200.
SMOKE DISPERSAL.....POOR UNTIL 1500....THEN FAIR.
HAINES INDEX........3 VERY LOW.
```

The next Spot (Site-Specific) Forecast for the Lower North Fork Unit was requested by fire officials on Monday, March 22, 2012 at 1501 MDT and issued by the Boulder NWS at 2102 MDT, Monday, March 26, 2012.

Lower North Fork (WILDFIRE) (Requested: 1501 MDT 3/26/12)

Forecast complete at 2102 MDT 3/26/12

Requested by: Jefferson County Fire Management




```
.DISCUSSION...WINDS WILL BE SOUTHWEST AT 10 TO 20 MPH WITH A FEW GUSTS TO 30
MPH OVER THE HIGHER RIDGES.  WINDS MAY SHIFT TO THE SOUTH BY 6 AM WITH SPEEDS
IN THE 6-12 MPH RANGE AND THEN BECOME SOUTHEAST BY NOON.  MAX HUMIDITY
RECOVERY OVERNIGHT WILL ONLY BE AROUND 35%.

.REST OF TONIGHT...
SKY/WEATHER.........MOSTLY CLEAR.
MIN TEMPERATURE.....36.
MAX HUMIDITY........35%.
20-FOOT WINDS.......SOUTHWEST WINDS 12-22 MPH WITH GUSTS TO 30 MPH.
TRANSPORT WINDS.....WEST 36-56 MPH UNTIL 2400...THEN 13-24 MPH.
MIXING HEIGHT.......3000-4000 FT AGL UNTIL 2300...THEN 2000-2400 FT
                    AGL.
SMOKE DISPERSAL.....EXCELLENT UNTIL 2100. POOR AFTER 0500.
HAINES INDEX........4 LOW.
```

Haines Forecasts and Manual Calculations:

Haines forecast of 3-very low was forecast on March 25th and 26th. Manual calculations using observed data for the Denver (DNR) upper air sounding produced a Haines of 6-High for the afternoon of the 25th, and morning and afternoon of the 26th .

Rocky Mountain Area Predictive Services Outlooks:

7-Day Significant Fire Potential Outlook-

This outlook combine's forecast fuel dryness with significant weather triggers to identify high risk areas for new large fires or large fire growth on existing fires for the purpose of *national* resource movement and allocation. Rocky Mountain Area Predictive Services 7-Day Fire Potential Outlook issued on Wednesday March 21, 2012 (Figure 26) included a "High Risk" for strong wind (among other factors) along the Colorado Front Range and eastern Plains for Day 6, Monday, March 26th, 2012.

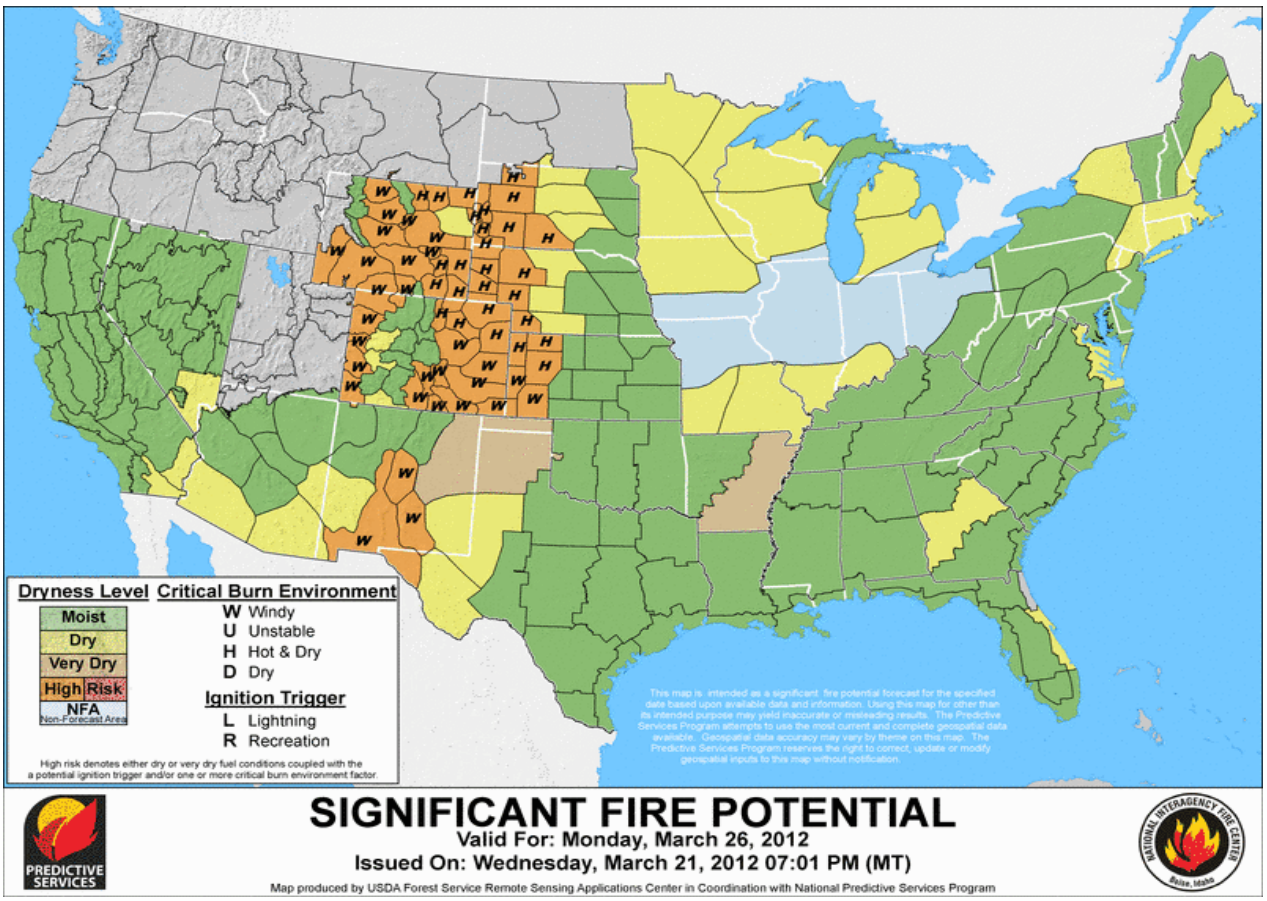


Figure 26. *Predictive Services 7-Day Significant Fire Potential issued Wednesday, March 21, 2012 and valid for Monday, March 26, 2012. Orange colors indicate "High Risk" for Critical Burn Environment.*

Locally (Rocky Mountain Area) Derived Fire Potential Outlooks-

In addition to providing data to the national fire potential outlook (Figure 26), Rocky Mountain Area Predictive Service produces weather and fuel dryness outlooks and corresponding large fire risk for the Rocky Mountain Area (Wyoming, Colorado, South Dakota, Kanas and Nebraska) for days 1 through 7. Different descriptors are used to convey large fire risk, but are utilized for the same purpose as national level (Determine long-range regional resource demand and allocation). Figure 27 and 28 are daily fire potential outlooks issued by Rocky Mountain Area Predictive Services on Wednesday, March 21, 2012 and Friday, March 22, 2012, respectively. The outlooks shown were valid for Monday, March 26, 2012.

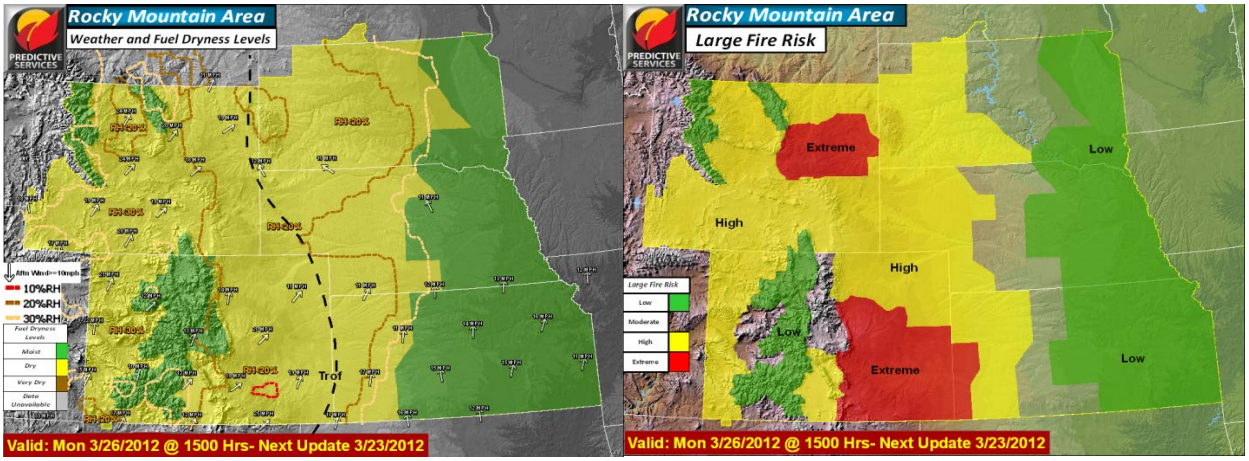


Figure 27. *Rocky Mountain Area Daily Fire Potential Maps issued Wednesday, March 21, 2012 and was valid for Monday, March 26, 2012. Weather and fuel dryness forecast (left) indicated widespread increasing winds and low humidity. The corresponding large fire risk (right) outlook showed "high" to "extreme"*

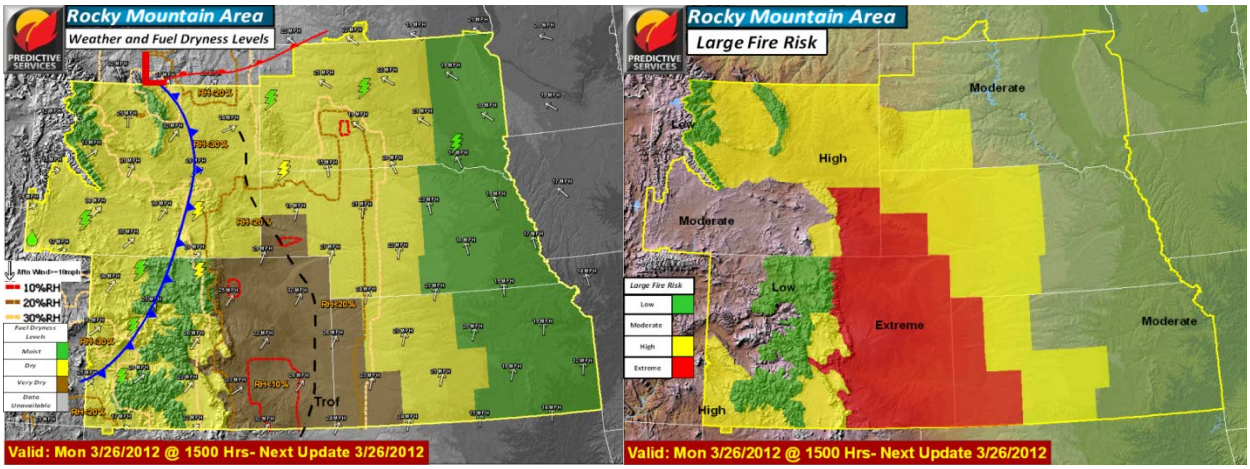


Figure 28. *Rocky Mountain Area Daily Fire Potential Maps issued Friday, March 23, 2012 and was valid for Monday, March 26, 2012. Weather and fuel dryness forecast (left) indicated widespread increasing winds and low humidity. The corresponding large fire risk (right) outlook showed "high" to "extreme" indices.*

The overall climatological and meteorological factors that contributed to rapid fire growth of Lower North Fork include:

1. Record warmth and dryness during the month of March (short-term drought conditions)
2. Rapid depletion of snowpack gained in February, exposing fuels to prolonged warm temperatures, low humidity and wind.
3. Air mass change (warm, dry, and unstable) beginning March 23rd
4. Rapidly changing weather conditions (temperatures, relative humidity, wind, and instability) following decrease in cloud cover and dry air push from the west.
5. A decrease in cloud cover resulted in increased vertical mixing between the air mass at the surface and aloft, allowing stronger winds to surface.
6. Pre-Frontal conditions (Above Average Temperature, Low Humidity, Strong and Gusty Winds, Unstable Atmospheric Conditions, Haines Index of 6, Poor Overnight Relative Humidity Recovery)

Data Collection and Considerations

Data collection and considered for this analysis includes:

- NOAA- National Weather Service Boulder Fire Weather Planning Forecast (FWF)
- NOAA- National Weather Service Boulder Spot Forecasts (Site Specific Forecasts)
- NOAA- National Weather Service Radiosonde Data for DNR (Denver)
- NOAA- National Weather Service Cooperative Observer Data
- NOAA- National Climate Data Center Archived Upper Charts
- NOAA- Hydrologic Prediction Center (HPC) Data
- Rocky Mountain Area Predictive Service 7-Day Outlook
- Rocky Mountain Area Predictive Service Daily Fire Potential Outlooks
- Department of Agriculture Natural Resource Conservation Service (NRCS)
- Archived U.S. Forest Service Remote Automated Weather Station (RAWS) Data
- USDA-United States Drought Monitor
- Colorado State University Cooperative Institute for Research in the Atmosphere
- University of Wyoming- Archived Upper Air Data

Fire Behavior

Wildland fire behavior is determined by the interaction of the primary components of the fire environment – fuels, weather, and topography. Topography is variable over space, and fuels and weather vary with both space and time. This variation is both short-term (within a day or between several days) and long-term (seasonality).

Topography

Topography includes any topographic feature or characteristic that influences fire behavior. Three major components of topography – elevation, slope, and aspect – have direct influences on fire behavior. Further, Terrain features, such as ridges, valleys, and saddles, influence fire behavior by channeling winds, often with an accompanied changes in speed and direction at the surface, and localized eddying effects.

Elevation

Elevation can influence fire behavior due to variation of temperature and relative humidity at different elevations. Lower elevations are generally warmer and drier than higher elevations, all things being equal. The area in the vicinity of Unit 4a ranges in elevation from 6,365 feet near the river to feet 7,060 at DP4 (Figure 29).

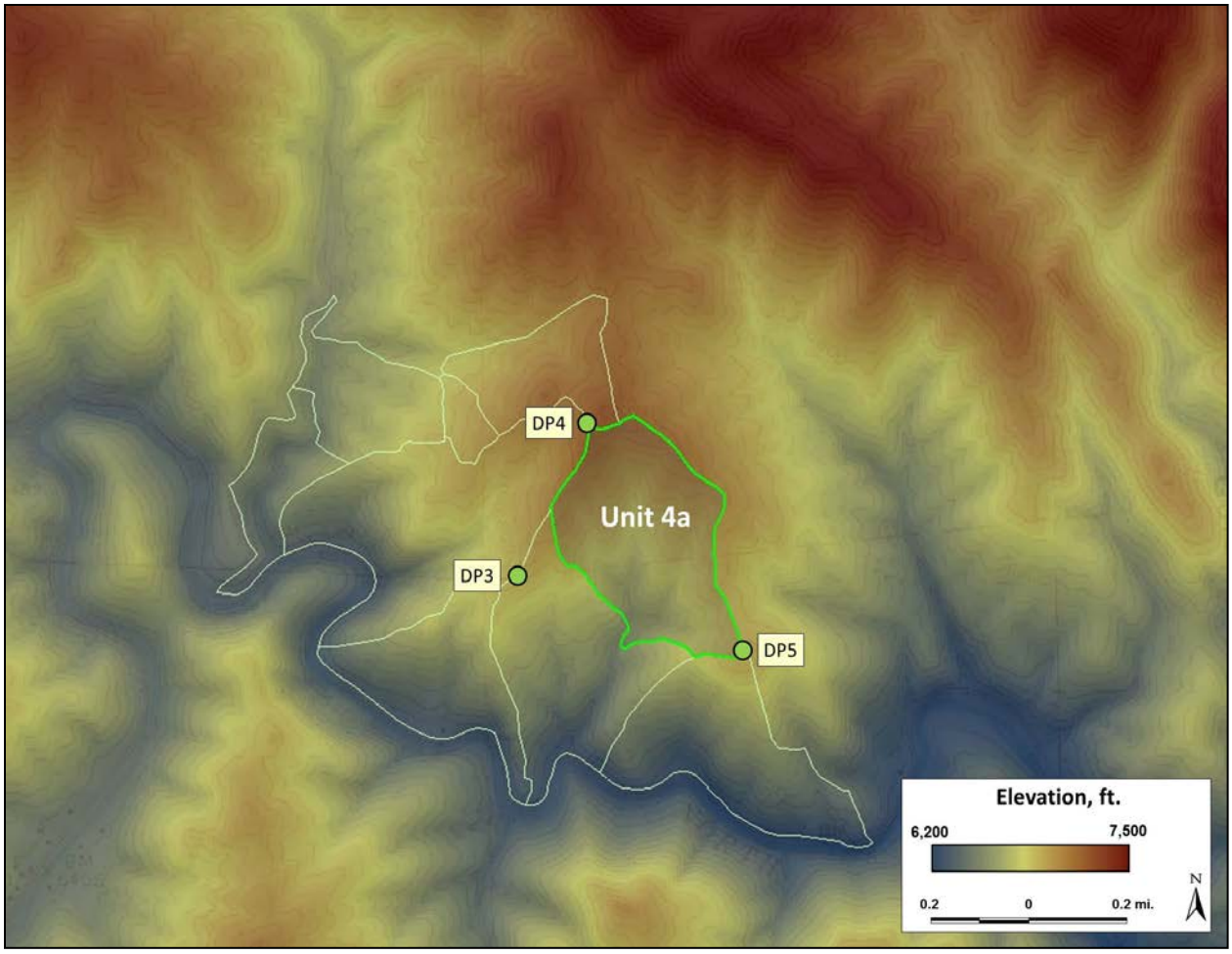


Figure 29. *Elevation in proximity to Unit 4a. Key reference locations are noted.*

Slope

Slope steepness influences fire behavior by generally accelerating (upslope) or slowing (downslope) fire spread. Slope and wind frequently interact to influence fire behavior. Wind aligned with slope (upslope winds) results in an acceleration of fire spread beyond wind or slope alone. Wind blowing downhill can reduce the uphill spread rate of fire, and with sufficient wind speeds, can overpower the impact of slope and drive fire spread downhill. From descriptions by personnel on Unit 4a on March 26, 2012, and examination of post-fire burn pattern indicators, this appears to have happened during the initial spread of the third spot fire near DP5.

Slope steepness on Unit 4a ranges from nearly flat (1.8%) to 85%. The average slope of Unit 4a is 36%. Over a broader area, slope also varies greatly. A map of the slope in the vicinity of Unit 4a is shown in Figure 30.

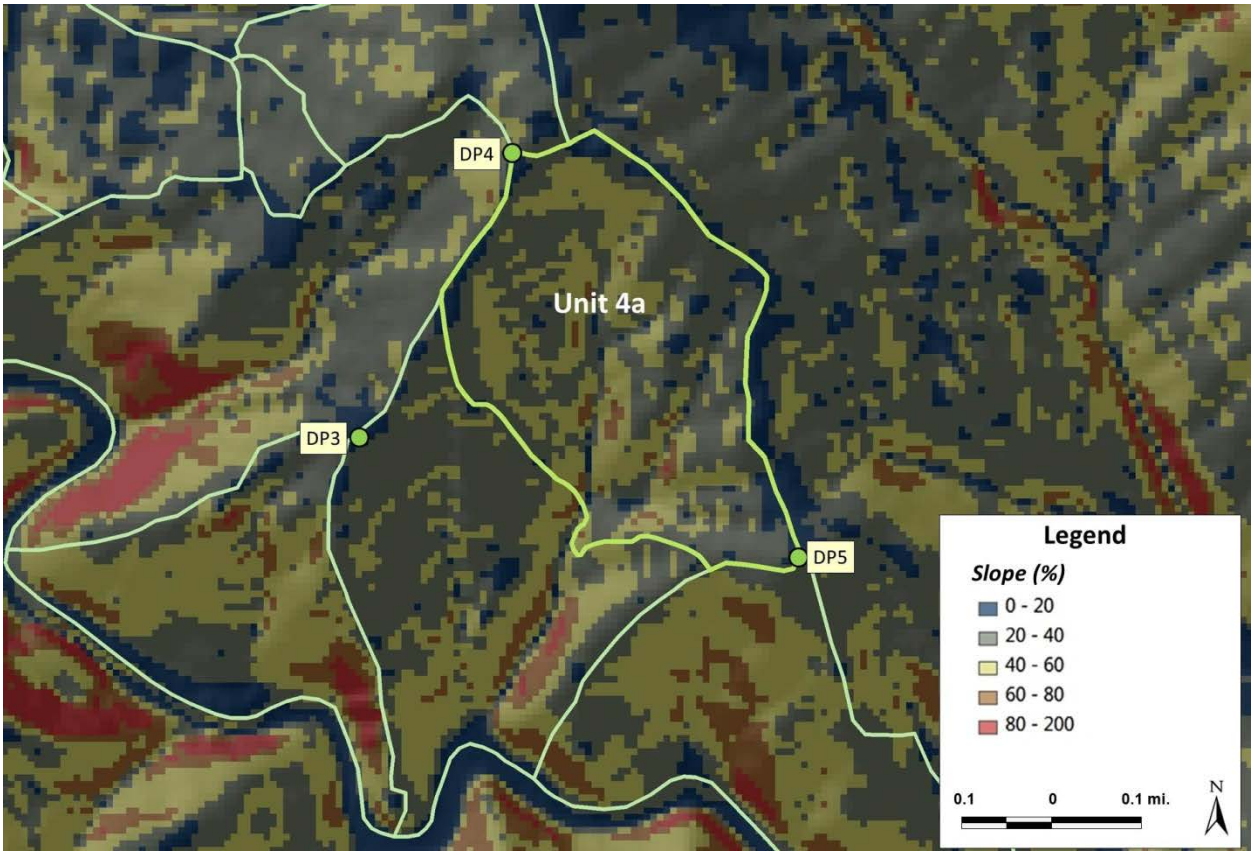


Figure 30. *Slope in the vicinity of Unit 4a, in percent.*

Aspect

Aspect is the direction a slope faces and is expressed as compass direction (degrees). Aspect influences fire behavior in the short-term by differential heating during the day, and in the longer term by affecting the fuel type and loading.

South- and southwestern aspects are typically warmer and drier and tend to have lighter fuel loadings. Conversely, more northerly aspects tend to be cooler and moister and have heavier fuel loadings. This was evident in Unit 4a, where drier aspects had open ponderosa pine stands with a light grass understory and cooler aspects had denser mixed conifer stands (ponderosa pine and Douglas-fir) with significant understory fuels (Figure 31).

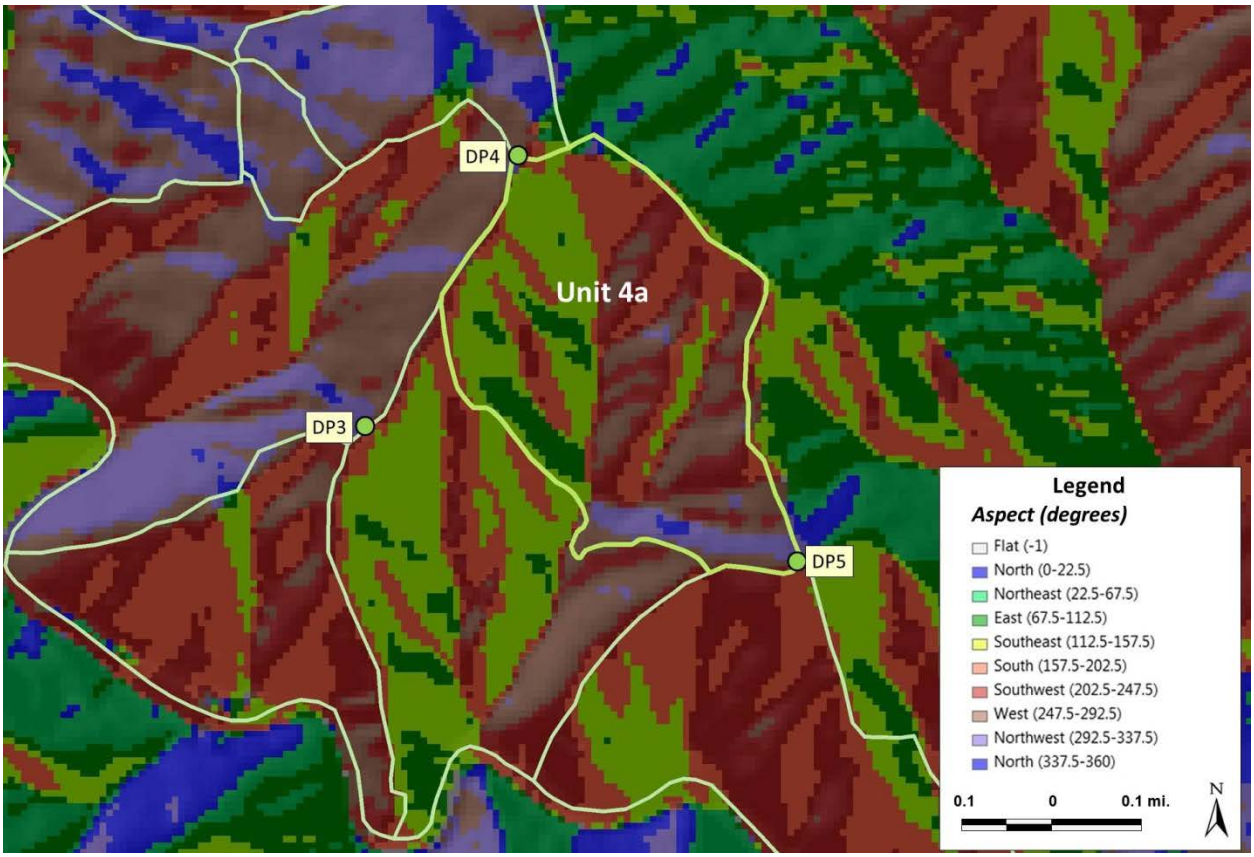


Figure 31. *Aspect in the vicinity of Unit 4a, in degrees.*

Fuels

Fuels within Unit 4a, include open ponderosa pine with light grass understory and denser mixed ponderosa pine/Douglas-fir stands with timber litter understory. Significant portions of the unit were masticated fuels resulting from mechanical treatment of woody fuels. In the two draws in the southern portion of the unit, fuels had not been mechanically treated due to access limitations by mechanical equipment.

Outside of Unit 4a, fuels varied. In Unit 1 and the upper portion of Unit 3, surface fuels were largely absent due to prescribed burning the previous year. To the north and northeast of Unit 4a, fuels were similar to those on the northern portion of Unit 4a – mechanically treated fuels with interspersed grass under open ponderosa pine. South of Unit 4a, fuels were similar to the lower portion of 4a – dense ponderosa pine/Douglas-fir stands on more northerly aspects, with open ponderosa pine and light grass on more southerly aspects. Surface fuels had been mechanically treated in a significant portion of the area north, east, and south of Unit 4a. This mechanical treatment altered surface fuels, breaking up larger pieces of woody debris and reducing the fuel bed depth. Figure 32 shows the extent of the areas that had been mechanically treated prior to March 22, 2012

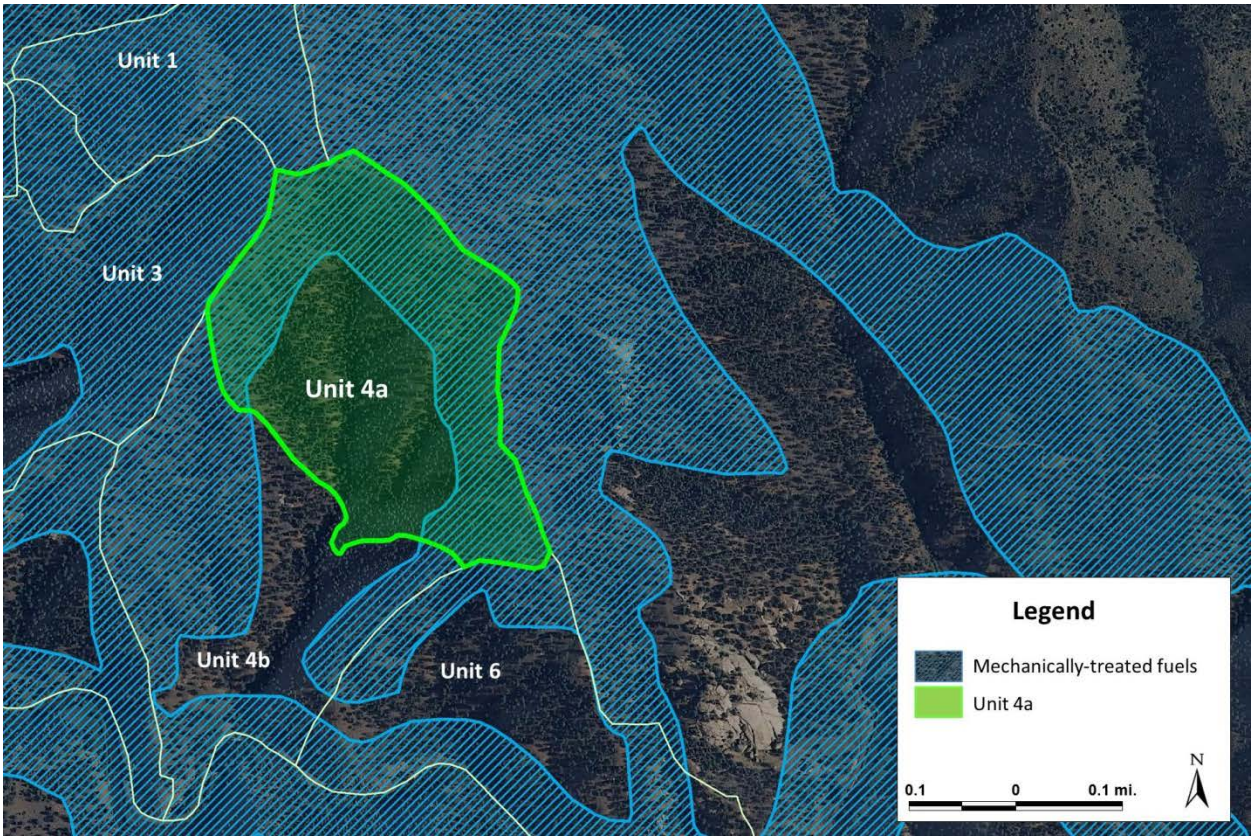


Figure 32. *Extent of mechanically-treated (masticated) fuels in the vicinity of Unit 4a. The interior of Unit 4a had not been treated due to equipment accessibility limitations.*

Weather

Weather Station Data

Three weather stations were used for information and analysis in this report: Bailey RAWS (BAWC2), Polhemus RAWS (POLC2), and the HOBO portable weather station located on-site on Unit 4a, about 800 feet up the ridge from DP3. RAWS stations record wind speed and direction at a standard height of 20 feet above the ground. The HOBO portable weather station had wind sensors at a height of about 6 feet.

Detailed information about these RAWS, and the data from these RAWS, is discussed in the Fire Weather section of this document. The locations of individual weather stations discussed in this document are shown in Figure 33.

Figure 33. *Weather stations (RAWS and the HOBO station) at sites representative of weather on Unit 4a. Respective distances of RAWS from Unit 4a are 7.25 mi. (Bailey) and 13.25 mi. (Polhemus).*

For assessment of on-site weather conditions on Unit 4a, weather observations taken by personnel on site were compared to hourly weather data logged at the Bailey and Polhemus RAWS from March 22-26, 2012. These are the two RAWS stations in closest proximity to Unit 4a, and provided the best representation of on-site conditions.

The HOBO portable weather station was not functioning properly during this time period so was not relied on for on-site weather. There were four sensors on the HOBO station – temperature, relative humidity, wind speed (anemometer), and wind direction (wind vane). From examination of the data from the HOBO station, it appeared the anemometer was the only sensor working properly during this time period. Comparison of wind speed data from the HOBO station to the Bailey and Polhemus RAWS data indicated the anemometer was working properly and providing a reasonable assessment of on-site winds. Therefore, the HOBO portable station, in conjunction with on-site weather observations (see Figures 7, 8, and 11), and data from the Bailey and Polhemus RAWS, was used solely for assessment of on-site wind speeds.

Weather Station Site Characteristics

The elevation and general site characteristics of each RAWS, and the HOBO portable station, are summarized in the table below. The location and site characteristics of each station are summarized in Figures 34-36.

Station	Elev. (ft.)	Distance to Unit 4a (mi.)	Site Characteristics	Use in this Report and Appendix
Bailey RAWS	7,982	7.25	Broad, open site; mid-elevation	Approximation of on-site temperature and RH at Unit 4a
Polhemus RAWS	8,683	13.25	Ridge top	Ridge top winds in the area
HOBO Portable	7,000	On-site	Mid-slope ridgetop on west perimeter of Unit 4a	Assessment of on-site winds

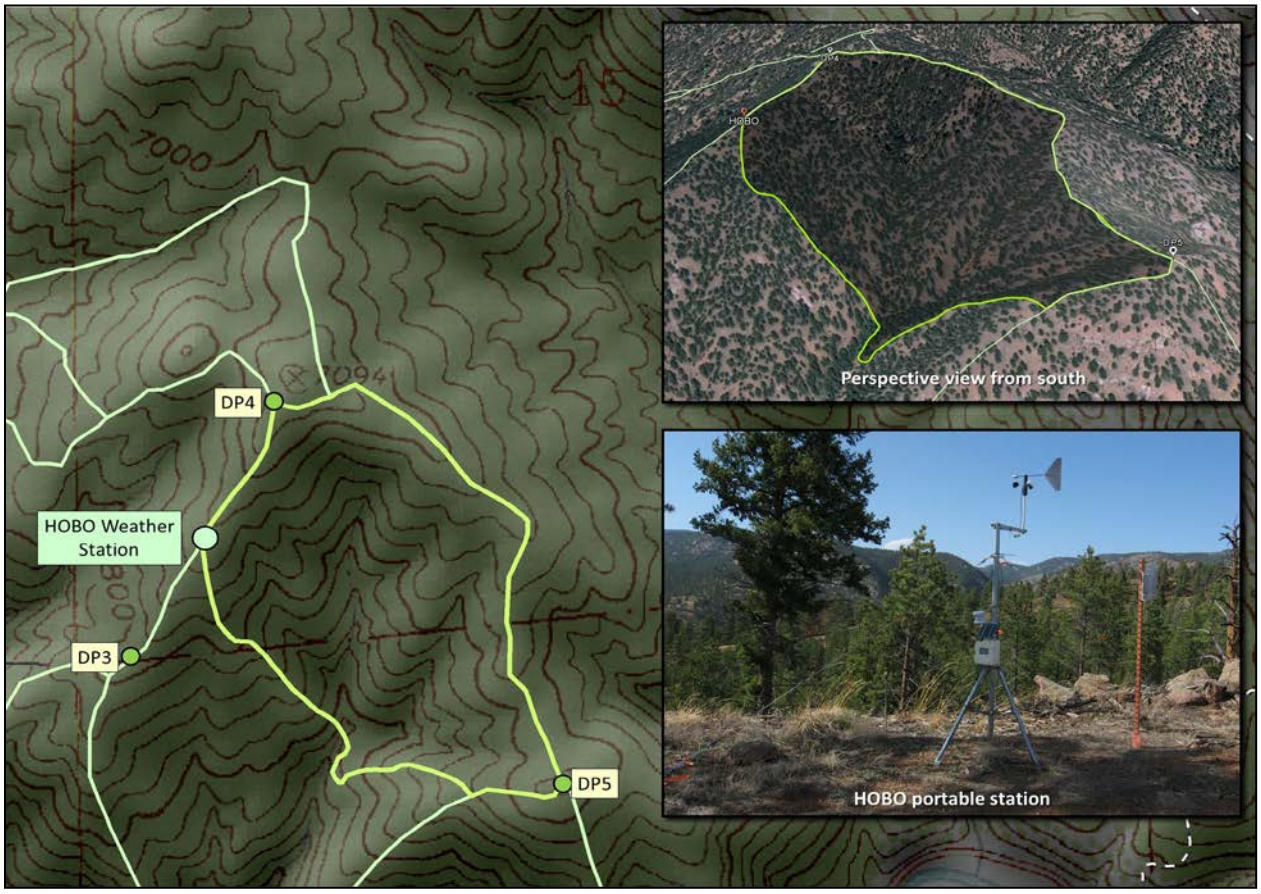


Figure 34. *Location and local site characteristics of the HOBO portable weather station between DP3 and DP4 on Unit 4a.*

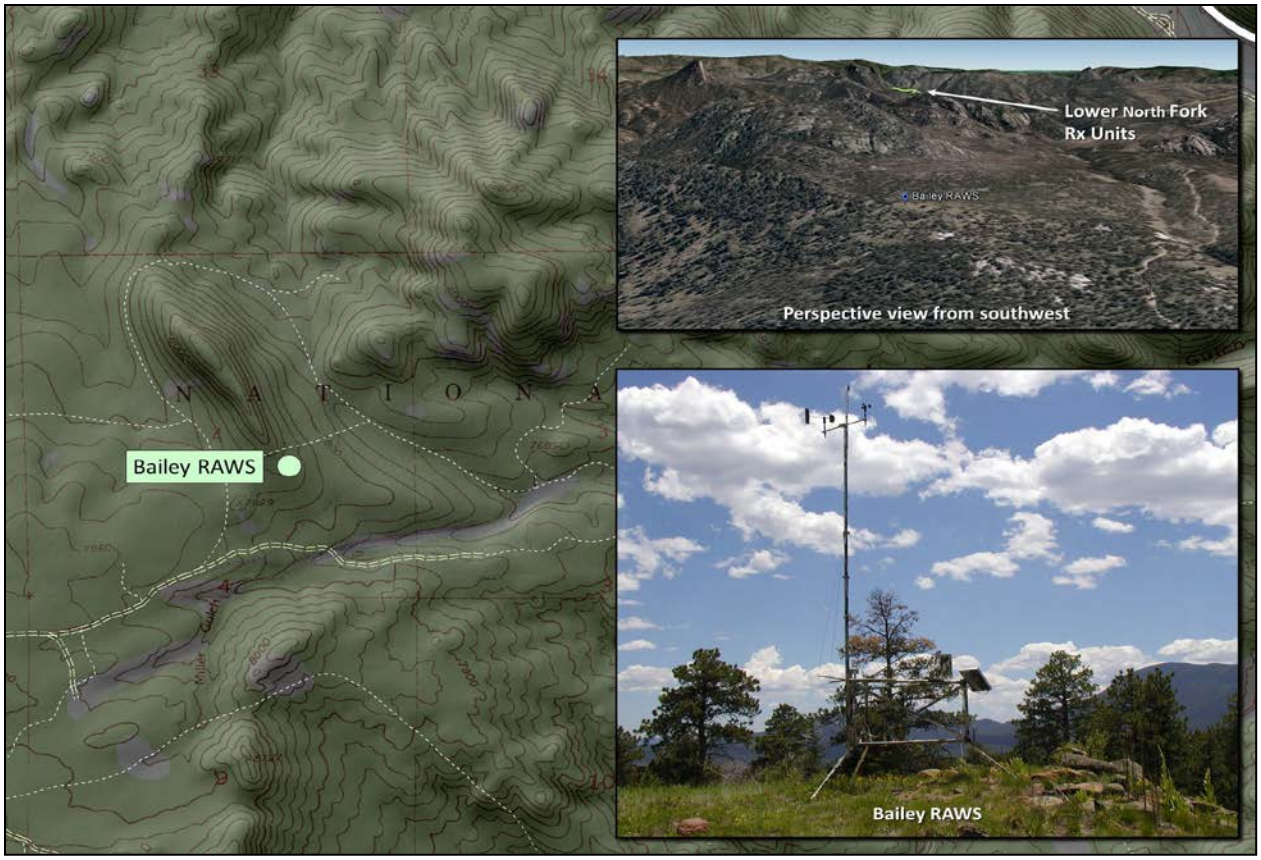


Figure 35. *Location and local terrain/site characteristics of the Bailey RAWS.*

Figure 36. *Location and local terrain characteristics of the Polheums RAWS.*

Seasonal Severity

Assessment of Seasonal Severity on the Colorado Front Range

Two NFDRS (National Fire Danger Rating System) indices are typically used for assessing seasonal conditions in the Front Range of Colorado: ERC (Energy Release Component) and 1000-hour fuel moisture. These two indices provide useful information about seasonal severity and long term drying trends, are a source of information used for pre-suppression and operational planning.

ERC and 1000-hour Timelag Fuel Moisture: Definitions

The National Wildfire Coordinating Group (NWCG) describes ERC and 1000-hour fuel moisture as follows:

"The Energy Release Component is a number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. Daily variations in ERC are due to changes in moisture content of the various fuels present, both live and dead. Since this number represents the potential "heat release" per unit area in the flaming zone, it can provide guidance to several important fire activities. It may also be considered a composite fuel moisture value as it reflects the contribution that all live and dead fuels have to potential fire intensity. The ERC is a cumulative or "build-up" type of index. As live fuels cure and dead fuels dry, the ERC values get higher thus providing a good reflection of drought conditions. The scale is open-ended or unlimited and, as with other NFDRS components, is relative. Conditions producing an ERC value of 24 represent a potential heat release twice that of conditions resulting in an ERC value of 12.

"As a reflection of its composite fuel moisture nature, the ERC becomes a relatively stable evaluation tool for planning decisions that might need to be made 24 to 72 hours ahead of an expected fire decision or action. Since wind and slope do not enter into the ERC calculation, the daily variation will be relatively small. The 1000-hr timelag fuel moisture (TLFM) is a primary entry into the ERC calculation through its effect on both living and dead fuel moisture inputs. There may be a tendency to use the 1000-hr TLFM as a separate "index" for drought considerations. A word of caution - any use of the 1000-hr TLFM as a separate "index" must be preceded by an analysis of historical fire weather data to identify critical levels of 1000-hr TLFM. A better tool for measurement of drought conditions is the ERC since it considers both dead and live fuel moistures." Source: http://fam.nwcg.gov/fam-web/pocketcards/erc.htm

Seasonal Adjustments for RAWS

Calculation of ongoing NFDRS indices throughout the year involves setting a "Greenup" and "Freeze" date of year, as well as setting a "Wet Flag" in daily observations, for each RAWS. The

Greenup and Freeze dates denote the availability of live fuels to burn as influenced by seasonal changes. The Wet Flag setting denotes that dead fuels are wet and less available to burn, and is typically set when there is snow cover and/or a long-duration precipitation event. Both these settings impart the influence of changing seasonal differences in fuel conditions into the NFDRS calculations, and impact the ERC and 1000-hour fuel moisture index trends.

Impacts of setting the Wet Flag in Shoulder Seasons

Optimum prescribed burning conditions often occur during the "shoulder seasons" of the year – spring and fall. Depending on the seasonal trends, the typical summer fire season can also extend early or late in the year. However, the Wet Flag is often set for many RAWS during the spring in anticipation of the upcoming summer season. This has the effect of re-setting the NFDRS indices as if they were wet and starting a new drying cycle. If the dead fuels were already dry, setting the Wet Flag during this time can lead to unreliable assessments of the actual seasonal severity.

This was the case for a number of RAWS in the Front Range of Colorado in March, 2012. See Figure 37 for illustration. On March 12, the Wet Flag was set for a number of RAWS in the Front Range, including Bailey and Cheesman, and was kept in place through March 24. This led to inaccurate NFDRS indices, and unrealistic wetting trends, being reported for these stations for this time period.

This Wet Flag setting has been a wide-spread issue with RAWS inputs to NFDRS for a number of years. In fact, a "SAFENET" – report of unsafe situation in wildland fire operations – was submitted on March 30, 2012 for just this issue (Figure 38). The 1000-hour fuel moisture and ERC trends for a number of weeks had been indicative of a steady drying trend.

This problem was subsequently corrected in early April, but had caused erroneous NFDRS indices to be reported for the latter half of March (Figures 39 and 40). During the course of this Review, fire personnel from federal, state, and local agencies expressed similar ongoing concerns about inaccuracies in local NFDRS indices.

	StationID	ObsDate	Type	SOW	Temp(F)	RH	24hr Precip	Duration	Wind Speed	Direction	Azimuth	Max Temp	Min Temp	Max RH	Min RH	WetFlag
16,595	052001	03/01/12 13:00	0	3	26	70	0.00	0	3	2	101	45	26	76	17	0
16,596	052001	03/02/12 13:00	0	3	20	65	0.00	0	3	2	70	26	9	98	43	0
16,597	052001	03/03/12 13:00	0	0	36	23	0.00	0	5	6	277	36	13	65	22	0
16,598	052001	03/04/12 13:00	0	0	54	13	0.00	0	3	6	255	54	31	40	13	0
16,599	052001	03/05/12 13:00	0	0	58	9	0.00	0	4	6	288	58	31	35	8	0
16,600	052001	03/06/12 13:00	0	0	59	7	0.00	0	8	6	255	59	39	19	5	0
16,601	052001	03/07/12 13:00	0	4	23	99	0.00	0	2	2	74	59	23	100	6	0
16,602	052001	03/08/12 13:00	0	0	40	29	0.00	0	3	2	101	40	17	100	27	0
16,603	052001	03/09/12 13:00	0	0	53	10	0.00	0	3	2	87	53	21	39	10	0
16,604	052001	03/10/12 13:00	0	2	54	19	0.00	0	4	4	161	57	27	29	9	0
16,605	052001	03/11/12 13:00	0	2	55	14	0.00	0	2	7	295	58	29	89	12	0
16,606	052001	03/12/12 13:00	0	1	56	11	0.00	0	2	8	341	58	36	30	10	1
16,607	052001	03/13/12 13:00	0	1	62	7	0.00	0	5	5	244	62	34	31	7	1
16,608	052001	03/14/12 13:00	0	0	62	5	0.00	0	5	6	249	62	36	22	5	1
16,609	052001	03/15/12 13:00	0	1	61	14	0.00	0	3	5	218	62	39	21	4	1
16,610	052001	03/16/12 13:00	0	0	65	9	0.00	0	4	5	242	65	35	47	9	1
16,611	052001	03/17/12 13:00	0	1	62	6	0.00	0	5	6	249	67	40	25	6	1
16,612	052001	03/18/12 13:00	0	3	54	17	0.00	0	6	4	178	64	42	26	5	1
16,613	052001	03/19/12 13:00	0	1	39	11	0.00	0	2	8	359	55	22	67	10	1
16,614	052001	03/20/12 13:00	0	0	40	25	0.00	0	4	2	81	41	18	78	11	1
16,615	052001	03/21/12 13:00	0	0	51	22	0.00	0	4	1	44	52	20	44	20	1
16,616	052001	03/23/12 13:00	0	0	70	9	0.00	0	4	2	110	70	30	47	9	1
16,617	052001	03/24/12 13:00	0	1	63	13	0.00	0	5	1	65	73	39	33	7	1
16,618	052001	03/25/12 13:00	0	1	69	7	0.00	0	5	6	276	71	36	65	7	0
16,619	052001	03/26/12 13:00	0	0	65	5	0.00	0	8	5	238	71	44	40	5	0
16,620	052001	03/27/12 13:00	0	1	64	6	0.00	0	5	5	230	66	39	25	5	0
16,621	052001	03/28/12 13:00	0	1	66	9	0.00	0	4	5	232	66	34	39	6	1
16,622	052001	03/29/12 13:00	0	0	63	7	0.00	0	4	7	297	66	40	24	7	0

Figure 37. *Data from the Bailey RAWS (Station ID 52001) from March 01 through March 30 showing the Wet Flag enabled (value set to "1") for March 12-24. Once the Wet Flag was removed (value set to "0"), the ERC and 1000-hour fuel moisture once again began to show a drying trend in the graphs*

SAFENET

Wildland Fire Safety & Health Reporting Network

Report unsafe situations in all wildland fire operations.

ID # 8SXM6ASAFE

REPORTED BY

Name : *(Optional)*
Phone : *(Optional)*
EMail : *(Optional)*
Date Reported : 04/01/2012
Agency/Organization : Other
State Agency :
Other Agency : RMA Interagency Fire

EVENT

Event Date : 03/30/2012
Local Time : 3:00 PM
Incident Name : N/A
Incident Number : N/A
State : CO
Jurisdiction : USFS
Local Unit : Pike National Forest

Incident Type : Wildland; Prescribed; Fuel Treatment
Incident Activity : Readiness/Preparedness
Stage of Incident : Other

Position Title : Predictive Services
Task :
Management Level : 1
Resources Involved : Fire Personnel

CONTRIBUTING FACTORS

Contributing Factors : Human Factors
Human Factors : Decision Making; Leadership; Performance; Risk Assessment; Situational Awareness
Other Factors : N/A

NARRATIVE

Describe in detail what happened including the concern or potential issue, the environment (weather, terrain, fire behavior, etc), and the resulting safety/health issue.

Inaccurate NFDRS indices from unit RAWS (i.e. Bailey and Cheeseman)

Systemic and chronic problems continue with the Rocky Mountain Area WIMS-RAWS-NFDRS program. Poor quality control and incorrect 1300 "O" type observation input has resulted in inaccurate NFDRS indices output (i.e. ERC, 1000-hr fuel moisture, fire danger, etc.) across portions of the Central/Southern Front Range of Colorado, an area that has experienced large fire activity this Spring.

Current NFDRS indices at the Bailey and Cheeseman RAWS are reporting 1000-hr fuel moistures greater than 25% and below average ERC's (near 10). This area has experienced record heat, low humidity, loss of snow cover, and has received little if any moisture during the last 30 days. Data quality problems could be a result of inconsistent and/or invalid usage of the "Wet Flag" parameter for much of March 2012.

These indices are typically utilized for planning and decisions related to prescribed burns, wildland fire preparedness and wildland fire suppression efforts by multi-jurisdiction (local, state, federal)fire managers. Erroneously moist NFDRS fuel indices WILL: 1. Create a false sense of security; 2. Provide an inaccurate portrayal of the current fire risk or situation; 3. Provide an inaccurate portrayal of anticipated fire behavior; 4. Impact planning and decisions related to firefighter operations; and 5. Negatively impact both firefighter and public safety.

IMMEDIATE ACTION TAKEN

Reporting Individual : please describe actions you took to correct or mitigate the unsafe/unheathful event.
Photos, particularly for equipment related issues, may be attached. Please do not exceed 5 pictures and compress photos for the smallest file size that illustrates the particular concern. Photos are subject to the same sanitization criteria as SAFENETS.

ATTACHMENTS:
#1
#2
#3
#4
#5

Figure 38. *SafeNet filed March 30, 2012 regarding NFDRS indices from local RAWS units, including Bailey.*

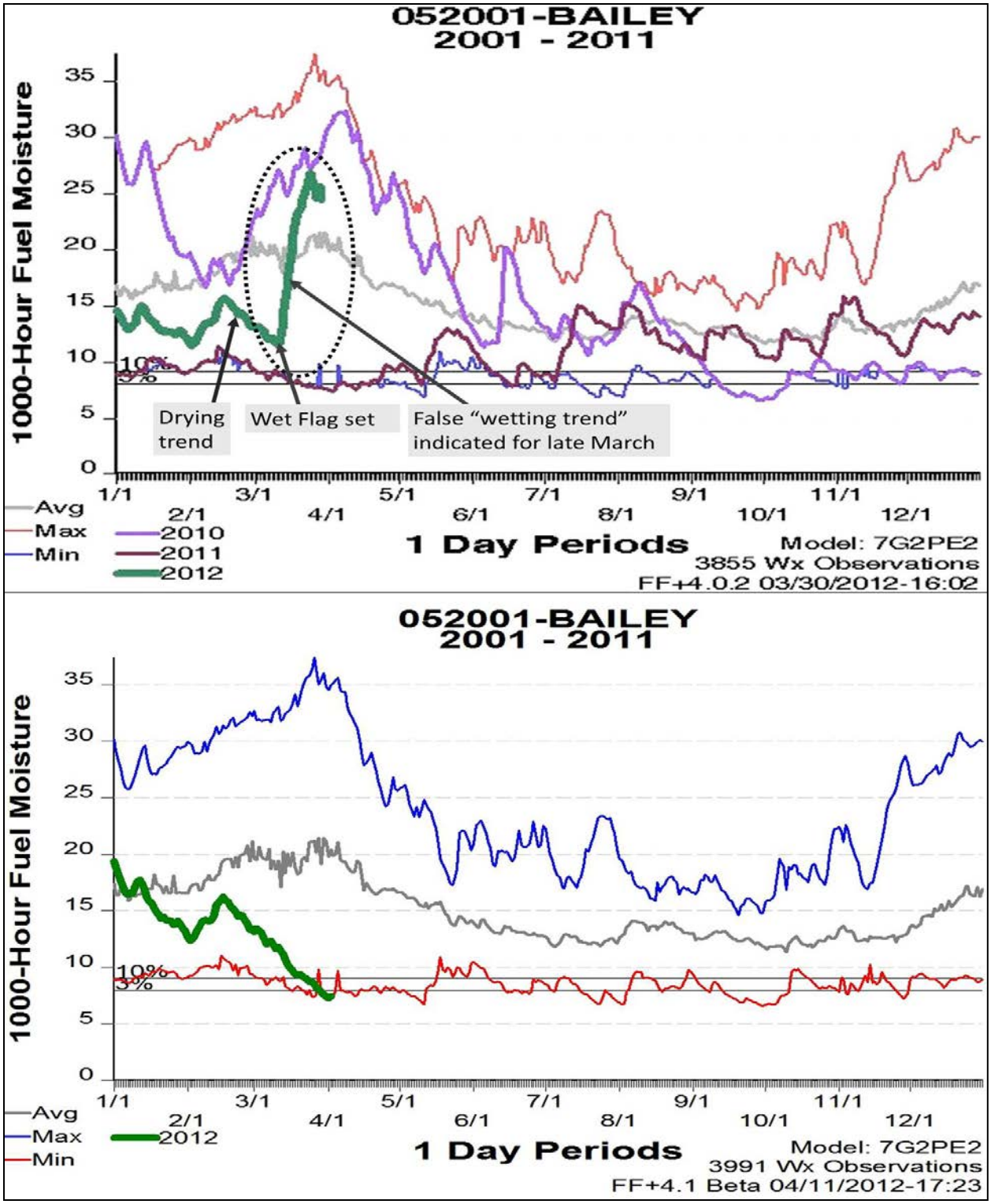


Figure 39. *NFDRS graph of 1000-hour fuel moisture trends for the Bailey RAWS using data generated with the wet flag set mid-March (top) and the same data with the wet flag removed (lower). The impact of setting the Wet Flag is evident by the sudden and dramatic drop in the reported 1000-hour fuel moisture (top, circle). Note that only the upper graph was available prior to March 30, 2012.*

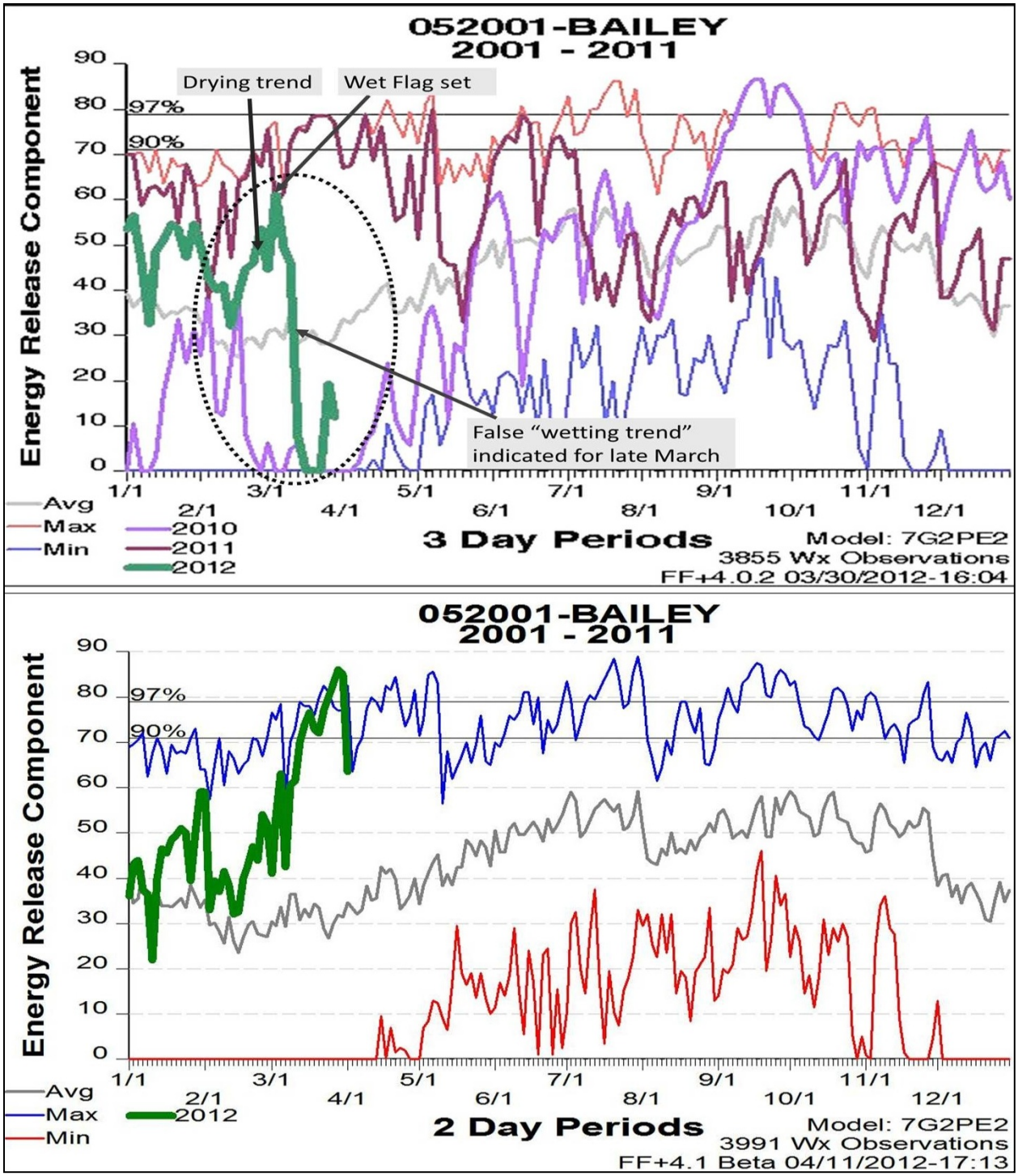


Figure 40. *NFDRS graph of ERC trends for the Bailey RAWS using data generated with the Wet Flag set mid-March (top) and the same data with the wet flag removed (lower). The impact of setting the Wet Flag is again evident by the sudden and dramatic drop in the reported 1000-hour fuel moisture (top, circle). Note: the sudden drop in ERC on April 02 in the corrected data (lower) is likely due to the Wet Flag being re-set on April 02, 2012, as there was precipitation in the area April 02-03. Also, it should be noted that only the upper graph was available prior to March 30, 2012.*

Fire Behavior

Gridded Winds

For the purpose of assessing the local winds near the surface on March 26, 2012, a CFD-based (computational fluid dynamics) program, WindWizard, was employed. WindWizard uses CFD algorithms with enhancements to tailor it to wildland fire applications. WindWizard acts as a "virtual wind tunnel," conforming strong synoptic winds aloft to local terrain features. Local terrain is represented by a digital terrain model, with settings to adjust for surface roughness by specifying the predominant vegetation as grass, brush, or forest. The output from WindWizard is a grid of regularly-spaced points representing wind speed and direction at a user-specified resolution. These wind grids are generated as ArcMap-format shapefiles, Google Earth KMZ files, and ASCII grids for use in wildland fire modeling programs such as FARSITE and FlamMap. See http://www.firemodels.org/index.php/windwizard-introduction/windwizard-overview for an overview of WindWizard.

For this report, Windwizard was used to simulate the surface winds on March 26, 2012, to assess local channeling of winds by ridges, valleys and draws in and around Unit 4a. The speed and intensity of actual winds aloft were estimated using data from the Polhemus RAWS, which is situated on a high-elevation, exposed ridgetop site. These ridgetop winds were then used to determine the appropriate input for winds aloft as an input to WindWizard. Wind speeds from the HOBO weather station were found to be consistent with those recorded at the Polhemus RAWS and provided an additional validation of the wind grid outputs.

The end result (Figures 41-43) shows simulated local wind patterns on Unit 4a that are consistent with what personnel on the ground reported on the upper (north) perimeter of the unit as winds increased through the day on March 26, In particular, the winds simulated for 1300h show winds intensifying and aligning with the slope and draw below where two spot fires were discovered below DP4, and winds simulated for 1400h show the same phenomenon where the third spot fire was discovered near DP5. It should be noted that the surface wind grids produced by WindWizard are for speed and direction at 20 feet above the surface (similar to those measured by RAWS). Where forest canopy is present, wind speeds near the ground would be reduced somewhat.

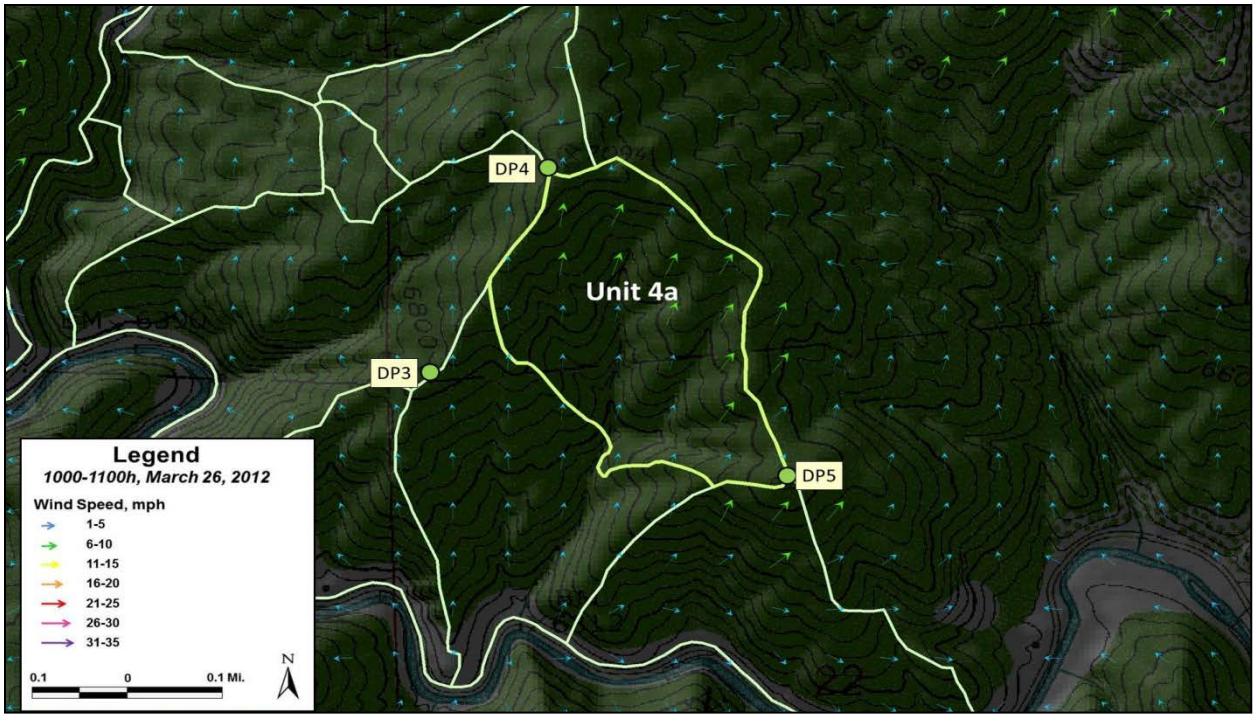


Figure 41. *Simulated surface winds for conditions at 1100h on March 26, 2012. Wind speeds are consistent with those recorded by the HOBO station and observations of personnel on the site.*

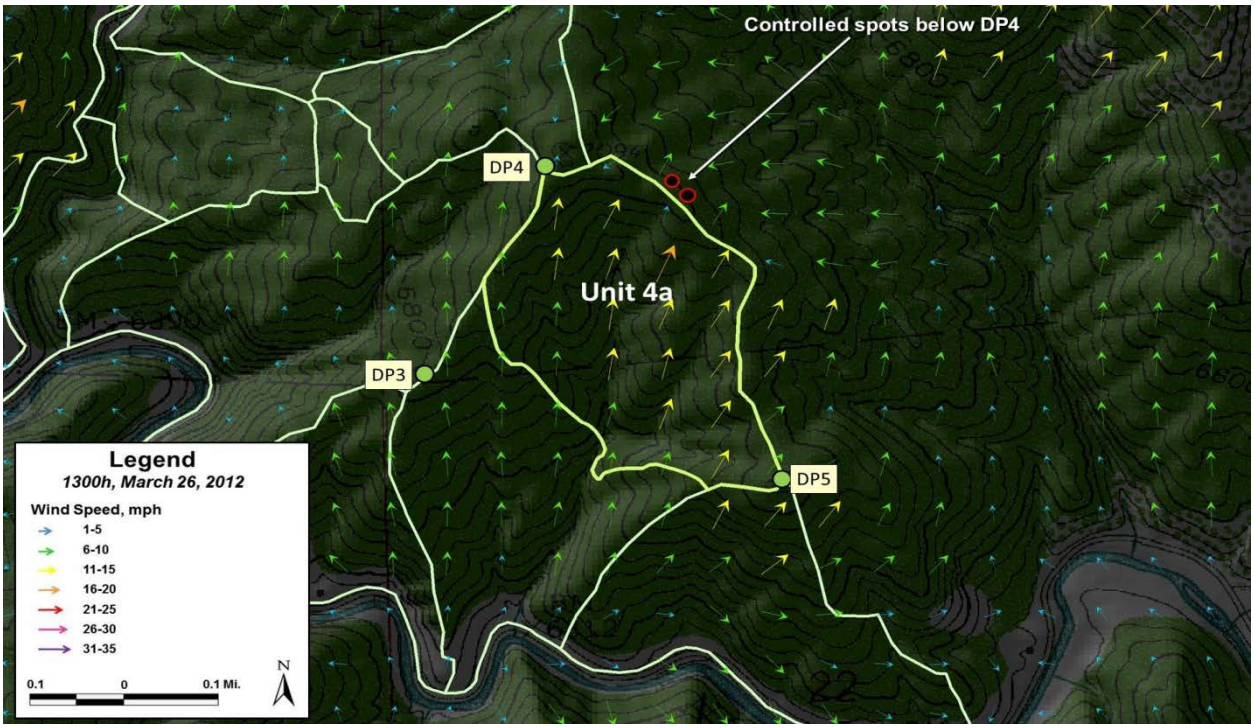


Figure 42. *Simulated surface winds for conditions at 1300h on March 26, 2012. Winds are increasing and channeling up the major draws in Unit 4a. The two spot fires below (east of) DP4 are indicated; simulated winds show alignment with terrain within the unit below this area.*

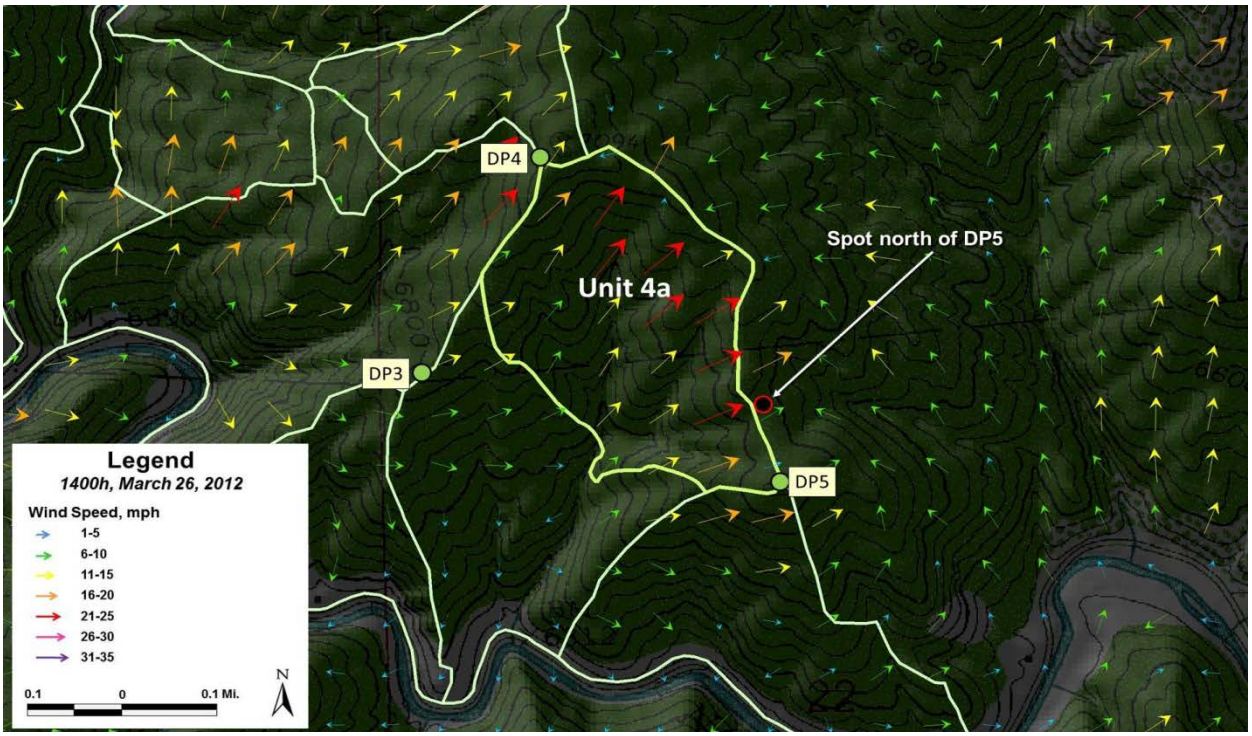


Figure 43. *Simulated surface winds for conditions at 1400h on March 26, 2012. The wind speed has intensified since 1300h and become more westerly. The third spot fire north of DP5 is shown. Simulated winds in this scenario show stronger winds that are in alignment with terrain – notably the draw below (west of) the control line where the spot fire occurred.*

Short-Range Surface Spotting

On the afternoon of March 26, 2012, personnel patrolling Unit 4a noticed fire spread by short range spotting in previously-burned areas when winds became strong at the surface. This resulted in the progression of fire across the surface, upslope toward the northern and eastern perimeter, and led to spot fires across the line. Each person independently described the spread as surface-borne embers in strong winds near the ground surface that spotted a few feet downwind, ignited new spots, which then repeated the process. This steady "leap-frog" spot fire spread enabled fire progression through areas where most of the surface fuels had been consumed, where what remained was largely duff that had not been consumed yet appeared cold. It is an unusual phenomenon for which there is no applicable fire spread model, and as such this type of fire spread is not readily predictable.

Fire Behavior Potential for March 26

In order to examine factors that led to increased fire activity, spotting, and rapid fire spread of fire outside Unit 4a, several fire behavior projections were run. These used a program called FlamMap to show potential fire behavior for the area. FlamMap is a computer program that displays potential fire behavior across a landscape, given inputs for a specific time. FlamMap

incorporates existing fire behavior models for surface fire spread (Rothermel, Andrews, Nelson) and crown fire spread (Rothermel, VanWagner). For further information about FlamMap, see http://www.firemodels.org/index.php/national-systems/flammap.

As inputs to FlamMap, GIS layers depicting fuel and terrain were obtained from the LANDFIRE archive (http://www.landfire.gov/). Though the LANDFIRE fuels information does not reflect the mechanically treated fuels, it does include some slash fuels within the area examined. Wind inputs for FlamMap consisted of the wind grids from WindWizard for specific times on March 26 as previously discussed. Weather inputs (temperature, relative humidity) were estimated from the Bailey RAWS data.

These analyses are not intended to be a depiction of the actual fire behavior that occurred on March 26. Rather, they are provided to give a comparison of potential fire behavior under the changing weather conditions that occurred on March 26 to help illustrate factors leading to more aggressive fire spread that afternoon.

Potential Flame Length

Flame length is directly related to heat intensity – the great the flame length, the more heat is produced at the flaming front. The depiction of potential flame length in Figure 44 is shown for categories depicting limitations of fire suppression resources. Flame lengths less than 4 feet can be directly attacked by firefighters with hand tools. Flame lengths up to 8 feet can be directly attacked with equipment (engines or dozers). Above 8 feet, only indirect attack is possible, and with increased flame length, there is increased potential for large fire growth

In Figure 44, flame lengths modeled for 1100h conditions (left) are consistent with what was observed and documented during ignition on March 22, under moderate winds, temperature, and RH. For 1400h conditions, the potential flame length shown has changed dramatically. This is a reflection of the increased winds, and warmer, drier conditions that predisposed the area to significantly more intense burning conditions.

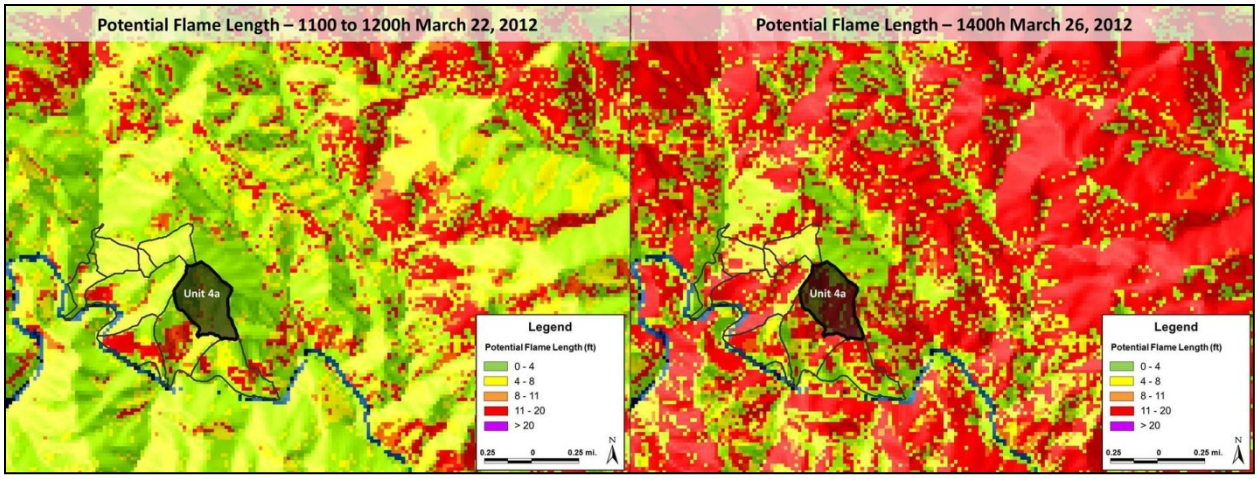


Figure 44. *Potential flame length under 1100h conditions (left) compared to 1400h conditions (right).*

Potential Crown Fire

Crown fire is the spread of fire through tree canopies (crowns). Crown fire can be either passive (torching only) or active (sustained runs through the crowns). Increased surface fire intensity can pre-heat crown fuels, making them more susceptible to crown fire. Additionally, significant surface fuels can facilitate spread of fire into crown fuels.

Potential crown fire modeled for 1100h and 1400h on March 26, 2012 is shown in Figure 45. Crown fire modeled for 1100h conditions is consistent with what was observed and documented during ignition on March 22, 2012 under moderate winds, temperature, and RH. Under that scenario, simulated crown fire was limited to torching (passive crown fire), with no sustained runs through the tree canopy. By comparison, during ignition, occasional single-tree torching was observed, and there were no sustained runs through the tree canopy.

For 1400h conditions, many areas show potential for sustained crown fire runs – notably the southeast portion of Unit 4a where there were denser mixed conifer stands, and east and northeast of Unit 4 where the fire did make sustained crown fire runs later in the afternoon.

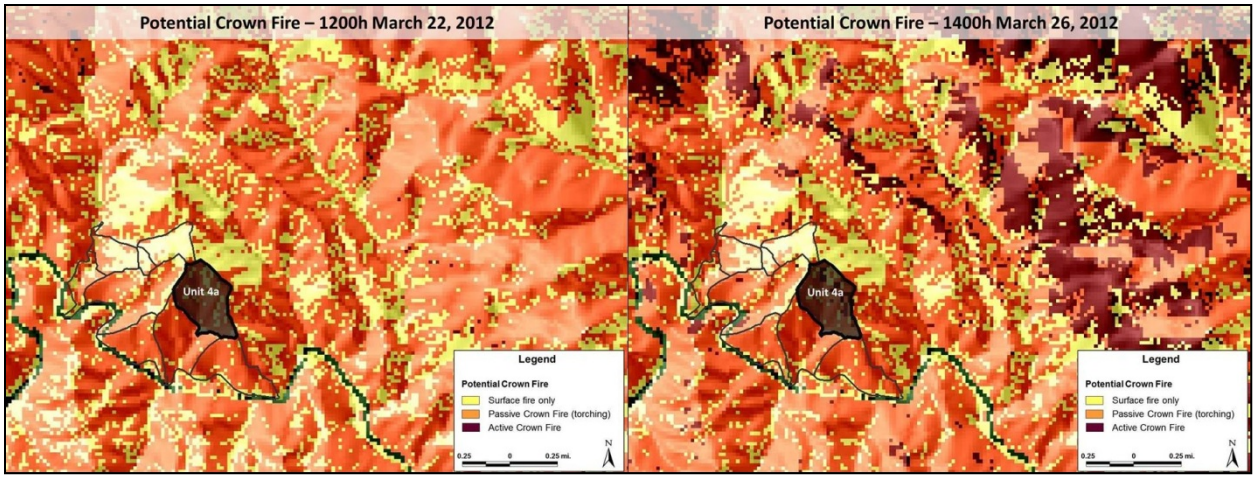


Figure 45. *Potential crown fire under 1100h conditions (left) compared to 1400h conditions (right). Passive crown fire denotes torching, while active crown fire denotes sustained runs through crown fuels.*

BEHAVE "CONTAIN" Modeling

To determine the effectiveness of additional fire suppression resources on March 26, 2012, as discussed in the Report, several modeling scenarios were run using the CONTAIN module of BEHAVE Plus. Assumptions and inputs to this modeling, and a description of outputs obtained from CONTAIN, are shown in Figure 46. A summary of the modeling results is shown in Figure 47. In all but one scenario (4 engines, 10% slope), the fire exceeded capabilities of suppression resources.

Fire Control Modeling

- **Model Used**: Behave fire spread model
- **Inputs:** conditions found at 1:00 PM on Lower North Fork Prescribed Fire, March 26, 2012
- **Assumptions:**
  - standard crew size of 3 personnel
  - line production rate of 12 ch/hr/engine for 1 hour
  - head attack, 1/10 acre at detection, 6 minute response
- **Outputs:** Estimates whether the spot fire could be caught with 1 Engine, 2 Engines, or 4 Engines

Figure 46. *Summary of inputs, assumptions, and outputs for fire behavior modeling to determine effectiveness of additional fire suppression resources on March 26. Modeling was done using the "CONTAIN" module of BEHAVE Plus*.

Fire Control Modeling Results

Fire Behavior Outputs	
10% Slope	35% Slope
Spread Rate – 23 ch/h	Spread Rate – 25 ch/h
Flame Length – 4.8 ft	Flame Length – 5 ft

Scenario	Slope Class	Contain Status	Contain Area
1 Engine	10% Slope 35% Slope	Escaped Escaped	N/A N/A
2 Engines	10% Slope 35% Slope	Escaped Escaped	N/A N/A
4 Engines	10% Slope 35% Slope	Contained Escaped	0.8 acre N/A

Figure 47. *Summary of results from fire behavior modeling performed to determine effectiveness of additional fire suppression resources on March 26. Modeling was done using the "CONTAIN" module of BEHAVE Plus*.

The following tables provide details of the BEHAVE runs:

BehavePlus 4.0.0 (Build 276)
Containment Scenario #1 - 1 Engine, 6 min. Response Thu, Apr 12, 2012 at 15:01:01

Input Worksheet

Inputs: SURFACE, CONTAIN

Input Variables	Units	Input Value(s)
Fuel/Vegetation, Surface/Understory		
Fuel Model		9
Fuel Moisture		

1-h Moisture	%	4
10-h Moisture	%	6
100-h Moisture	%	8
Live Herbaceous Moisture	%	
Live Woody Moisture	%	

Weather

20-ft Wind Speed (upslope)	mi/h	20
Wind Adjustment Factor		.4

Terrain

Slope Steepness	%	10, 35

Fire

Fire Size at Report	ac	.1

Suppression

Suppression Tactic		Head
Line Construction Offset	ch	0
Resource Line Production Rate	ch/h	12
Resource Arrival Time	h	.1
Resource Duration	h	1

Notes

Run Option Notes

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Suppression input is for a single resource [CONTAIN]; multiple values can be entered for any input variable.

Results

Slope	ROS (max)	Flame Length	Contain Status	Time from Report	Contain Area	Fireline Constructed
%	ch/h	ft		h	ac	ch
10	22.7	4.8	Escaped	0.1	-1.0	0.0
35	24.5	5.0	Escaped	0.1	-1.0	0.0

BehavePlus 4.0.0 (Build 276)

Containment Scenario #2 - 2 Engines, 6 min. Response

Thu, Apr 12, 2012 at 14:55:29

Input Worksheet

Inputs: SURFACE, CONTAIN

Input Variables	Units	Input Value(s)
Fuel/Vegetation, Surface/Understory		
Fuel Model		9
Fuel Moisture		
1-h Moisture	%	4
10-h Moisture	%	6
100-h Moisture	%	8
Live Herbaceous Moisture	%	
Live Woody Moisture	%	
Weather		
20-ft Wind Speed (upslope)	mi/h	20
Wind Adjustment Factor		.4
Terrain		
Slope Steepness	%	10, 35
Fire		
Fire Size at Report	ac	.1
Suppression		

Suppression Tactic		Head
Line Construction Offset	ch	0
Resource Line Production Rate	ch/h	24
Resource Arrival Time	h	.1
Resource Duration	h	1

Notes

Run Option Notes

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Suppression input is for a single resource [CONTAIN]; multiple values can be entered for any input variable.

Results

Slope	ROS (max)	Flame Length	Contain Status	Time from Report	Contain Area	Fireline Constructed
%	ch/h	ft		h	ac	ch
10	22.7	4.8	Escaped	0.1	-1.0	0.0
35	24.5	5.0	Escaped	0.1	-1.0	0.0

End

BehavePlus 4.0.0 (Build 276)

Containment Scenario #3 - 4 Engines, 6 min. Response

Thu, Apr 12, 2012 at 15:01:28

Input Worksheet

Inputs: SURFACE, CONTAIN

Input Variables	Units	Input Value(s)
Fuel/Vegetation, Surface/Understory		
Fuel Model		9
Fuel Moisture		
1-h Moisture	%	4
10-h Moisture	%	6
100-h Moisture	%	8
Live Herbaceous Moisture	%	
Live Woody Moisture	%	
Weather		
20-ft Wind Speed (upslope)	mi/h	20
Wind Adjustment Factor		.4
Terrain		
Slope Steepness	%	10, 35
Fire		
Fire Size at Report	ac	.1

Suppression

Suppression Tactic		Head
Line Construction Offset	ch	0
Resource Line Production Rate	ch/h	48
Resource Arrival Time	h	.1
Resource Duration	h	1

Notes

Run Option Notes

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Suppression input is for a single resource [CONTAIN]; multiple values can be entered for any input variable.

Results

Slope	ROS (max)	Flame Length	Contain Status	Time from Report	Contain Area	Fireline Constructed
%	ch/h	ft		h	ac	ch
10	22.7	4.8	Contained	0.3	0.8	11.5
35	24.5	5.0	Escaped	0.1	-1.0	0.0

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REVIEW AND RECOMMENDATIONS:
ENHANCING FIRE RESPONSE AND MANAGEMENT
IN COLORADO STATE GOVERNMENT

April 23, 2012

Review Team Co-Chairs:

Roxane White, Chief of Staff, Governor John Hickenlooper

Mark Gill, Chief of Staff, President Tony Frank, Colorado State University

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EXECUTIVE SUMMARY

On March 26, 2012, a wildfire fire occurred in the foothills of Jefferson County, Colorado. This fire, called the Lower North Fork fire, burned for a week and resulted in the tragic deaths of three people and the loss of 24 structures (21 primary homes, one secondary homes, one rental property and one community building) and the scorching of 4,140 acres in a populated area near Conifer, Colorado. At the peak of the fire, over 900 homes in the area were evacuated.

Governor John Hickenlooper and Colorado State University President Tony Frank requested a thorough examination of the state's emergency response capabilities. The team (hereinafter referred to as the "Review Team") was directed to review the structure of the emergency coordination between the State Forest Service and the Division of Emergency Management—and their processes and communication systems—in order to improve the state's response to fires and protect people and property.

Currently, the Colorado State Forest Service, housed at CSU, is identified as the lead agency for wildfire suppression in the Colorado Revised Statutes §29-22.5-103 (3)(a) and in the State of Colorado's Emergency Operations Plan, with primary responsibility for Emergency Support Function 4a (wildland fire response). After careful analysis, the team felt that moving this authority to an executive agency would provide improved accountability and ensure a single point of authority for prescribed burns and wildfire suppression.

THE OPTIONS: Two options emerged as viable: a move to the Department of Public Safety or a move to the Department of Local Affairs. While the Department of Local Affairs has extensive experience in recovery, the team felt that moving the Division of Emergency Management to the Department of Public Safety would improve emergency operations while maintaining sensitivity to the needs and abilities of the local entities during recovery operations.

THE RECOMMENDATION: The review team recommends that the prescribed fire and wildfire management portions of the Colorado State Forest Service (CSFS) in CSU be moved into the Division of Fire Safety, within the Colorado Department of Public Safety (CDPS), and the entire Division of Emergency Management (DEM), within the Department of Local Affairs (DOLA), be moved into the CDPS.

THE BILL BASS REPORT ON THE PRESCRIBED FIRE: Immediately, following the Lower North Fork Fire, the Governor and the President of Colorado State University convened a separate independent team to review the prescribed fire and key factors that led to its escape. The review team also made recommendations with respect to the Colorado Emergency Resource Mobilization System and the Lower North Fork Prescribed Fire Review. Their findings are detailed in their final report Lower North Fork Prescribed Fire, Prescribed Fire Review (also known as the Bass Report). Among the conclusions of the Prescribed Fire Review Team are recommendations for minimizing future risk of prescribed fire. For each of those recommendations the relevant agencies have responded with implementation plans, detailed in this report.

MANDATE FROM GOVERNOR JOHN HICKENLOOPER AND COLORADO STATE UNIVERSITY (CSU) PRESIDENT TONY FRANK: GOAL OF REPORT

President Frank and I have directed our chiefs of staff (Roxane White for the State of Colorado, and Mark Gill for CSU) to convene officials of the Colorado State Forest Service, the Department of Natural Resources, the Department of Local Affairs, the Colorado Division of Emergency Management, the Department of Public Safety, the Division of Fire Safety and Colorado State University to thoroughly examine our emergency response capabilities. We have asked them to review the structure of the emergency coordination between the State Forest Service and the Division of Emergency Management—and the processes and communication systems—so that we can improve our response to fires and protect people and property. They have been asked to develop written recommendations to enhance and define accountability and responsibility for firefighting activities by the State of Colorado. They have until April 23 to develop specific, written recommendations based on the Prescribed Fire report and on their experiences with fire management. They will be reviewing activities such as but not limited to clarifying roles and responsibilities, creating one central point of accountability for fire management which is done with State personnel, identifying obstacles that may inhibit better coordination and communication, and resource allocation. We have instructed them to submit a report to me by April 23rd in order to ensure that recommendations for statutory changes or resource needs may be addressed this legislative session and for this fire season.

INCIDENT

On March 26, 2012, a wildfire fire occurred in the foothills of Jefferson County, Colorado. This fire, called the Lower North Fork fire, burned for a week and resulted in the tragic deaths of three people and the loss of 24 structures (21 primary homes, one secondary homes, one rental property and one community building) and the scorching of 4,140 acres in a populated area near Conifer, Colorado. At the peak of the fire, over 900 homes in the area were evacuated.

RESTRUCTURING OPTIONS FOR STATE AGENCIES

To attain a single point of responsibility and accountability for fire response within state government, CSU has asked the State of Colorado to immediately assume management of prescribed burns and wildfire management. Given the long history and working relationship between CSFS and CSU, the Review Team agreed that all other components of the CSFS would remain at CSU at this time. Separating and then structurally re-defining the way the state conducts prescribed burns and wildfire response was therefore the question before the team.

The Review Team agreed on two fundamental objectives to guide the discussion:

- Goal: improving wildfire response and the management of prescribed fire.
- Identifying one ultimate point of authority on wildfire and emergency management.

GENERAL FACTORS THE REVIEW TEAM CONSIDERED

In crafting a recommendation for new structure, the team carefully evaluated both the wildfire suppression and recovery needs. In addition, issues such as infrastructure support, ability to immediately assume responsibility, relationship with counties and local jurisdictions, and budget and staffing needs were essential elements to the final recommendation.

To help provide guidance and comparison, the team reviewed the practices of other states. Emergency management and state forest services are housed in a number of different agencies throughout the country. These include Agriculture, Military Affairs, Natural Resources, Public Safety, and agencies such as DOLA. In addition, some states have Departments of Homeland Security and Emergency Management.

Because CSU has not requested and the Review Team has not recommended a move that would include all functions of the CSFS, agencies such as Agriculture and Department of Natural Resources were not seen as viable options. Neither department currently manages prescribed fire or wildfire suppression or recovery. The Department of Military and Veterans Affairs was not considered to be a viable option due to their role is as a support agency and not a lead agency. See Appendix E for more information about options that were considered but not recommended.

After careful analysis, the Review Team felt that two options were viable: a move to the Department of Public Safety or a move to the Department of Local Affairs. A summary of the discussion points follows, in Table 1.

Table 1: Summary of Strengths for Required Relocation Tasks, by Agency

Required Task	Department of Public Safety (CDPS)	Department of Local Affairs (DOLA)
Fire Suppression	Crisis experience	Crisis experience limited
Fire Recovery	Delegates to local entities	Extensive recovery support experience
Emergency Operations	Extensive experience	Not a crisis agency
Dispatch	Equipment and resources in place	Experience limited
Date for Assuming Reponsibility	June 1, 2012	August 1, 2012
Current Fire Experience	Division of Fire Safety	Division of Emergency Management
Coordination with Homeland Security	In place	In place
Coordination with Law Enforcement	In place	Coordinated through DPS
Physical Space	Available	Tenant finish required, at a cost of $225,000
Financial Capacity to Absorb	In place	Would need to add one FTE, at a cost of $63,180
Human Resource Capacity to Absorb	In place	Would need to add one FTE, at a cost of $55,440
Communication Systems & Experience	In place, with substantial expertise managing	Limited experience
Local Government Relations	In place	Extensive relations in place
Ability to Manage Physcial Assets	Similar assets	No similar assets
Experience with Federal Contracts	Extensive experience	Extensive experience
Requirements for Additional FTE	None	Two additional FTE
Experience with Mergers	Port of Entry, current	Division of Housing, 2011
Fiscal Impact	Budget neutral	Annual cost of $118,620 per year and one-time cost of $225,000

RECOMMENDATION

Because wildland fire activities involve a crisis response, the team recommends that serious consideration be given to moving wildland fire activities, including prescribed fire, operations to the Department of Public Safety. The Department of Public Safety has extensive experience responding in times of life threatening crises. While the Department of Local Affairs has extensive experience in recovery, the review team felt that moving the Division of Emergency Management and its personnel to the Department of Public Safety will ensure that recovery efforts are still handled with a great deal of sensitivity to the needs and abilities of the local entities.

The review team recommends that the prescribed fire and wildfire management portions of the Colorado State Forest Service in Colorado State University be moved into the Division of Fire Safety within the Colorado Department of Public Safety and the entire Division of Emergency Management within the Department of Local Affairs be moved into the Colorado Department of Public Safety, respectively called the Division of Fire Prevention and Control and the Division Homeland Security and Emergency Management to reflect their consolidated roles

CURRENT STRUCTURE: OVERVIEW OF AGENCIES AND ROLE IN FIRE MANAGEMENT

Colorado State Forest Service

Overview: In 1911, the Colorado General Assembly established the Office of the State Forester at what was then the Colorado State College of Agriculture and Mechanic Arts, now known as Colorado State University (CSU). This office continued under the College of Forestry until 1933. Because of funding and other commitments, this was deemed an unsatisfactory arrangement, so the General Assembly consolidated the State Forester's Office with the State Land Board. This arrangement continued for four years but it, too, was deemed unsatisfactory, primarily because of the State Land Board's interests. In 1937, State Forestry functions were transferred back to CSU, this time under the auspices of the Extension Service. By 1945, the General Assembly again decided to transfer the State Forestry function back to the State Land Board, where it remained for ten years.

In 1955, the Society of American Foresters and several legislators took steps to establish a stronger, more cohesive State Forestry Program and initiated new legislation that would transfer the forestry program from the State Land Board back to CSU. Realizing the importance of developing a strong forestry program, the Board of Agriculture, CSU's governing body, designated the Colorado State Forest Service as a branch of the university. In 1965, additional legislation was passed that officially named the forestry function of the Board of Agriculture as the Colorado State Forest Service.

Since that time, the CSFS has served under the direction of the Vice Provost for Agriculture and University Outreach and the Dean of the Warner College of Natural Resources, where it remains today.

In addition to its service and outreach responsibilities within CSU, the CSFS also provides service to the Division of Forestry in the Colorado Department of Natural Resources. The division was created through legislation passed in 1999. The purpose of the division is to strengthen natural resource policy formulation addressing all 25 million acres of forestland in Colorado. The CSFS was tasked with providing forestry expertise to the Division of Forestry through a 2001 Memorandum of Understanding between the Colorado Department of Natural Resources and Colorado State University.

Wildfire Roles & Responsibilities: The CSFS is identified as the lead agency for wildfire suppression in the Colorado Revised Statutes §29-22.5-103 (3)(a) and in the State of Colorado's Emergency Operations Plan, with primary responsibility for Emergency Support Function 4a. Through a series of cooperative agreements with counties (called Emergency Fire Fund or EFF agreements), the CSFS is positioned to assume responsibility of a wildfire only when it exceeds the capacity of a local sheriff and when the sheriff requests that CSFS take over. In most cases, the CSFS immediately delegates authority to an interagency incident management team to fight the fire; therefore, the CSFS rarely has command and control over a wildfire for any significant period of time.

The CSFS manages wildfire through a range of efforts and funding sources. The Wildfire Preparedness Fund, which is administered by DOLA and comes from Federal Mineral Lease dollars, supports equipment and staff. Preparedness efforts include the development of mitigation plans and operating guides for wildfires. A fire equipment shop is maintained at the Foothills Campus and is self-funded. The CSFS also uses prescribed fire as part of its approach in managing forests, and personnel in the field are likely to be trained and certified to work on both prescribed fires and wildfire suppression efforts.

Colorado State Forest Service has a total operating budget of $14,319,117 and 146.25 FTE. The funding for prescribed fire and wildfire includes $3,641,497 in state funds and $814,494 in earnings from fire shop operations. Earnings from application of the indirect rate (facilities and administration) to fire billing is currently budgeted in Fiscal Year 2012 at $1,191,000. This amount varies from year to year based on fire activity.

Division of Emergency Management

Overview: Located within the Department of Local Affairs, the Division of Emergency Management (DEM) has the mission of implementing the five core emergency management functions of Preparedness, Prevention, Mitigation, Response, and Recovery. The DEM addresses wildfire as part of its all-hazards responsibilities. Responsible for implementing the State Emergency Operations Plan (SEOP) and operating the State Emergency Operations Center (SEOC), DEM's authorities are found in Colorado Revised Statutes 24-32-2101 through 24-32-2607. One of the DEM's responsibilities is resource mobilization during a large-scale incident beyond the capacity of a county except for wildfires with resource ordering through the national interagency system. The DEM has 30.1 full time employees (FTE) funded through a combination of General Fund, re-appropriated and federal funds. Six core functions form the structure for the DEM: Preparedness & Prevention, Chemical Stockpile Emergency Preparedness Program, Response, Mitigation, Recovery, and Grant Administration. To implement these six core functions, the DEM expends $3,854,460. Total revenue for the DEM is approximately $16.55 million, with the difference being passed to local jurisdictions for their emergency management programs.

Wildfire Roles & Responsibilities: The DEM does not have any direct wildfire suppression capability or responsibility. However, when a fire exceeds the inter-agency system's capacity, the DEM can authorize resource mobilization as part of its "response" role. The response function includes 3.95 FTE and an annual expenditure of $504,810. Wildfire is the number one reason for activation of the SEOC. Communication support in the form of radios and assistance with communication planning is also available as needed. The DEM takes a leadership role in providing situational updates for partners and the Governor's office and has the SEOP responsibility of coordinating the assistance provided by all state agencies and partners in response to a wildfire.

Department of Military and Veterans Affairs (DMVA)

Overview: As the first military responders in the state, the DMVA's National Guard is available in response to an Executive Order declaring a state emergency or for immediate response when requested by local authority at the site of the emergency. National Guard

forces and equipment are available for any emergency. Access to the National Guard depends upon the type of emergency and level of government involvement. Primarily funded by the federal government, these resources are available for state use in a support role. The National Guard is never in command or control of state emergencies.

Wildfire Roles & Responsibilities: The DMVA participates in wildfire suppression efforts only upon request, and those requests come only when all other resources have been overwhelmed.

Department of Public Safety: Office of Preparedness, Security and Fire Safety (Division of Homeland Security), Division of Fire Safety

Overview: The mission of the Office of Preparedness, Security and Fire Safety (also known as the Division of Homeland Security) is to ensure the safety and security of Colorado through unity of effort with federal, local, state and tribal partners in order to prevent, protect against, respond to and recover from all-hazards. The Division has 47 FTE and a budget of $15.35 million, excluding resources available through state, federal and local partners.

The Division of Fire Safety works to prevent fire threats through code enforcement and by strengthening emergency response capabilities to those incidents that cannot be prevented. The agency is responsible for all fires except wildland fire.

Wildfire Roles & Responsibilities: The agency does not have any direct wildfire suppression capability or responsibility. It provides voluntary training and certification of firefighters and is responsible for maintaining the state's emergency resource mobilization plan and resource database, which are used for mobilizing resources to all large-scale incidents. The Division also provides training and certification of the state's all-hazards incident management teams.

ONGOING CHALLENGES AND OPPORTUNITIES: COLORADO'S EMERGENCY RESOURCE MOBILIZATION SYSTEM

Longstanding concerns about resource mobilization have previously prompted recommendations that include restructuring and moving wildfire functions from CSU, updating technology, streamlining communications, tightening dispatch systems, and restructuring state agencies that deal with emergency management. The recommended reorganization provides an opportunity to address some of these ongoing challenges, summarized briefly here.

Technology and resource mobilization systems in Colorado need immediate attention. In response to concerns about recent wildfire responses in the state, the Colorado State Fire Chiefs Association (CSFCA) tasked a multi-disciplinary working group to develop a position paper to be presented to the Governor with recommendations regarding what could be done to fix the resource mobilization system in Colorado. Resource ordering and resource availability during wildfire incidents were identified as pervasive and urgent problems.

The CSFCA Working Group recommends implementing a single statewide plan for the mobilization and deployment of resources for all-hazard emergency response. This all-hazard plan should be supported by a single database for the inventory and tracking of available and mobilized resources, and should interface with the National Interagency Dispatch System. The State also needs to evaluate how it uses the Interagency Dispatch System, particularly the Zone Dispatch Centers. In the short term, fixing Connect Colorado (the State's resource inventory database), and then linking that to WebEOC (the State's Emergency Management system) and developing a means to interface with the National Interagency Dispatch System at the Geographic Area Level (Rocky Mountain Area Coordination Center) will enhance resource mobilization. The combination of these efforts is likely to take approximately one year, and could be done in concert with structural reorganization.

Interoperable communications between local and state emergency responders is an ongoing problem as local government transitions to Digital Trunked Radio (DTR) systems and as the State builds out the infrastructure. Communication plans should be incorporated into all Annual Operating Plans and all responders should have copies of the communications plan. Also, the Consolidated Communications Systems Authority, which will be created by HB 12-1224, should include interoperable communications for wildland fire in its plans for addressing DTR infrastructure needs.

LOWER NORTH FORK FIRE: RESPONSE TO RECOMMENDATIONS IN PRESCRIBED FIRE REVIEW, APRIL 13, 2012, WILLIAM BASS

After the Lower North Fork Fire was contained, the Governor and the President of Colorado State University requested that an independent team review the prescribed fire conducted by the Colorado State Forest Service that led to the wildfire. This team, led by William Bass of the US Forest Service, examined the factors that led to its escape. The team interviewed personnel associated with the implementation of the prescribed fire and reviewed and examined the written record or events and actions leading up to the escape. Their findings are detailed in their final report titled "Lower North Fork Prescribed Fire, Prescribed Fire Review" (April 13, 2012) (hereinafter referred to as the "Bass Report"). Among its conclusions are recommendations for minimizing future risk of prescribed fire.

In addition, on March 28, 2012, Governor Hickenlooper issued an Executive Order (D 2012-006) that suspended all prescribed fire conducted by state agencies or on state property until a thorough review of prescribed fire protocols and procedures is conducted. That review is underway (see section STATUS AND DESCRIPTION OF ADDITIONAL REVIEWS below). As per this suspension, the CSFS will review its prescribed fire protocols and procedures to address the recommendations in the Bass Report and any further recommendations produced in the larger prescribed fire protocol review currently underway.

As a start to that review and revision of procedures, below are the specific recommendations from the Bass Report and the agencies' responses to how these recommendations are and will be addressed. The Review Team concurs with all recommendations from the report.

Note: Although these responses include dates for completion of the action to address the recommendations, it is important to emphasize that no prescribed fire will be conducted by state agencies or on state property until all reviews are complete, all reforms are adopted and incorporated, and the Governor's suspension is lifted.

Recommendation #1:

The WIMS--RAWS--NFDRS program needs to be improved to insure safe and more effective fire operations across jurisdictions throughout the year. Inconsistent procedures must be resolved in the Rocky Mountain Area (RMA) between fire management agencies, cooperators and the supporting agencies involved with weather data collection, National Fire Danger Rating System (NFDRS), and information dissemination. The interagency Rocky Mountain Coordinating Group (RMCG) includes the Colorado State Forest Service, whose personnel rely on accurate and timely weather observations, NFDRS outputs, fire weather forecasts (NWS) and long term large fire risk assessments (Predictive Services). NFDRS output from some weather stations were erroneously moist during this period. Maintenance of weather stations is variable by agencies and this can degrade data outputs. Red flag watch and warning criteria are interpreted differently by the Predictive Services specialists and the National Weather Service which directly led to the issuance of a SAFENET for events that occurred during the time period under review.

The National Fire Danger Rating System (NFDRS) is a critical component of public safety. The system is used to develop fire danger predictions and manage elements of risks associated wildland fires. The system supports strategic decision making regarding prescribed fire, pre-event resource placement, staffing levels, appropriate suppression response, and likely evacuation areas. The system provides a variety of indices that portray current and potential fire danger conditions.

The network of Remote Automatic Weather Stations (RAWS) supporting the NFDRS was developed in a piecemeal fashion with different ownership and inconsistent maintenance standards among federal agencies. These inconsistencies compromise system reliability. Realizing the importance of a robust and reliable network of RAWS, the Review Team received a commitment from U.S. Department of Agriculture and U.S. Department of the Interior officials at the Rocky Mountain Geographic Area Coordination Center to conduct an assessment of the stations and systems that support the NFDRS within the Rocky Mountain Geographic Area. The assessment will include the following:

- A review of station maintenance and accuracy records and aspects of hardware-software integration in order to identify problems, that when resolved, will improve the reliability and robustness of the station network.
- A review of NFDRS concerns within the Rocky Mountain Geographic Area from 2002 to present in order to identify trends, reoccurring issues and progress in making improvements to the NFDRS.
- Prioritization of identified issues and concerns that warrant consideration and action by the Rocky Mountain Area Coordinating Group member agencies and personnel.
- Recommendations for solutions to issues identified will be presented, in written form, to Rocky Mountain Area Coordinating Group executives and the Co-Chairs of this review team by June 15, 2012.

While information from the NFDRS is critical in decisions concerning prescribed fire, field verification of the data is also critical. Field verification of weather conditions allows improved analysis of predicted fire behavior, fire weather forecasting, and smoke management. Therefore, the state will implement the use of portable RAWS at the treatment area prior to planned ignitions. Portable RAWS will help prescribed fire teams better determine and predict small-scale weather features in or near the treatment area.

Recommendation #2:

Colorado State Forest Service prescribed burn plans have a sound staffing plan based upon measures of fire danger and cumulative drought. However, consider replacing the Keetch-Byram Drought Index (KBDI) with indices such as NFDRS indices of Energy Release Component (ERC) and/or 1000 hour timelag fuel moisture. These two are in common use by the interagency fire community. Ensure all prescribed fire plans include up-to-date information prior to implementation.

Fire Management Officers and Burn Plan Preparers will update existing prescribed fire plans, and all future plans and staffing will utilize NFDRS indices, such as Energy Release

Component (ERC) and 1000-hour fuel moisture content, as the primary drought indicators. Effective April 19, 2012, the format of prescribed fire plans has been changed to reflect the use of ERC and 1000-hour fuel moisture indices; this work will be completed by May 14, 2012. By October 5, 2012, all existing prescribed fire plans will be reviewed individually and will be updated to reflect the use of ERC and 1000-hour fuel moisture. All new prescribed fire plans will use the revised format that reflects ERC and 1000-hour fuel moisture indices.

Recommendation #3:

CSFS prescribed fire operations need to be strengthened with specific attention to mop-up standards tied to fuel consumption and residual heat remaining in the burn unit. Consider adding an element of long-term patrol and monitoring to the existing table of organization. Patrol and monitoring activities should be maintained on prescribed fires in Wildland-Urban Interface (WUI) areas at a level commensurate with the risks until heat sources are minimal or non-existent or the fire is declared out.

Patrol and mop-up procedures will be analyzed for each burn plan and updated as follows.

- The required number of resources will be identified by kind and type for extended mop-up until a specific percentage of mop-up (commensurate with burn complexity and fuel conditions) has occurred around the unit. Plans that have identified heavier fuels will be analyzed for commensurate mop-up needs. Resources will remain committed until the designated percentage of mop-up has occurred, based on fuel types.
- Mop-up standards for each prescribed fire plan will dictate when the unit can be put into patrol status. Frequency, timing, and duration of patrols will be specified until the fire is declared out. Plans will be identified in the wildland-urban interface and patrol and monitoring activities will be commensurate with risks including Fire Weather Watch, Red Flag Warning, or High Wind Warning/Watches, until heat sources are minimal or nonexistent, or the fire is declared out.
- Key indicators will be included in the prescribed fire plan that identify the frequency, timing, and duration of patrols until the fire is declared out. These indicators will be commensurate with risk, especially in the wildland-urban interface. Fire Weather Watch, Red Flag Warning, or High Wind Warning/Watches are minimum key indicators. Additionally, the following will be included in the plan: resources ordered, timing for order, and duration of commitment.
- Heat imaging technology will be one of the tools used to identify heat sources in the interior of the unit.
- Spot weather forecasts will be obtained prior to use of prescribed fire on any unit. Updated spot weather forecasts will be requested for the following days until minimum mop-up standards have been met or the fire is declared out. When Fire Weather Watch, Red Flag Warning, or High Wind Warnings/Watches are issued, updated spot weather forecasts will be obtained.
- Portable weather stations will be used and will adhere to specific maintenance and calibration schedules, based on manufacturer recommendations.

- Commencing April 17, 2012, the format of prescribed fire plans will be changed to reflect the strengthening of prescribed fire operations and will be completed by May, 17, 2012. By October 5, 2012, all existing prescribed fire plans will be reviewed individually and will be updated to reflect the strengthening of prescribed fire operations. All new burn plans will use the revised format that reflects the strengthening of prescribed fire operations.

Recommendation #4:

Refine the Prescribed Burn Plan with its Technical Review process. An outside reviewer for more complex burns, particularly those within multiple jurisdictions, may be helpful to CSFS in this next phase of organizational recovery.

The review process for prescribed fire plans will be amended to include the following:

- In addition to the CSFS internal review process, plans within multiple jurisdictions, that are in the wildland-urban interface, or are complex will be reviewed by an outside technical expert.
- Commencing April 17, 2012, plans requiring additional reviews will be identified and outside technical reviews will be initiated. All plans will be internally reviewed no later than October 5, 2012; all plans requiring external review will be completed by December 31, 2012.

Recommendation #5:

Segregate mastication fuels from un-masticated and/or natural fuels by sub-dividing or redesigning treatment units to address fuel moisture and potential fire behavior variation.

Existing plans that have both masticated and natural fuel components will be identified and the benefits of segregating the fuel types will be analyzed; all treatment options will be considered to meet plan objectives while reducing risk.

Commencing April 17, 2012, foresters will identify plans that have masticated and natural fuel components. By October 5, 2012, all existing prescribed fire plans that have masticated and natural fuel components will be reviewed individually and updated to reflect the segregation of those fuels with consideration of other treatment options to meet plan objectives. All new prescribed fire plans that have masticated and natural fuel components will use the revised format that reflects the segregation of fuels with consideration of other treatment options to meet plan objectives.

Recommendation #6:

Update medical plan to list new address of St. Anthony's Hospital and its helipad coordinates.

All future prescribed fire plans will have current and updated contact information for officially designated Burn Trauma Centers, and all hospitals and medical facilities listed in

the prescribed fire plan. All medical plans will be reviewed prior to any ignition to confirm accuracy.

STATUS AND DESCRIPTION OF ADDITIONAL REVIEWS

The Prescribed Fire Protocol Review

Following the Governor's Executive Order (D 12-006, March 28, 2012) suspending prescribed fire application by state agencies or on state property, a review of the procedures and protocols used by the Colorado State Forest Service for conducting prescribed fire has been initiated by a review team. The review team will especially focus on the lessons learned and recommendations of the Bass Report on the prescribed fire that lead to the Lower North Fork Wildfire, and the forest conditions and special challenges applying prescribed fire within high threat red zone near communities and along the Front Range. The Governor's prescribed fire suspension will remain in place until these recommendations are adopted and incorporated, until the Prescribed Fire Protocol Review Team has completed its work and its recommendations are also adopted and incorporated into the protocols for prescribed burns, and until the Governor has lifted his suspension of prescribed fire.

The Lower North Fork Wildfire Review

The Governor, along with Senators Udall and Bennet and Representative Coffman, in an April 16, 2012 letter to US Forest Service Chief Tom Tidwell (see APPENDIX J), requested that the US Forest Service Research branch conduct a thorough review of the Lower North Fork wildfire. Similar reviews were conducted of the Hayman Fire (Hayman Fire Case Study, September 2003) and the Fourmile Canyon Fire (Fourmile Canyon Fire Preliminary Findings, October 2011). As with those previous reviews, this review will look at the atmospheric, geographic, and vegetative conditions that affected the behavior of the fire. The review will also look at the effect of any previous fuels treatment within the burn area, defensible space measures around homes, and the suppression activities conducted and resources available in fighting this fire. This review will also pay special attention to the social aspects of this fire, such as evacuation procedures, human response to the fire, economic impacts, and other similar factors. For this reason, this review will involve the affected community through public input and community meetings. This review will be initiated within the next month, and will take many months to complete.

APPENDICES

A. **Members of Review Team**
B. **Summary of Roles in Wildland Fire Management**
C. **Organization Chart for Preferred Recommendation**
D. **Organization Chart for Alternative Recommendation**
E. **Options Considered but Not Recommended**
F. **Current Colorado State Forest Service Organization Chart and Total FTEs**
G. **Current Colorado Department of Public Safety Organization Chart and Total FTEs**
H. **Current Department of Local Affairs Organization Chart and Total FTEs**
I. **Documents Consulted**
J. **Congressional Letter Requesting Review of Wildland Fire**

APPENDIX A: MEMBERS OF REVIEW TEAM

Roxane White, Chief of Staff, Governor John Hickenlooper **(CO-CHAIR)**

Mark Gill, Chief of Staff, President Tony Frank, Colorado State University **(CO-CHAIR)**

Joyce Berry
Dean, Warner College of Natural Resources, Colorado State University

Reeves Brown
Executive Director, Colorado Department of Local Affairs

Peter Byrne
Director Joint Staff, Colorado National Guard

Paul Cooke
Executive Director, Colorado State Fire Chiefs Association

Lisa Dale
Colorado Department of Natural Resources

James Davis
Executive Director, Colorado Department of Public Safety

Joe Duda
Deputy State Forester, Colorado State Forest Service

James Eklund
Senior Deputy Legal Counsel, Governor's Office

Dave Hard
Director, Colorado Division of Emergency Management

Mickey Hunt
Deputy Director, Colorado Department of Military and Veterans Affairs

Mike King
Executive Director, Colorado Department of Natural Resources

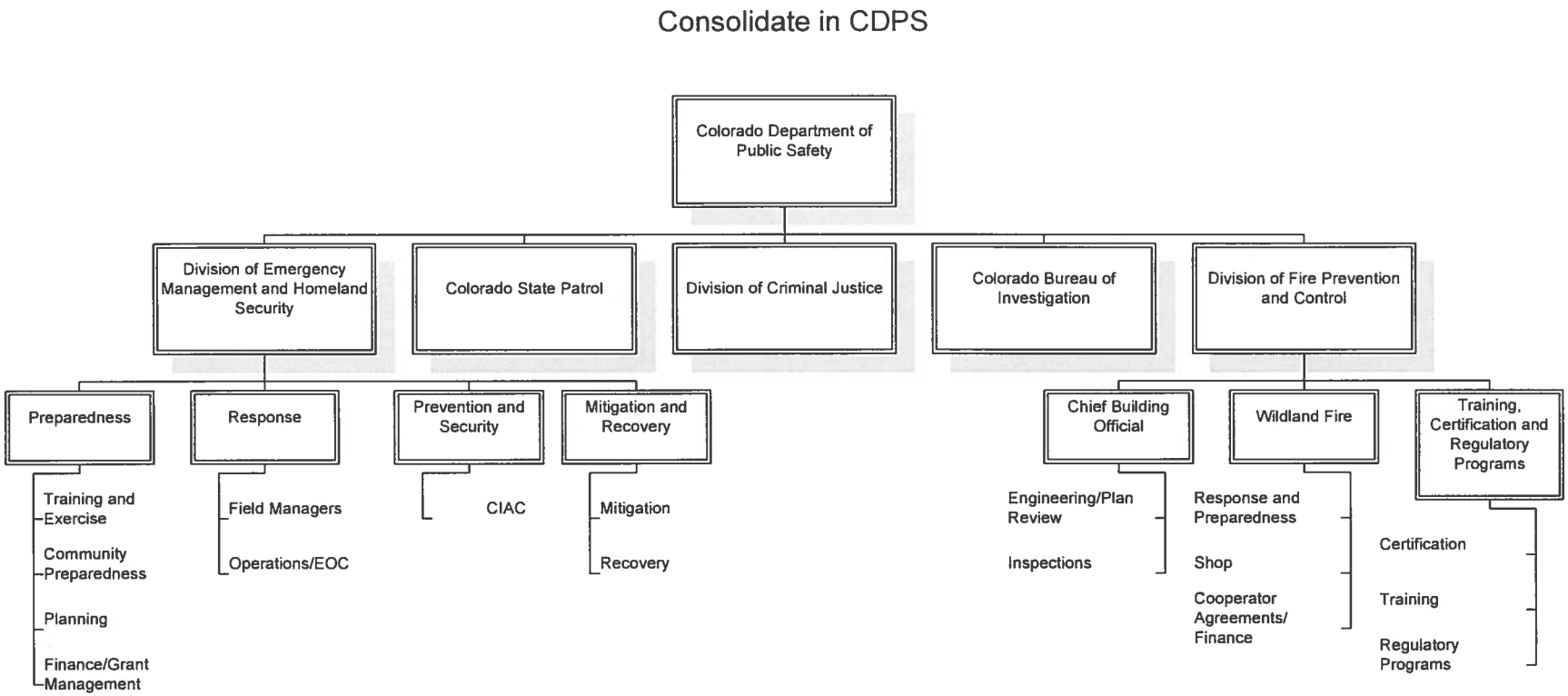
Kevin Klein
Director, Colorado Division of Homeland Security

Doug Young
Policy Director, Governor's Office

APPENDIX B: SUMMARY OF CURRENT ROLES IN WILDLAND FIRE MANAGEMENT

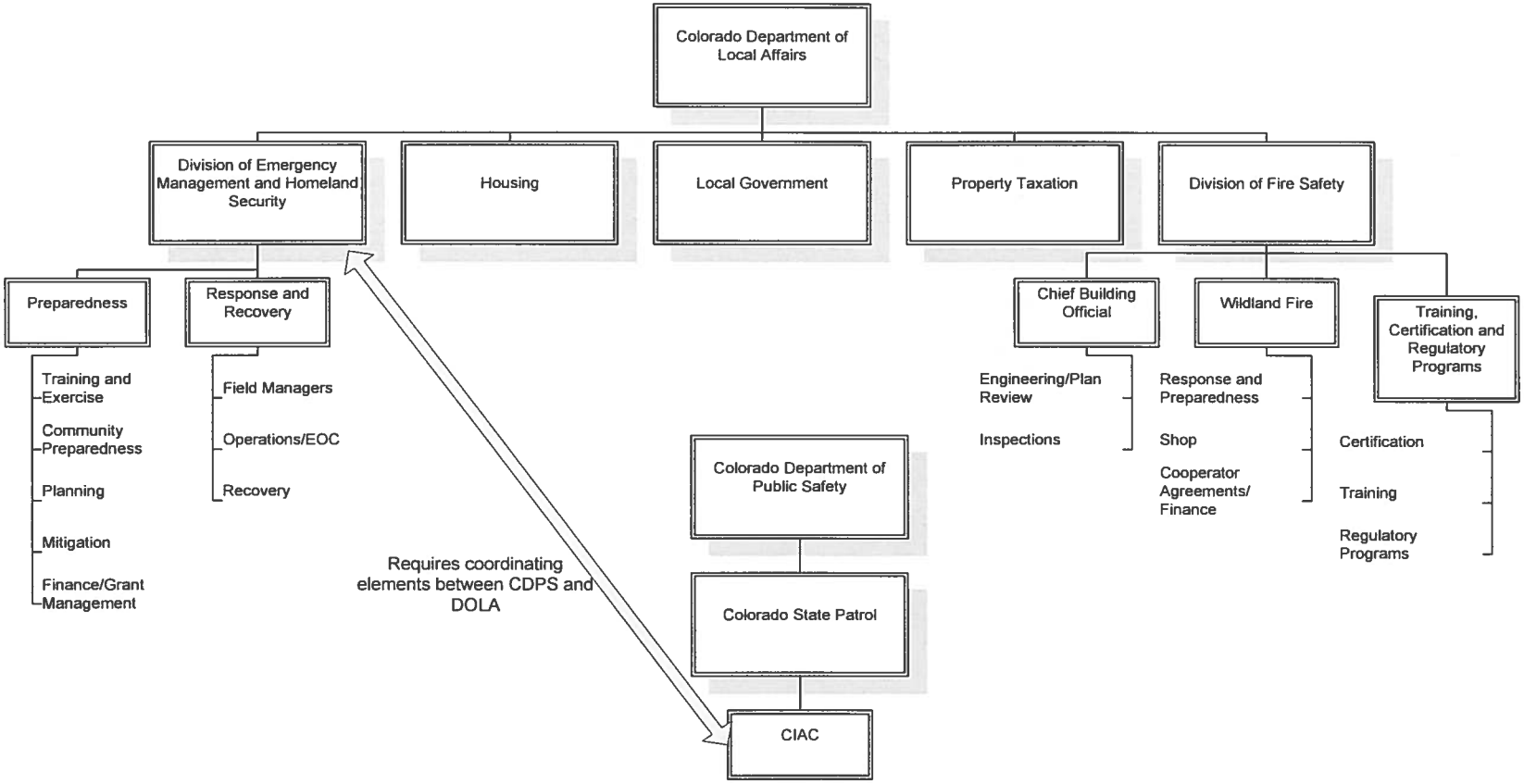
Issue	CODHS	DEM	CSFS
Resource Mobilization	Fire Safety is responsible for developing and implementing the plan and resource database	Has the authority to implement the system during a large-scale incident, but does not yet own the plan or database.	Uses a different system until it is exhausted.
Emergency Support Functions	Provides DEM with Fire (other than wildland fire), Urban Search and Rescue, Logistics, and Law Enforcement Emergency Support Functions.	Implements the State Emergency Operations plan with 15 Emergency Support Functions	Provides wildland fire Emergency Support Function
Training and Exercise	Coordinates homeland security related training and exercise, provides incident management training, provides firefighter training including wildland fire training.	Provides training and exercise for emergency management and incident management	Provides wildland fire training
Planning	State homeland security strategy and State Threat and Hazard Identification and Risk Assessment, facilitates regional homeland security strategies.	State Emergency Operations Plan, mitigation plans, recovery plans, State Threat and Hazard Identification and Risk Assessment, facilitates local emergency operating plans.	Facilitates Annual Operating Plans, develops mitigation plans, develops and implements operating guides for wildland fires.
Fire Departments	Fire Safety is primary contact to the state for local fire departments.	Facilitates operations and relationships among fire departments and their respective emergency managers.	Develops cooperator agreements with local fire departments.
Emergency Response	Fire Safety provides incident management support to large-scale incidents, typically wildland fires, on an as-needed basis.	Field personnel provide incident management support on a regular basis for a large variety of incidents.	Field personnel provide incident management for wildland fires.
Incident reporting	Provides CSFS with data on wildland fires for risk assessment and related federal funding.		

APPENDIX C: ORGANIZATION CHART FOR PREFERRED RECOMMENDATION



APPENDIX D: ORGANIZATION CHART FOR ALTERNATIVE RECOMMENDATION

Consolidate in Local Affairs



APPENDIX E: OPTIONS CONSIDERED BUT NOT RECOMMENDED

- **Move into Colorado Department of Military and Veterans Affairs**

The Department of Military and Veterans Affairs consists of the Division of the National Guard, the Division of Veterans' Affairs, and Division of Civil Air Patrol and is headed by the Adjutant General of Colorado. The Division of the National Guard is further divided into the Joint Staff (responsible for Defense Support of Civilian Authorities), the Colorado Army National Guard and Colorado Air National Guard. Placement of wildland fire management under DMVA would blur the lines of command with military response and civilian response. Primary funding for DMVA is provided by the federal government to support its mission of national defense. Lines of authorizations, authorities and appropriations would be blurred if DMVA took the lead in wildland fire management.

- **Move into Department of Natural Resources**

The DNR does not currently do emergency response. In the event of a blow-out on an oil and gas well, response protocols exist that shift primary responsibility to external chains of command. Similarly, in the event of a mine collapse, the Division of Reclamation and Mining Safety does not take the lead. Moving wildfire suppression into the Department would not achieve the goal of solidifying a single point of accountability.

- **Move into Department of Agriculture**

The Department of Agriculture also does not have responsibility for emergency response. With eight divisions focused on inspections, consumer services, markets, and other forms of agricultural support, the Department lacks both the infrastructure and the capacity for wildfire management.

- **Create a new stand-alone agency**

Constitutional limits on the number of state departments, uncertainty about the efficiency of a new department, and the likelihood that a new department would expand government eliminated this option from further consideration. Furthermore, the estimated costs associated with creating a new department are prohibitive.

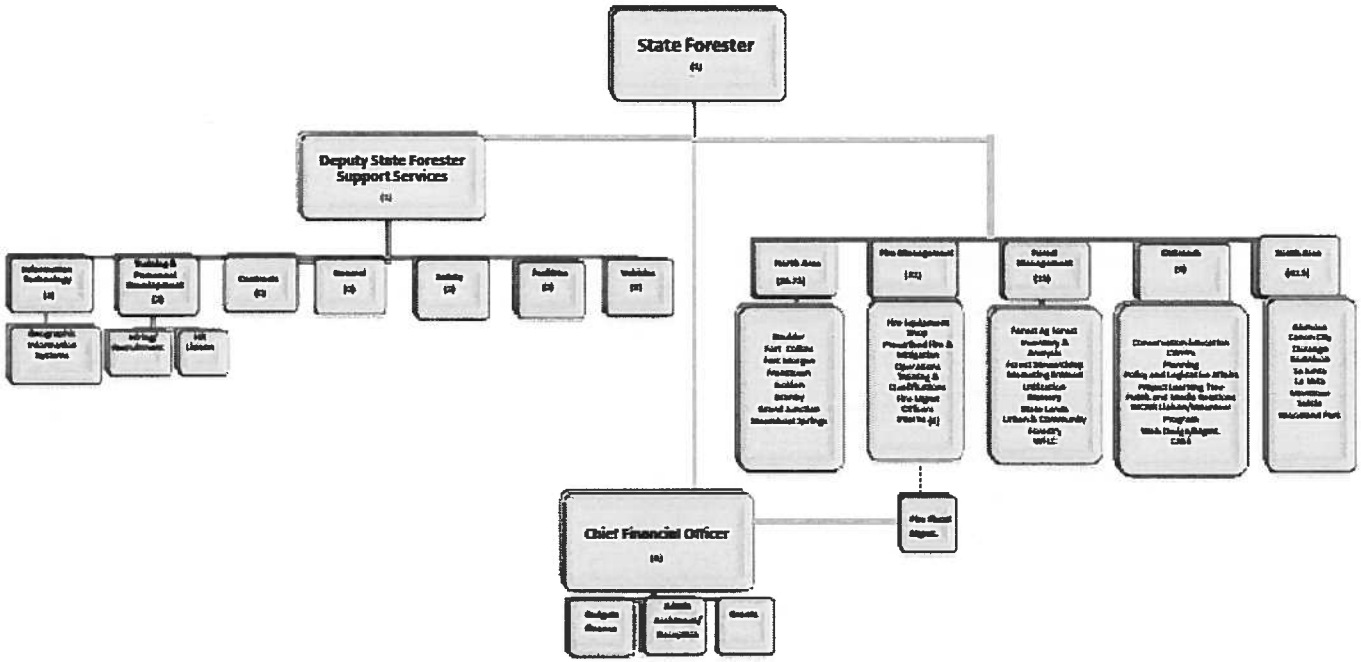
- **Divide up DEM / Office of Preparedness in CDPS**

One option considered was dividing the functions of the DEM in DOLA and those of the Office of Preparedness in CDPS to create new units. All response-related units could be housed within CDPS and all local support and assistance could be housed with DOLA. Drawbacks identified included creating new lines of accountability, likely adding new FTE, duplicating preparedness efforts in both departments, breaking apart functioning working relationships, requiring a switch between state agencies during the transition from response to recovery, and segmenting emergency response into two different state agencies. Ultimately the team agreed that the six functions of DEM work best in concert with one another, and separating them was not preferred.

APPENDIX F: CURRENT COLORADO STATE FOREST SERVICE ORGANIZATION CHART AND TOTAL FTE

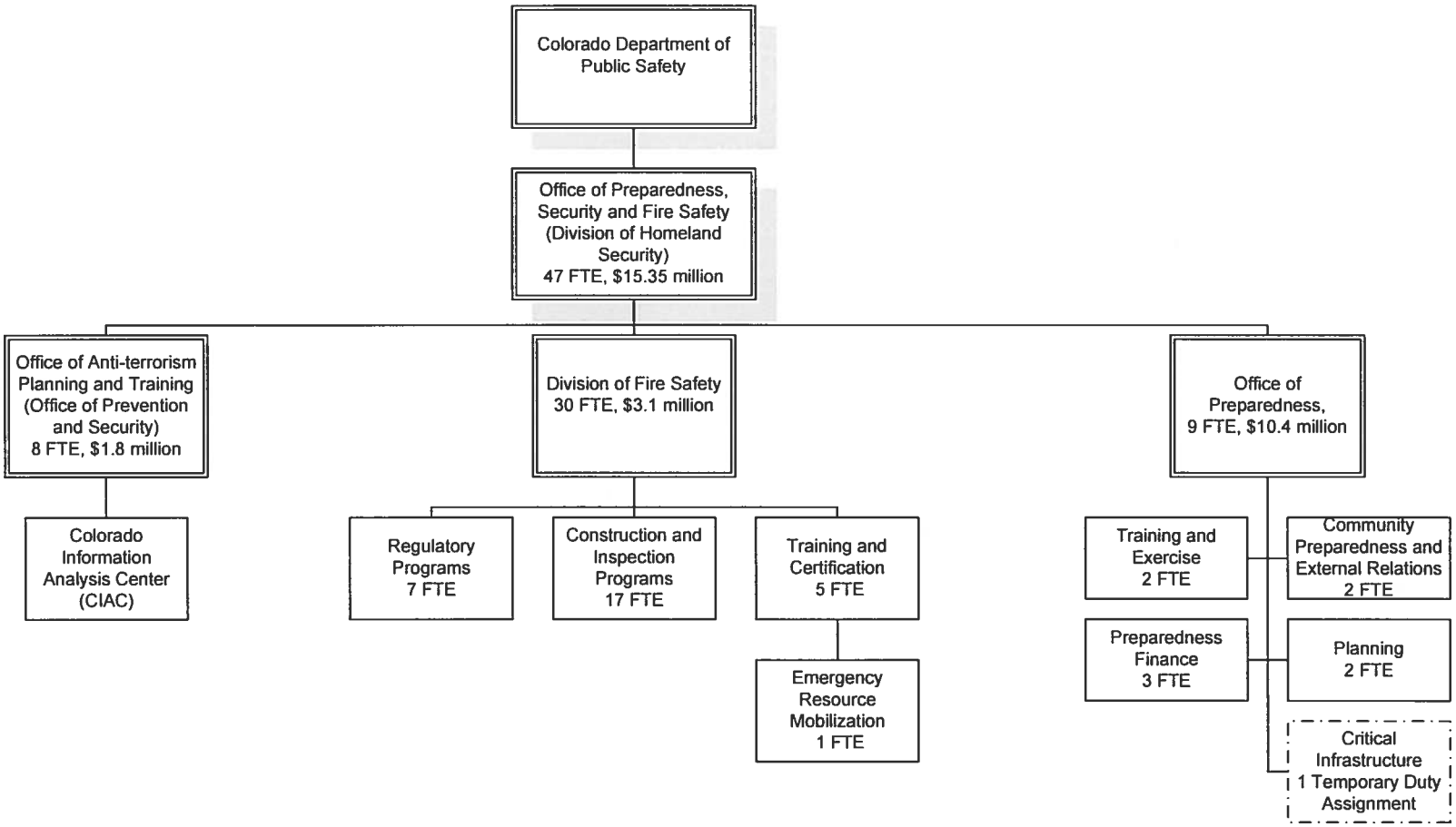
Colorado State Forest Service
Agency Organizational Chart
April 2012

Total Salaried FTE = (146.25)

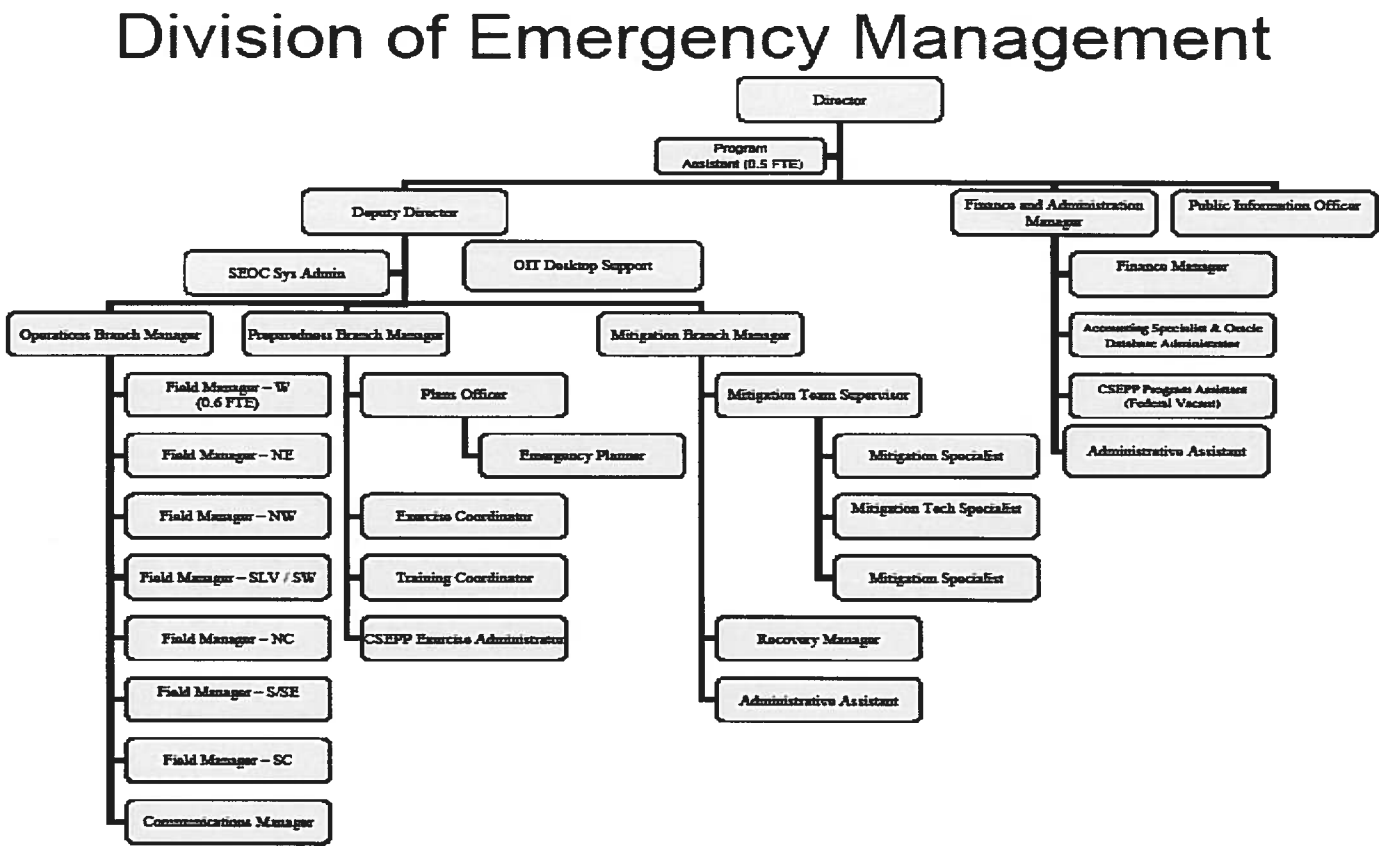


APPENDIX G: CURRENT COLORADO DEPARTMENT OF PUBLIC SAFETY ORGANIZATION CHART AND TOTAL FTE

Current Structure in CDPS



APPENDIX H: CURRENT DEPARTMENT OF LOCAL AFFAIRS ORGANIZATION CHART AND TOTAL FTE



DOLA/DEM Core Function Chart with FTE count and Cost per Function

- Plan- 0.95 FTE Maintain and Improve State Emergency Operations Plan; EMPG Grants to Local Govts for plans
- Organize and Equip - 0.4 FTE- maintain and improve SEOC communications and IT systems; EMPG Grants to Local Govts.
- Train - 0.45 FTE -EMPG Eligible Courses for State & Local Govt Officials;
- Exercise -0.95 FTE-Create and Execute State Exercises of the SEOC for CO specific hazards
- Evaluate/Improve - Assist Local Govts through EMPG grants and technical assistance with improving overall EM programs. 6.3 FTE calculated by labor hours of all Field Managers, EMPG Program Mgr. and Finance Chief
- Colorado Emergency Planning Commission -0.4 FTE
- Total 9.45 FTE, Personnel Cost including indirect (13%) = $960,320
- All Operating Costs = $317,420

Preparedness & Prevention:
9.45 FTE
Total Cost = $1,277,940

- State Level Preparedness (including all noted in the Preparedness Function)
- Grants and Preparedness Assistance (including all noted in the Preparedness Function) to the CSEPP County (Pueblo)
- Total 4.6 FTE
- Personnel Cost including indirect (17.9%) = $475,880 (diff indirect rate due to program rules)
- All Operating Costs = $163,840

Chemical Stockpile Emergency Preparedness Program (CSEPP):
4.6 FTE
Total Cost = $639,720

- Field Managers (FM) Assist Local Govts. with each activation 1.4 total FTE by labor hrs. spent by all FMs.
- Maintain Situational Awareness 0.7 FTE
- Coordinate State Level Response to Local Requests for Assistance
- Maintain SEOC and Operate during Disasters and Emergencies - 0.75 FTE hrs. spent during activations
- Most P&P and all CSEPP staff shift to Response during disasters
- Executive Order Management 0.05 FTE
- Soon to include Resource Mobilization (adds 1 FTE)
- Organize and Equip 1.05 FTE- maintain and improve SEOC communications and IT systems
- Total 3.95 FTE
- Personnel Cost including indirect (13%) = $371,700
- All Operating Costs= $133,110

Response:
3.95 FTE
Total Cost = $504,810

Colorado's Comprehensive Emergency Management Program

All Six Functions are Interconnected: Grand Total FTE 30.1, and $3,854,460

- State Hazard Mitigation Plan
- Chair the State Hazard Mitigation Team
- Oversee post-disaster mitigation operations and coordinate mitigation resources
- Conduct mitigation trainings, workshops, and exercises
- EMPG Grants to Local Governments for Plans & Projects
- Pre-Disaster Grants and Assistance to Local Governments for Plans & Projects
- Post-Disaster (Recovery) Grants and Assistance to Local Governments for Projects
- Total 4.55 FTE
- Personnel Cost including indirect (13%) = $393,910
- All Operating Costs= $153,590

Mitigation:
4.55 FTE
Total Cost =$547,500

- State Recovery Plan
- State Housing Task Force
- Coordinate State Recovery Assistance and all Recovery Support Functions
- Assist with Local Recovery from Disasters and Emergencies
- 0.95 total FTE during non-disaster periods
- All Grant Admin, Mitigation, and most P&P FTE shift to Recovery after a disaster
- Personnel Cost including indirect (13%) = $98,810
- All Operating Costs = $30,720

Recovery:
0.95 FTE
Total Cost = $129,530

- Issue and maintain all awards to Local Govts. and any other Grant recipients – Awards include:
  - EMPG - 110 Total Awards divided between 75 Annual Program Awards, 15 - Mitigation, and 20 - Projects; 7 Haz-Mat Prep Grants; 20 Pre-Disaster Mitigation; 10 - Response, usually CSFS and/or Nat. Guard; 3 or 4 Recovery with no Presidential Disaster; have had up to 350 awards for a Presidential Disaster Declaration
- Track all grants, budgets and performance periods
- Fiscal and Performance Monitoring and review of all Grants made by the DEM
- Meet all grant reporting requirements
- All Field Managers, Program staff and Managers, all Finance staff, and all Admin. staff participate in these processes – Total 6.6 FTE by total labor hours of all involved personnel
- Personnel Cost = $529,690
- All Operating Costs = $225,270

Grant Administration:
6.6 FTE
Total Cost = $754,960

April 16, 2012 - DEM

APPENDIX I: DOCUMENTS CONSULTED

Agreement for Cooperative Wildfire Protection in County, template agreement dated January 2003. Available from the Colorado State Forest Service.

Colorado All-Hazard Incident Management Team Training and Certification Program Advisory Committee Charter and Bylaws, 2009. Available from the Colorado Division of Emergency Management

Colorado State Forest Service Summary Report, February 1, 2012. Available from the Colorado State Forest Service

Colorado Statewide Cooperative Wildland Fire Management and Stafford Act Response Agreement, final June 1, 2011. Available from the Colorado State Forest Service.

FEMA – State Agreement – 2012, Fire Management Assistance Grant Program, State of Colorado, March 5, 2012. Available from the Colorado State Forest Service.

Great Plains Interstate Forest Fire Compact. See: http://csfs.colostate.edu/pdfs/2011-Great-Plains-Forest-Fire-Compact-AOP.pdf

Intergovernmental Agreement for Participation in the Colorado Emergency Fire Fund (EFF), template revised January 2012. Available from the Colorado State Forest Service.

Issue Brief: Colorado's Dysfunctional Emergency Resource Mobilization System Draft, April 4, 2012. Available from the Colorado State Fire Chiefs Association

Memorandum to Rich Homann – CSFS, Wildfire Partners Committee, and Emergency Fire Fund Committee, March 2, 2012. Available from the Colorado Division of Emergency Management

State of Colorado Emergency Operations Plan – 2010 Basic Plan Executive Summary. Available at: http://www.colorado.gov/cs/Satellite?c=Page&childpagename=DOLA-Main%2FCBONLayout&cid=1251595696267&pagename=CBONWrapper

State of Colorado Emergency Operations Plan – Wildfire Suppression Emergency Support Function #4a, November 2010. Available at: http://www.colorado.gov/cs/Satellite?c=Page&childpagename=DOLA-Main%2FCBONLayout&cid=1251595696267&pagename=CBONWrapper

State of Colorado Emergency Resource Mobilization Plan, April 2010. Available from the Colorado Division of Fire Safety.

Wildfire Emergency Response Fund (WERF) as published in the Colorado Revised Statutes

Wildfire in Colorado, Six Areas of Wildland Fire Management, March 2012. Available from the Colorado State Forest Service

APPENDIX J: CONGRESSIONAL LETTER REQUESTING REVIEW OF WILDLAND FIRE

April 16, 2012

Mr. Tom Tidwell
Chief, U.S. Forest Service
1400 Independence Ave., SW
Washington, D.C., 20250-0003

Dear Chief Tidwell:

As you know, on March 26th a fire occurred in the foothills of Jefferson County, Colorado. This fire, called the Lower North Fork fire, burned for a week and resulted in the tragic deaths of three people and the loss of 23 primary homes and the scorching of over 4,000 acres in a populated area near Conifer, Colorado. Thankfully, the fire is now contained and the process of reviewing its origin and the use of prescribed fire is underway. There are many other issues that have been raised that we believe warrant review as well.

We are writing to seek the U.S. Forest Service's (USFS) assistance to conduct an impartial and scientific review of this fire. We appreciate that the USFS Rocky Mountain Research Station did important reviews of the Hayman and Fourmile Canyon fires in Colorado and we are now seeking a similar review of this fire. The review is not only important given that the dry forest and climate conditions in Colorado present serious continued fire threats to communities but also because there has been a tragic loss of life.

As a result, we are seeking a similar comprehensive review by the Forest Service's Research branch of the Lower North Fork fire that would examine the factors that lead to its ignition, its behavior, the suppression response activities, the emergency response coordination, and the communication to the area residents on evacuation and information regarding the fire's threat.

In addition to scientific factors that were examined by those other fire reviews, given the loss of life and concerns raised by the residents affected by this fire, we feel it is imperative that the USFS Research branch include a formal review of the "human and social dimensions" of this fire as part of its review. Therefore, we feel it is important that this study involve the community affected by this fire in the review process, including a public involvement process and community meeting, in order to form a comprehensive understanding of what happened and how to prevent similar incidents in the future.

Specifically, we would like this review to address the following issues (this is not meant to be an exhaustive or exclusive list of topics):

- the activities and communications among emergency personnel at the local, state and federal levels, as well as the communications to residents about evacuation and information regarding this fire;

- the activities of fire crews and responders (and resources that were available) from the wildfire's initiation until full containment, including offers to provide assistance and how these resources were employed;
- the conditions—including fuel, forest structure, prior fuel treatment, topography, weather, wind, and land ownership—that affected fire behavior and intensity and to what extent did these factors influence where the fire stopped, how hot the fire burned, whether soil was damaged, etc.
- the effectiveness of thinning treatments and prescribed fire—including defensible space work and other wildfire mitigation activities around structures—in stopping or slowing the fire, reducing fire intensity and damage;
- the degree and under what circumstances firefighting activities were successful in limiting the spread of the fire; were aerial suppression resources timely, readily available and effective; to what extent was controlling the fire dependent on the weather; and
- the factors that influenced which structures burned.

We expect that you would incorporate the findings from all other available post-fire reviews, such as the prescribed fire independent review led by William Bass and the investigation underway by the Jefferson County Sheriff's Office.

As you know, it is imperative that we continue to reduce the risk of catastrophic fire in the ever-expanding wildland-urban interface. This important review will provide critical independent analysis so that we can learn from this fire and be better prepared and appropriately respond to future fires.

We would welcome the USFS Research branch review of this fire and stand ready to assist in this effort.

Sincerely,

John Hickenlooper
Governor

Mark Udall
U.S. Senator

Michael Bennet
U.S. Senator

Mike Coffman
U.S. Representative

JEFFERSON COUNTY SHERIFF'S OFFICE
REPORT #12-8273

Jefferson County Sheriff Office

12-8273

Supplement No
ORIG

Reported Date
03/26/2012
Nature Of Call
-AOA
Member#/Dept D#
SENSANO,MICHAEL

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	ORIG	03/26/2012	13:55

Status	Nature Of Call
OPEN - FORWARD TO INVESTIGATIONS	ASSIST OTHER AGENCY

Location	From Date	From Time
S. FOXTON RD/CTY HWY 96	03/26/2012	13:50

Member#/Dept ID#	Assignment	Entered by
5034/SENSANO,MICHAEL	PATROL MOUNTAIN WATCH A	5034

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	5040	04/03/2012	07:14:23

Person Summary

Invl	Invl No	Type	Name	MNI	Race	Sex	DOB
OTH	1	G	STATE FOREST SERVICE	1152610			
RP	1	B	NORTH FORK FIRE DEPT	99647			

Jefferson County Sheriff Office

OTHER 1: STATE FOREST SERVICE

Involvement	Invl No	Type	Name	MNI	PRN
OTHER	1	Government	STATE FOREST SERVICE	1152610	1453079

REPORTING PARTY 1: NORTH FORK FIRE DEPT

Involvement	Invl No	Type	Name	MNI
REPORTING PARTY	1	Business	NORTH FORK FIRE DEPT	99647

PRN
1453080

Type	Address	City
Work/Business	19384 CTY HWY 126	BUFFALO CRK

Date
03/26/2012

Phone Type	Phone No	Date
Business	[redacted]	03/26/2012

Narrative

On 032612 at approximately 1355 hours, I was advised by the Jefferson County Sheriffs Office that there was a smoke that was being observed around the Riley Peak area of the USFS. The caller who was at 13589 Callae Crt was reporting that the smoke was very thick.

I proceeded to the area when I heard dispatch say that North Fork Fire was enroute. I asked if they were able to check forest rd 538 which goes to the Riley Peak area and I would check the area from the Reynolds Reserve area north from the Long Gulch area.

This area was accessible from S. Foxton Rd and from the top there is a good unobscured view of the area.

I drove to the end and parked at the cul-de-sac and started to hike to the high point of Long Gulch. I also heard that Sgt Parr was enroute up to the
area so I had given him the combination to enter onto Reynolds Reserve via the locked gate.

When I got to the end I saw that the smoke was very heavy and that I recognized that area to be the Denver Water Board, Bannon Property. I also recognized that the area that was smoking had been the area of a prescribed fire which was operated by the State Forest Service Crew. From my vantage point I was able to see a white pick-up truck and it appeared to be a State Forest Service Vehicle. I did not see anyone in the area of the fire and I did not see any fire crews or fire vehicles in the area and the wind was blowing very hard. I was pushed off balance as I stood on the point.

By that time Sgt PARR had arrived. He also saw the fire and the smoke, I told him of what I believed to be a State Forest Service vehicle parked on the top pf the hill and west of the burn area. I still believed that the fire was consuming a lot of fuel and it was burning hard throwing up black smoke in the area. I then advised that I had believed this to be a prescribed fire. I then asked the Jefferson County Sheriffs' Office Dispatcher if she would check and see if the fire was contained. She replied a short time later. "Technically Not". I explained that that was a weird response and we looked at the fire which was described as only being a 5-10 acre fire. We believed that the fire had consumed more than 10 acres. I again looked for personnel but was unable to see any within the smoke area or the burn area.

We left the area to go down to the bottom to open the gate for responding personnel. Sgt PARR left heading north. I then observed a short time later, members from the Jefferson County Fire Mitigation Crew responding code to the area south of me.

I then met with Fire Fighter Joe PAGE and we drove back up to the area that I had been at earlier. There was a short delay being that there was vehicular problems of the Elk Creek Fire Dept. Jeep Cherokee but we did get up to the end of the roadway. The Fire Chief for North Fork Fire Dept, as well as Chief Ware from the Elk Creek Fire Dept. arrived a short time later and passed us proceeding to the end of the Reserve. After I assisted Firefighter Joe PAGE. we both got to the top as the other chiefs were leaving to set up fighting the fire. Firefighter Joe PAGE then moved to a lower point to be a "spotter" and I remained at the top.

Lt. ESTER and Sgt TABORSKY arrived and I pointed out the fire to them and explained that I believed that the fire was a State Forest Service Fire and I pointed out the area of the fire and its relationship to the residential area above it. The area being Ridge Rd and Kuehster Rd. I also explained that there were members of our fire

Jefferson County Sheriff Office

Narrative

mitigation crew within the burn area and that they had arrived some time before the Sgt and Lt arrival. I pointed out the firefighters on scene now and that there was a firefighter spotting on the lower ridge closer to the fire. I also explained that the path of travel could be based on the wind an the fact that there were canyons rising to the top of the ridge which are inhabited. Both Sgt TABORSKY and LT ESTER left the area as they were initiating evacuation plans.

I then proceeded to the area of the river and started to check the area. At approximately 1838 hours i arrived at 18475 S Platte River Rd. I noticed that the occupants were still at home and that there were members of Channel 9 News present filming.. I also noticed that the fire had crested the ridge and was starting to move down the ridge. The area had good defensible space but I still contacted the Jefferson County Sheriffs Office Dispatch to notify a fire crew to assist in structure protection of the residence and the surrounding area.

The North Fork Fire Dept Engine arrived and assisted me in removing flammable patio furniture from the deck area of the residence

The residents and the press crew (2 adult males) left the area. without incident.

I continued to check the area and I drove to the Dome Rock area where there were no signs of fire close by.

At approximately 1845 hours I then proceeded to the area of Kuehster to assist with additional evacuation as well as "Traffic Control Post" at the intersection of Pleasant Park/Oehlman Park.

I was relieved from this post at approximately 0145 hours on 032612. My shift ended at 0230

On 032712 at approximately 0700 hours I spoke to SGT PARR who requested CST assistance at KUEHSTER where Deputy BRUENING had high centered his patrol vehicle. I proceeded to the area and started to photograph the area under case number 12-8270.

[redacted]

At approximately 1640 hours the Jefferson County Sheriffs Office Dispatch advised to check 12839 S. Foxton due to the fact that there was possibly an irate adult male there due to the closure of the road. I checked and everything was fine.

I returned to the CTP at S Fixation and Running Deer and remained until 1845. My shift ended at 1930 hours.

On 032812, 032912, 033012, and 033112 I was assigned to rove the S. Platte of the North Fork due to the fact of road closures. During this time I also had conducted escorts of care providers to the Blackhawk Rd.

Also I transported two VMS boards to the S. Foxton Rd/US Hwy 285 post and the Buffalo Creek Board.

The S. Foxton Rd Section was reopened so VMS board 199 was transported to the "Com-Bus" on 040212 and the message was changed on VMS board 898 advising of the fire ban. It still is at Buffalo Creek on Cty Rd 96/Cty Rd 126.

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Jefferson County Sheriff Office

12-8273

Supplement No
0001

Reported Date
04/02/2012
Nature Of Call

Member#/Dept D#
BRUENING,DAVID

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0001	04/02/2012	11:12

Member#/Dept ID#	Assignment	Entered by
1552/BRUENING,DAVID	PATROL MOUNTAIN WATCH A	1552

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	5040	04/11/2012	16:01:21

Narrative

On Monday March 26, 2012 at about 5:50 p.m., Deputy R. Barnes, Deputy J. Hertel, Deputy J. Chrachol and I responded to the area of 14094 North Ranch Trail reference a forest fire on the home owner's property. There had been numerous reports of a large fire in the area and we were attempting home owner evacuations in the area. I was driving Jefferson County Patrol vehicle # 2498.

Once in the area, there were numerous small spot ground fires and near zero visibility due to smoke, ash and fire embers. As Deputy Barnes and Deputy Chrachol assisted the home owner at 14094 North Ranch Trail, Deputy Hertel and I attempted to evacuate homes on Eagle Vista Drive. At the intersection of Kuehster Road and Eagle Vista Drive, the fire was visibly in the trees and on the ground. Visibility was zero feet and the wind was blowing from the east at about 30 to 40 mph. I made the decision to turn around at the intersection for personal safety concerns of both Deputy Hertel and myself.

Deputy Hertel and I then returned to 14094 North Ranch Trail to assist that homeowner who was attempting to safe his live stock. After about 5 minutes, the home owner stated, "I'm not leaving, I've built this all by myself." We informed the homeowner that we could not make him leave but that due to our personal safety, we were going to evacuate the area.

At about 6:20 p.m., all four deputies got in our respective department vehicles and started back down Kuehster Road towards Pleasant Park Road. The visibility was again near zero due to smoke, ash and flames. I was the lead vehicle in the group of four as we headed down Kuehster Road. As we drove slowly down Kuehster, the wind driven smoke, ash and flames covered the road making navigation near impossible. With the zero visibility, I was only able to follow the mapping in my patrol vehicle to help navigate down the road.

At one point, I drove off the road and into a ditch. I was able to drive out of the ditch then immediately re-entered a ditch due to no visibility. As I was attempting to find the roadway, I veered farther off the left side of the road. At that point, the visibility was zero with heavy smoke, ash and flames surrounding my vehicle. I then attempted to drive forward to the right to get back on the roadway. I drove forward and drove into a small tree. I then attempted to back up and regain some bearing. As I drove back, I drove over what appeared to be numerous rocks causing the vehicle to high-center on a large rock. I attempted to drive forward again but the vehicle was stuck and would not move.

At that point, fearing for my personal safety, I aired over the radio "I need help." The vehicle was surrounded by flames and smoke and I had no visual on any of the other vehicles that were following me. Within about 1 minute, Deputy Chrachol aired that he was on the road behind my location just to the right. I was able to see the emergency lights of his vehicle and I abandoned vehicle 2498 and ran to Deputy Chrachol's vehicle. I was able to retrieve the keys for 2498 and kept them with me. Deputy Barnes who was the third vehicle in the line then aired that we were cut off by the fire and we were returning to the North Ranch Trail area for safety.

All three vehicles and the four deputies were able to drive back to 14186 Kuehster Road and we parked in an open field at the residence. About 10 minutes later, Fire Department brush truck crew was able to reach our location. The decision was made to evacuate our locate and drive back down Kuehster Road. The fire crew confirmed that the fire had pushed over the road at the location of my vehicle and the road was passable. We

Jefferson County Sheriff Office

Narrative

then followed the brush truck back down Kuehster Road where the fire crew stopped at the intersection of Kuehster Road and Elk Ridge Road. The three Jefferson County vehicles continued down Kuehster Road safely.

I remained at the intersection of Kuehster Road and Pleasant Park Road and assisted with traffic control for the remainder of the evening. I was relieved from my location at about 11:30 p.m.

Jefferson County Sheriff Office

12-8273

Supplement No
0002

Reported Date
04/02/2012
Nature Of Call

Member#/Dept D#
FEHRINGER,WENDY

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0002	04/02/2012	11:46

Member#/Dept ID#	Assignment	Entered by
1631/FEHRINGER,WENDY	PATROL MOUNTAIN WATCH A	1631

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	5046	04/02/2012	21:13:57

Narrative

On March 26,2012 at about 5:02 p.m. Jefferson County Dispatch initiated reverse 9-1-1 with an evacuation 2 mile radius from Kuehster and Arrowhead Springs Trail reference a Wildland Fire. The evacuation was mandatory and the evacuation site was Conifer High School. I was enroute to Conifer High School at about 5:16 p.m. and arrived at about 5:34 p.m. Bill Robbins, of Jefferson Schools Security, arrived at about the same time.

Evacuees began arriving at about 5:50 p.m.

Red Cross volunteers began arriving at about 6:05 p.m.

I attempted to provide information to the evacuees the best I could and requested copies of maps from the Conifer High School library staff.

I was relieved by Deputy Jeff Krage and Deputy Scott Stephens at about 10:00 p.m. I returned to the Mountain Substation to wait for Sergeant James Parr and the rest of my team.

Everyone was accounted for and cleared the Mountain Substation at about 11:19 p.m.

Disposition: Closed

Jefferson County Sheriff Office

12-8273

Supplement No
0003

Reported Date
04/09/2012
Nature Of Call

Member#/Dept D#
BARNES,RANDAL

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0003	04/09/2012	07:35

Member#/Dept ID#	Assignment	Entered by
0156/BARNES,RANDAL	PATROL MOUNTAIN WATCH A	0156

RMS Transfer	Approving Officer	Approval Date	Approval Time
Pending	5040	04/09/2012	13:04:55

Assisting Deputy	Assisting Deputy	Assisting Deputy
DEPUTY DAVE BRUENING	DEPUTY JASON HERTEL	DEPUTY WENDY FEHRINGER
Assisting Deputy	**Assisting Deputy**	**Assisting Deputy**
DEPUTY JERRY CHRACHOL	SERGEANT MIKE RUBENSTEIN	CAPTAIN DELL KLEINSCHMIDT
Assisting Deputy		
DEPUTY MIKE SENSANO		

Narrative

On 03-26-2012 at about 1700 hours myself, Deputy Bruening, Deputy Hertel, Deputy Fehringer was at the Mountain Precinct waiting to see if we were needed to assist on the fire at in the Pike National Forest off of Foxton, later identified as the Lower North Fork Fire. Sergeant Parr advised that the reverse 911 was actuated and told us to respond to the fire.

I advised Sergeant Parr that I was familiar with the area and that I would respond there to start evacuations. Deputy Hertel and Deputy Bruening followed me. We activated our emergency equipment, (lights and sirens). Deputy Fehringer was asked to respond to Conifer High School to assist with the evacuees.

JCSO Dispatch advised that evacuations had started on Kuester Road. I asked how many deputies were on Kuester Road to evacuate. JCSO dispatch said only one. I advised dispatch that we would respond to Kuester Road.

We arrived in the area at about 1750 hours. JCSO dispatch advised of a 911 call stating a man was trapped on North Trail Court. On arrival in the area there were trees burning on both sides of Kuester road as well as a lot of smoke. Driving was slow due to the lack of visibility. While driving to North Trail Court we meet up with Deputy Chrachol,Jerry. The 4 of us drove to North Trail Court. I asked Deputy Hertel and Bruening to start the evacuations on North Trail while Deputy Chrachol and I look for the man that was trapped. I contacted a female who said she was the wife of the man located at 13874 North Trail Court. She told me that he was trying to gather up the live stock. I told her to leave the area and that we would help him. The man later identified as James Chambers was at the rear of the residence trying to load several horses in a trailer. I told James that he needed to leave. He said he wasn't going to leave without his horses. Deputy Chrachol and I stayed and assisted him for about 10 minutes. I told him that he needed to leave immediately. He said "no" I got his name and date of birth. I gave that information to JSCO dispatch and advised that he was a refusal.

Deputy Bruening and Hertel arrived just as we were leaving. Deputy Bruening said that the fire was heading straight for us. We all felt that it was time to clear out. Deputy Bruening was in the lead car and started out towards Pleasant Park Road by way of north Kuester Road. Deputy Chrachol was 2nd with Deputy Hertel in third and I was at the rear.

There was fire on both sides of the road. I could see houses burning. The smoke was so bad that I could not see the road or the vehicle in front of me. We all had our emergency lights activated. I opened my driver side window to see if I could see the ditch so I could use that as a reference to stay on the road. My vehicle immediately filled up with black smoke and burning embers.

At about 1826 hours Deputy Bruening advised that he had driven his vehicle off of the road and was stuck. He said that he was in trouble. We could not see him and he could not see our lights. Deputy Chrachol and myself

Jefferson County Sheriff Office

Narrative

used our spotlights but could not find him. Sergeant Rubenstein asked us to activate our sirens hoping that Deputy Bruening could hear the sirens. A couple of minutes later Deputy Chrachol and myself saw Deputy Bruening's vehicle. Deputy Chrachol used his car radio and guided Deputy Bruening to his patrol vehicle. Deputy Bruening got out of his vehicle and joined Deputy Chrachol in his. We all turned around and headed back the same way we started. The fire was too intense to continue on North Kuester Road.

Sergeant Rubenstein, Captain Kleinshmidt as well as Deputy Sensano lead us out of the burn area and to an open field using mapping and our GPS coordinates. I was told to continue south on Kuester that there was an open field. We all ended up at 14206 Kuester Road. There was a large area where the fire had already been. Next to the field was a log home. Next to the log home was a clump of trees and a wood pile completely engulfed in flames. I grabbed the garden house while deputy Bruening turned on the water. We both tried to put out the fire but the water pressure was very low. Soon after 2 members of the fire department arrived and put water on the fire.

Several minutes after the fire department arrived we all heard a very loud noise. It sounded like a jet was right over the top of us. A member of the fire department told me that the fire was exploding and that we needed to leave the area. The four of us headed back down Kuester Road. The smoke was not as bad. We were able to see the road and drive out of the area.

The media was parked on Kuester road and Pleasant park road. Several members of the media was trying to interview home owners. Several fights almost broke out. I talked to the media and asked them to leave the homeowners alone during this troubled time. They agreed too talk to the homeowners only if they agreed. I talked to as many of the homeowners as I could and tried to give them as much information as I could about where the fire was. I asked them to leave the area for their safety and go to Conifer High School where they could get updated information.

Deputy Bruening joined me in my patrol unit and we drove back up Kuster to continue the evacuations. We cleared the area at about 0030 hours on 03-27-2012.

Jefferson County Sheriff Office

Reported Date
04/09/2012
Nature Of Call

Member#/Dept D#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0004	04/09/2012	13:26

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/09/2012	14:50:17

Narrative

PHONE INTERVIEW WITH CURT ROGERS

On April 3, 2012, at about 2:24 p.m., I conducted a phone interview with Curt Rogers, Fire Chief for the North Fork Fire Department, as part of the investigation into the origin and cause of the Lower North Fork Fire (LNF).

During my interview with Chief Rogers, we spoke about his response for assistance to the prescribed burn area on Denver Water Board property on March 26, 2012. On that day North Fork Fire personnel were dispatched to the Denver Water Board Property by the Jefferson County Sheriff's Office Dispatch, to assist the Colorado State Forest Service with a "slop over" in the prescribed burn area. When Chief Rogers arrived at the prescribed burn area he observed a Colorado State Forest Service "engine" engaged in fire suppression along the dirt road on the property. As he continued in he observed "multiple spot fires" on the northeast end of the burn unit. As additional NFFD fire personnel arrived, they began to assist with extinguishing spot fires in the area. At that time, Chief Rogers spoke with the CSFS Forester Kevin Michalak, and discussed concerns that the fire was becoming a much larger event. It was determined that the request for a Type 3 Incident Management Team (IMT) be made. Chief Rogers estimated that the fire had spread to approximately five acres at that time.

I asked Chief Rogers if he had made the request to the Jefferson County Sheriff's Office for the Type 3 IMT and he stated he did, but that he believed CSFS had already made the request.

Chief Rogers stated that while he was on scene the wind was "extremely strong" and that one of the firefighters working on a NFFD engine had used either a Kestrol or a Sky Master to take a wind measurement. According to Rogers the wind measurement showed the wind to be sustained at 50 mph from the southwest, with stronger gusts.

Chief Rogers, Michalak and Elk Creek Fire Department Fire Chief Bill McLaughlin went to the end of Platte View Rd., to look over the fire. Rogers stated that it was difficult to see the exact spread of the fire due to heavy smoke; however they could tell that the fire was progressing rapidly. At that time they identified a drainage area in the valley as the "trigger point", which Rogers explained was a term used to identify a progression point in a Wild land Fire where if reached by the fire, evacuation requests would be made. They then returned to the Denver Water Board property.

While speaking with Chief Rogers, I asked him if he knew of any Burn Permits in the NFFD district and he stated he did not. He went on to explain that Burn Permits are issued by the Jefferson County Health Department and signed off on by the Fire Department.

I also asked Chief Rogers if he had responded up to the area of the Reynolds Park Fire on March 23, 2012. He stated that he did and that he believed the fire cause included some type of human activity, although he could not specify exactly what had caused the fire. I asked him if he believed the LNF fire and the Reynolds Park fire could be linked and he stated that it was highly unlikely. Chief Rogers did not indicate that evidence of a campfire was found near the Reynolds Ranch Fire.

Chief Rogers was also asked if the NFFD had been dispatched to any smoke or fire investigation between March 23rd and March 26th. Chief Rogers recalled the Reynolds Park Fire as well as a smoke investigation call coming

Jefferson County Sheriff Office

Narrative

from the prescribed burn area on March 24th, 2012. He stated that they contacted the CSFS and were advised that the smoke coming from the burn area was well within the black.

DISPOSITION: Open

Jefferson County Sheriff Office

12-8273

Supplement No
0005

Reported Date
04/09/2012
Nature Of Call

Member#/Dept D#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0005	04/09/2012	13:27

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/09/2012	13:42:03

Narrative

PHONE INTERVIEW WITH MICHAEL MULVANEY

On April 5, 2012, I conducted a phone interview with Michael Mulvaney, DOB/ [redacted], regarding a fire in Reynolds Ranch Open Space Park he had witnessed on March 23, 2012.

In speaking with Mulvaney, he stated that on March 23, 2012, he was hiking along Eagle View Trail, when he observed a fire in a dead tree and an approximately 20 foot and 60 foot area of grass burned out. Mulvaney hiked out of the area and drove to where he had cell phone coverage and called the JCSO Dispatch Center.

When Mulvaney contacted dispatch he stated that the call taker thought he was talking about the prescribed burn and he stated that it was not the same area.

I asked Mulvaney about his statement to the call taker that the he could see where there was a campfire. Mulvaney stated he saw what appeared to him as a fire ring made of rocks near the tree and he believed embers from that fire caused the tree to burn. He went on to say that he hikes the Eagle View Trail once a week and he did not see the rock ring there the week prior.

Mulvaney had no additional information regarding the incident and I ended the interview at that time.

DISPOSITION: Open

Jefferson County Sheriff Office

12-8273

Supplement No
0006

Reported Date
04/09/2012
Nature Of Call

Member#/Dept D#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0006	04/09/2012	13:28

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/09/2012	13:43:09

Narrative

CBI ARSON TIP LINE FOLLOW UP

On March 29, 2012, I received an e-mail from CBI Fire Investigator Jerry Means regarding an Arson Hotline tip they had received on March 29, 2012, at 6:45 a.m.

The caller, who had identified himself as Bill Tyler, stated that he had a "hunch" about the cause of the Lower North Fork Fire. Further details sent in the e-mail by the call taker stated the caller had hunches about the cause of this fire, relating back to fires last year starting by the road sides from Parker Road south to Colorado Springs, and the fire last year in Boulder.

On March 31, 2012, I called Tyler and left him a voice mail with my contact information, so that I could speak with him regarding the Arson Hotline call.

On April 2, 2012, I received a phone call from Tyler on my department issued cell phone. In speaking to Tyler he stated that he had a "hunch" about several fires that had occurred in the last year along roadsides in Jefferson County as well as fires along Parker Road, all the way to Colorado Springs. Tyler went on to say that his "hunch" came from information he had gathered from watching the news, which indicated several fires had occurred along roadsides and appeared to be 15 minutes apart. As part of his "hunch" Tyler also mentioned the "large" fire in Jefferson County last year, which I took as the Indian Gulch Fire, as also having occurred on the roadside.

Tyler had no specific information in regards to locations, dates of fires or cause, but it was his belief that an individual was going around and lighting fires.

Of the fires mentioned by Tyler having occurred in Jefferson County "along the roadway", the cause was identified as a faulty catalytic converter. Other fires, including the Indian Gulch Fire the area of origin was identified as being off any major roadway. I have no knowledge of the fires along Parker Road.

At this time there is no addition follow up to be conducted regarding the information provided by Tyler.

DISPOSITION: Open

Jefferson County Sheriff Office

12-8273

Supplement No
0007

Reported Date
04/11/2012
Nature Of Call

Member#/Dept D#
HERTEL,JASON

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0007	04/11/2012	12:38

Member#/Dept ID#	Assignment	Entered by
1520/HERTEL,JASON	PATROL MOUNTAIN WATCH A	1520

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	5040	04/11/2012	16:11:33

Narrative

On Monday March 26, 2012 at about 5:50 p.m I responded to the area of 14094 North Ranch Trail reference a forest fire on the home owner's property. There had been numerous reports of a large fire in the area and we were attempting home owner evacuations in the area.

Once in the area, there were numerous small spot ground fires and near zero visibility due to smoke, ash and fire embers. As Deputy Barnes and Deputy Chrachol assisted the home owner at 14094 North Ranch Trail, I attempted to evacuate homes on Eagle Vista Drive. At the intersection of Kuehster Road and Eagle Vista Drive, the fire was visibly in the trees and on the ground. Visibility was zero feet and the wind was blowing from the east at about 30 to 40 mph.

I then returned to 14094 North Ranch Trail to assist that homeowner who was attempting to save his live stock. After about 5 minutes, the home owner stated, "I'm not leaving, I've built this all by myself." We informed the homeowner that we could not make him leave but that due to our personal safety, we were going to evacuate the area.

At about 6:20 p.m., I got into my department vehicle and started back down Kuehster Road towards Pleasant Park Road. The visibility was again near zero due to smoke, ash and flames. I was the second vehicle in the group of four as we headed down Kuehster Road.

As we drove slowly down Kuehster, the wind driven smoke, ash and flames covered the road making navigation near impossible. With the zero visibility, I was only able to follow Deputy Breuning by seeing his overhead emergency lights at times. He was the lead car at this time.

Deputy Breuning drove off the road and into a ditch. I could no longer see his vehicle when this happened. I could no longer see the road when this happened. As I was attempting to find the roadway, I was only able to see the sides of the road and could tell I was at an intersection. I decided at this point to stop and wait for Deputy Breuning to return to my location and attempted to turn my patrol car around to head out of the fire and smoke. At that point, the visibility was zero with heavy smoke, ash and flames surrounding my vehicle. I heard Deputy Breuning say over the radio "I need help." At this point I asked Deputy Breuning if he could see my lights. He did not reply. Within about 1 minute, Deputy Charachol aired that he was on the road behind Deputy Breuning's location just to the right.

Deputy Barnes who was the third vehicle in the line then aired that we were cut off by the fire and we were returning to the North Ranch Trail area for safety.

All three vehicles and the four deputies were able to drive back to 14186 Kuehster Road and we parked in an open field at the residence. About 10 minutes later, Fire Department brush truck crew was able to reach our location. The decision was made to evacuate our location and drive back down Kuehster Road. The fire crew confirmed that the fire had pushed over the road at the location of my vehicle and the road was passable.
We then followed the brush truck back down Kuehster Road where the fire crew stopped at the intersection of Kuehster Road and Elk Ridge Road. The three Jefferson County vehicles continued down Kuehster Road safely.

I remained in the area and assisted with traffic control for the remainder of the evening. I was relieved from my

Jefferson County Sheriff Office

Narrative

location at about 11:30 p.m.

Jefferson County Sheriff Office

Reported Date
04/11/2012
Nature Of Call
-AOA
Member#/Dept D#
IRELAND,KATHLEEN

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0008	04/11/2012	13:38

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1801/IRELAND,KATHLEEN	INVESTIGATIONS PERSONS CRIMES	1801

RMS Transfer	Prop Trans Stat	Property?	Approving Officer	Approval Date
Successful	Successful	None	0057	04/11/2012

Approval Time
13:59:09

Narrative

PHOTOLOG

DATE: March 30, 2012
ARRIVAL: Approximately 10:30 AM
CLEAR: Approximately 3:30 PM

LOCATION OF RESPONSE: Various locations, Jefferson County, Colorado

CAMERA: DIGITAL- Nikon D-60
START TIME: Approximately 10:46 AM
END TIME: Approximately 3:15 PM

PHOTO LOG
1. Case placard for 13579 Rocky Top Trail
2. 13579 Rocky Ridge Road
3. 13579 Rocky Ridge Road
4. 13579 Rocky Ridge Road
5. 13579 Rocky Ridge Road
6. 13579 Rocky Ridge Road
7. 13579 Rocky Ridge Road
8. Correction Placard for 13579 Rocky Ridge Road
9. Case placard for Rocky Top Trail - possibly 18776 Rocky Top Trail
10. Rocky Top Trail- possibly 18776
11. Rocky Top Trail- possibly 18776
12. Rocky Top Trail- possibly 18776
13. Rocky Top Trail- possibly 18776
14. Rocky Top Trail- possibly 18776
15. Rocky Top Trail- possibly 18776
16. Rocky Top Trail- possibly 18776
17. Rocky Top Trail- possibly 18776
18. Rocky Top Trail- possibly 18776
19. Rocky Top Trail- possibly 18776
20. Rocky Top Trail- possibly 18776
21. Electric meter # 291644/61533988
22. Electric meter # 291644/61533988
23. Property with above meter number on Rocky Top Trail
24. Property with above meter number on Rocky Top Trail
25. Property with above meter number on Rocky Top Trail

Jefferson County Sheriff Office

Narrative

26. Property with above meter number on Rocky Top Trail
27. Property with above meter number on Rocky Top Trail
28. Property with above meter number on Rocky Top Trail
29. Property with above meter number on Rocky Top Trail
30. Property with above meter number on Rocky Top Trail
31. Property with above meter number on Rocky Top Trail
32. Case placard with above meter number
33. Case placard- unknown address on Rocky Top Trail with meter number 291 679/61534023
34. Property with above meter number on Rocky Top Trail
35. Meter at above property
36. Property with above meter number on Rocky Top Trail
37. Property with above meter number on Rocky Top Trail
38. Property with above meter number on Rocky Top Trail
39. Property with above meter number on Rocky Top Trail
40. Property with above meter number on Rocky Top Trail
41. Property with above meter number on Rocky Top Trail
42. Property with above meter number on Rocky Top Trail
43. Property with above meter number on Rocky Top Trail
44. Property with above meter number on Rocky Top Trail
45. Property with above meter number on Rocky Top Trail
46. Placard with meter number for above property
47. Placard for 13657 Rocky Top Trail
48. 13657 Rocky Top Trail
49. 13657 Rocky Top Trail
50. 13657 Rocky Top Trail
51. 13657 Rocky Top Trail
52. 13657 Rocky Top Trail
53. 13657 Rocky Top Trail
54. 13657 Rocky Top Trail
55. 13657 Rocky Top Trail
56. 13657 Rocky Top Trail
57. 13657 Rocky Top Trail
58. 13657 Rocky Top Trail
59. Placard for 18006 Rocky Top Trail
60. 18006 Rocky Top Trail
61. 18006 Rocky Top Trail
62. 18006 Rocky Top Trail
63. 18006 Rocky Top Trail
64. 18006 Rocky Top Trail
65. 18006 Rocky Top Trail
66. 18006 Rocky Top Trail
67. 18006 Rocky Top Trail
68. 18006 Rocky Top Trail
69. 18006 Rocky Top Trail
70. Placard for 17986 Rocky Top Trail
71. 17986 Rocky Top Trail
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79. 17986 Rocky Top Trail

Jefferson County Sheriff Office

Narrative

80. 17986 Rocky Top Trail
81. 17986 Rocky Top Trail
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83. 17986 Rocky Top Trail
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90. 17986 Rocky Top Trail
91. 17986 Rocky Top Trail
92. 17986 Rocky Top Trail
93. 17986 Rocky Top Trail
94. Placard for outbuildings for 17986 Rocky Top Trail
95. Outbuildings for 17986 Rocky Top Trail
96. Outbuildings for 17986 Rocky Top Trail
97. Outbuildings for 17986 Rocky Top Trail
98. Outbuildings for 17986 Rocky Top Trail
99. Outbuildings for 17986 Rocky Top Trail
100. Outbuildings for 17986 Rocky Top Trail
101. Outbuildings for 17986 Rocky Top Trail
102. Outbuildings for 17986 Rocky Top Trail
103. Outbuildings for 17986 Rocky Top Trail
104. Outbuildings for 17986 Rocky Top Trail
105. Outbuildings for 17986 Rocky Top Trail
106. Outbuildings for 17986 Rocky Top Trail
107. Outbuildings for 117986 Rocky Top Trail
108. Placard for Kuehster Road (13637)
109. 13637 Kuehster Road
110. 13637 Kuehster Road
111. 13637 Kuehster Road
112. 13637 Kuehster Road
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124. 13637 Kuehster Road
125. 13637 Kuehster Road
126. 13637 Kuehster Road
127. 13637 Kuehster Road
128. 13637 Kuehster Road
129. Placard for 13647 Kuehster Road
130. 13647 Kuehster Road
131. 136 47 Kuehster Road
132. 13647 Kuehster Road
133. 13647 Kuehster Road

Jefferson County Sheriff Office

Narrative

134. 13647 Kuehster Road
135. 13647 Kuehster Road
136. 13647 Kuehster Road
137. 13647 Kuehster Road
138. 13647 Kuehster Road
139. 13647 Kuehster Road
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142. 13647 Kuehster Road
143. 13647 Kuehster Road
144. 13647 Kuehster Road
145. 13647 Kuehster Road
146. 13647 Kuehster Road
147. Placard for 13697 Arrowhead Springs Trail
148. 13697 Arrowhead Springs Trail
149. 13697 Arrowhead Springs Trail
150. 13697 Arrowhead Springs Trail
151. 13697 Arrowhead Springs Trail
152. 13697 Arrowhead Springs Trail
153. 13697 Arrowhead Springs Trail
154. 13697 Arrowhead Springs Trail
155. 13697 Arrowhead Springs Trail
156. Placard for 13657 Kuehster Road
157. 13657 Kuehster Road
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171. 13657 Kuehster Road
172. 13657 Kuehster Road
173. 13657 Kuehster Road
174. Placard for 13801 Kuehster Road
175. 13801 Kuehster Road
176. 13801 Kuehster Road
177. 13801 Kuehster Road
178. 13801 Kuehster Road
179. 13801 Kuehster Road
180. 13801 Kuehster Road
181. 13801 Kuehster Road
182. Placard for 13807 Kuehster Road
183. 13807 Kuehster Road
184. 13807 Kuehster Road
185. 13807 Kuehster Road
186. 13807 Kuehster Road
187. 13807 Kuehster Road

Jefferson County Sheriff Office

Narrative

188. 13807 Kuehster Road
189. 13807 Kuehster Road
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192. 13807 Kuehster Road
193. 13807 Kuehster Road
194. 13807 Kuehster Road
195. 13807 Kuehster Road
196. 13807 Kuehster Road
197. 13807 Kuehster Road
198. Placard for 13097 Arrowhead Springs Trail
199. 13097 Arrowhead Springs Trail
200. 13097 Arrowhead Springs Trail
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202. 13097 Arrowhead Springs Trail
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219. 13097 Arrowhead Springs Trail

NARRATIVE:

On March 30, 2012, I received a request from Captain John Mayns to respond to the Incident Command Center for the Lower North Fork Fire, at the Conifer High School. At approximately 8:10 AM, I met with Captain Mayns at the Command Center. Captain Mayns asked that I contact Jefferson County Sheriff's Office Investigator Don Roach and work with him and West Metro Fire Rescue Lieutenant Bill Maron and Colorado Bureau of Investigation Agent and Arson Investigator Jerry Means in locating and photographing the various residences and outbuildings that had suffered damage in the Lower North Fork Fire.

I met with Investigator Roach, Lieutenant Maron and Agent Means at the Command Center. It was decided that Lieutenant Maron and I would start at one end of Kuehster Road and Agent Means would start at the other end and work our way toward each other. As we travelled these areas Investigator Roach asked that I take photographic documentation of the damaged structures and surrounding areas.

At approximately 10:46 AM, I began taking the above listed photographs of the structures and surrounding areas as requested. As I drove and stopped and took photographs of the area, Lieutenant Maron acted as navigator, locating the various properties on a map as much as possible. At some of the properties we were unable to locate any type of physical address and in the cases where electric meters were located, we documented the electric meter number, in the hopes of later being able to determine the physical address by cross referencing with Intermountain Rural Electric Association records. I completed taking the above listed photographs at approximately 3:15 PM. When completed I returned to the

Jefferson County Sheriff Office

Narrative

Incident Command Center and then to the Jefferson County Sheriff's Office, where I submitted the flashcard containing the above photographs to the Crime Lab for processing.

DISPOSITION:

Open

Jefferson County Sheriff Office

Reported Date
04/17/2012
Nature Of Call
-AOA
Member#/Dept D#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0009	04/17/2012	06:31

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	12:31:52

Narrative

REVIEW OF PRESCRIBED FIRE PLAN

On March 22, 2012, the Colorado State Forest Service conducted a Prescribed Burn on Denver Water Board property Unit #4, located off of Foxton Road.

As part of the investigation into the Lower North Fork Fire, I reviewed the procedures followed by the Colorado State Forest Service (CSFS) for this project, in comparison to the guidelines set forth in the National Wildfire Coordination Group (NWCG) Planning and Implementation Guide and the NWCG Prescribed Fire Complexity Rating System Guide.

At the time of the review I was unable to locate a copy of the 2002 NWCG Prescribed Fire Complexity Rating System Guide used in determining the complexity rating for the CSFS Lower North Fork project. Therefore, the complexity rating was compared to the 2004 NWCG Prescribed Fire Complexity Rating System Guide.

The following is a summary of the review:

Planning: The planning of the Lower North Fork (LNF) prescribed burn area was prepared in 2006 by James B. Webb, Forest Stewardship Concepts Ltd., a contracted company with the Colorado State Forest Service (CSFS). A revision to the burn plan dated October 12, 2011, was reviewed and approved by CSFS District Forester Allen Gallamore and CSFS Area FMO Vaughn Jones as well as phone notifications to Tim Foley of the changes.

The original prescribed burn plan prepared in 2006 was approved on October 9, 2009. The prescribed burn plan shows that it is valid for 5 years after approval.

(Information regarding the prescribed burn plan review, recommendations and approval can be found on page 1.)

Objective: The objectives for the LNF prescribed burn area are to restore forest health and vigor and to reduce wildfire hazard.

(Objectives for the prescribed burn can be found on page 3)

Complexity Elements Worksheet: The prescribed fire complexity rating for the LNF prescribed burn project shows an overall rating of **Moderate.** It is unknown if the complexity rating was completed for the entire project or for each individual burn unit.

Of the 15 elements listed in the Prescribed Fire Complexity Rating Guide 13 area listed as moderate in the three categories of Risk, Potential Consequences and Technical Difficulty. One element, Fire Treatment Objectives is listed as High in only the risk category and one, Ignition Procedures/Methods is listed as low in all three categories.

The Fire Complexity Rating Rationale was not included in the prescribed burn plan, so I was unable to review the processes completed by the preparer when rating the 15 complexity elements.

Jefferson County Sheriff Office

Narrative

Notifications: The prescribed fire plan includes a notification list that includes local Law Enforcement Agencies, to include the Jefferson County Sheriff's Office as well as the surrounding Fire Protection Districts, including the North Fork Fire Department, Elk Creek Fire Department, and Inter-Canyon Fire Department, all of which incorporate or border the burn area.

Jefferson County Dispatch records show that on March 22, 2012, at about 7:23 a.m., the Sheriff's office was advised of the prescribed burn.

Also included in the notification is a Press Release sent created by the CSFS as well as Variable Messaging Signs (VMS) posted on S. Foxton Road and Platte River Road.

(Notifications can be found on pages 6 and 7 of the prescribed burn plan)

Smoke Management: The Smoke Permit for the Unit 4 project was obtained on or around January 23, 2012

(See Smoke Permit for details)

Workforce and Equipment Requirements: The workfore requirements for the prescribed burn met or exceeded the minimum requirements established in the Prescribed Fire Burn Plan.

See case report attachment Workfore Table for details.

Prescribed Fire Mop-Up Plan: The prescribed fire Mop-Up plan includes the Extended Mop-Up and Patrol Plan. This portion of the plan identifies "most prescribed burns do not escape on the day of ignition. They usually kick up **during a wind event a day or two following the burn** or creep underground or across the line in some dry organic material."

There is also a special wind note in the plan, which states "If high winds are predicted (CSFS personnel will be notified via radio or pager by NWS or Jeffco Dispatch) or are actually occurring in the area the RXB2/ICT4 will direct resources to focus mop-up efforts on the downwind edges of the unit(s).

The plan calls for Mop-Up activities to be conducted after burning activities as well as additional Mop-Up on the second day. Based on interviews conducted during the investigation, CSFS personnel conducted Mop-Up activities after the burn was conducted on March 22, 2012 as well as the following day on March 23, 2012. The mop-up was completed at a minimum of 2 chains in or 132 feet.

CSFS personnel then began patrol operation on March 24, 2012. On that day, light smoke was observed in the middle of the burn area, well within the "black" and no action was required.

On March 24, 2012, North Fork Fire Department received a smoke investigation call in the area. NFFD did not respond to the call after communications through JCSO Dispatch with the CSFS, in which it was determined, the smoke "well within the black" and was coming from the LNF burn area.

Patrol operations were not conducted on March 25, 2012, based on observations made on March 24, 2012.

CSFS personnel returned to the burn area on March 26, 2012, to continue patrol operations and collect fire suppression equipment left in the burn area.

Escaped Fire Analysis and Action Plan: The assessment made for an escaped fire in the burn area identified two scenarios.

1 = the burn escapes and is controlled within the general vicinity of the burn.

2 = the burn escapes and runs for a mile or more and threatens structures to the north and east of the burn area.

The analysis also identifies the threat to life and property, identifying that scenario 2 would result in a significant threat to structures.

The action plan identifies trigger mechanisms for an escaped fire. The first trigger mechanism states:

Any fire outside of the Maximum Manageable Area (MMA) that is not fully contained within 1 hour of discovery will

Jefferson County Sheriff Office

Narrative

be declared an escaped fire. Refer to LNF -Holding and Contingency Map for the MMA.

Based on interviews and radio and communications logs from the CSFS and the Jefferson County Sheriff's Office, CSFS personnel identified a "slop over" in the LNF burn area at approximately 1:40 p.m., and requested additional resources. At that time the fire was estimated at 2/10 of an acre. At 2:30 p.m., the fire had spread to approximately 5 acres and CSFS and initial responding fire personnel declared the fire as an escape.

Prescribed Fire Go/No-Go Checklist: The Go/No-Go checklist was completed on March 22, 2012 at 11:29 a.m., and signed by the Burn Boss, Ignition Specialist and Holding Specialist.

See attached Go/No-Go checklist for details.

Synopsis:

In my review of the Lower North Fork Prescribed Burn Plan, I was unable to find any deviations from the standards outlined in the NWCG Prescribed Fire Planning and Procedures Guide.

I also found that the Colorado State Forest Service (CSFS) followed or exceeded the requirements outlined in the Prescribed Burn Plan while conducting the prescribed burn for unit #4 on March 22, 2012.

On the date of the prescribed burn the CSFS exceeded the recommended requirements for personnel and equipment needed for the prescribed burn. After conducting the burn, they conducted mop-up operations and did additional mop-up on March 23, 2012, to a distance of approximately 200 feet into the burn area.

The burn area was patrolled on March 24, 2012, at which time smoke was identified as coming from well inside the burn area. The standard procedure for a prescribed burn is to create perimeter with no or minimal organic fuels around the body of the burn area. After the ignition of the unit, mop-up will be conducted to create a deeper perimeter and the center of the burn area will be left to burn out on its own, which will create smoke from inside the area.

On Sunday March, 25, 2012, the National Weather Service (NWS) issued a Fire weather watch for 216, which included the LNF burn area. Based on RAWS and spot weather data, along with interviews conducted during the investigation, this was the first time adverse conditions were broadcast.

On March 26, 2012, at about 10:30 a.m., CSFS returned to the burn area to monitor the burn as well as retrieve suppression equipment from the area. It is at that time that small spot fires and the "slop over" occurred.

There was no information discovered during the investigation that indicated any persons or entity involved in the prescribed burn deviated from standard practice or violated any applicable state statute.

DISPOSITION: Open

PRESCIRIBED FIRE PERSONNEL AND EQUIPMENT TABLE

The below table is an attachment for supplemental report #9

Personnel	**Recommended**	**Actual**
Burn Boss	1 RXB2	1 RXB2 and 1 trainee
Ignition Specialist	1 RXI2/FIRB	1 RXI2
Holding Specialist	1	1
Firing Crew	3 FFT2+	5 FFT2
Holding Crew/Squads	(5) FFT1 & 4 FFT2	20 person Swift Crew, 15 person CSFS crew, JCSO Fuels Crew and 6 Jeffco Open Space Rangers
Engine Crew	(12) 4 ENGB + 8 FFT 2	As required
PIO	1	1 available
FEMO	1 (optional)	1
Lookout/Smoke Monitor	2	As required
Equipment		
Engines	3 Type VI (min)	5 Type 6, 1 Type 7, 1 Type 4
Misc. Vehicles	3 SUV or Pickup	3
ATV’s	2 (optional)	1 UTV, JCSO ATV

Jefferson County Sheriff Office

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Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0010	04/17/2012	06:41

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	12:36:42

Narrative

VERIFIED DAMAGED/DESTROYED RESIDENCES

On March 30, 2012, CBI Special Agent Fire Investigator Jerry Means and West Metro Fire Department Lieutenant Bill Maron checked each of the address on the original list and verified that the residence was damaged or destroyed in a manner consistent with the path of the Lower North Fork Fire. The above listed addresses were confirmed as having been damaged or destroyed by the fire. There is no evidence any of the structures were lost from another fire event. The below listed residences were identified as being damaged or destroyed by the Lower North Fork Fire.

14409 Eagle Vista Dr.
14419 Eagle Vista Dr

14201 Broadview Cir.
14141 Broadview Cir.

17051 Elk Ridge Rd.
17050 Elk Ridge Rd.
17020 Elk Ridge Rd.
16950 Elk Ridge Rd.
17000 Elk Ridge Rd.

13579 Rocky Ridge

17986 Rocky Top Trail
18006 Rocky Top Trail
18516 Rocky Top Trail
18656 Rocky Top Trail
18726 Rocky Top Trail
18776 Rocky Top Trail

17223 Arrowhead Springs Trail
17254 Arrowhead Springs Trail

13637 Kuehster Rd.
13647 Kuehster Rd.
13657 Kuehster Rd.
13801 Huehster Rd. (Historic Lamb Schoolhouse)
13807 Kuehster Rd.

The Sheriff's Office initially identified 25 residences as having been damaged or destroyed by the fire. It is unknown what methods were used to obtain develop the list.

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Narrative

The following addresses from the original list had either no damage to any structures on the property or the address could not be found.

13097 Arrowhead Springs Trail - Unknown/Erroneous address
13697 Arrowhead Springs Trail - Unknown/Erroneous address
13707 Arrowhead Springs Trail - This is the bran for the Flickin property at 17051 Elk Ridge Rd.

It was also reported that 14440 Eagle Vista Drive had been destroyed by fire. This information was reported through a 911 call by the homeowner Edgar Simpson. It was also reported by the Colorado Division of Emergency Management; however investigators found no fire damage at the residence, which was later verified by the homeowner.

The addresses and GPS reference point taken by investigators during their damage assessment were forwarded to the Jefferson County Assessors Office for verification with their records. The Assessors office verified the addresses and provided me with the assessed value for each home. Based on the assessed value for each residence the total loss for residences is $11,333,260.00.

The total loss value provided is for residences only and does not include any out buildings or other items of value within the residence to include vehicles.

DISPOSITION: Open

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Administrative Information

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Jefferson County Sheriff Office	12-8273	0011	04/17/2012	06:42

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	12:38:12

Narrative

WEATHER DATA REVIEW

As part of the investigation into the Lower North Fork Fire, I conducted a review of the weather information available for Area 216 from the National Weather Service, to include Spot Weather Forecasts for the Lower North Fork Prescribed Burn, Area Forecast discussions, Fire Weather Planning Forecasts and Fire Watch and red Flag Advisories.

In reviewing the weather data, I observed Spot Weather Forecast requests for the Lower North Fork prescribed burn on March 18th, 22nd and 23rd. The Spot Weather forecast information was obtained through RMACC online services. The Spot Weather Forecasts showed RH percentages between 16% and 45%, with wind directions changing from the southwest at 20 mph in the early morning to north/northwest at 7 mph in the late morning and afternoon.

Spot Weather Forecast requested for March 22, 2012, between 9:00 a.m., and 8:00 p.m., while the prescribed burn was preformed, showed the RH between 25% and 39% with north/northeast wind between 3-10 mph.

Forecasts for March 23, 2012, during mop-up operations showed the RH to be between 17% and 40% with winds from the southeast and southwest between 2 and 7 mph.

I also reviewed the NWS Area Forecast discussions. In reviewing the forecast discussions for March 20th through March 24th, 2012, I did not see any concerns about the weather conditions in the Lower North Fork burn area.

On March 25, 2012, The NWS introduces a Fire Weather Watch for the foothills below 7000 feet, but not in zone 216. Additional weather discussions on the 25th, show high winds are expected for Monday (March 26, 2012), with high to extreme fire danger developing. The discussion also indicates a Red Flag warning in place for the 26th.

In reviewing the Fire Weather Messages, I observed the NWS issued a Fire Weather Watch for areas in Jefferson County below 6000 feet on March 24, 2012, at about 2:09 p.m. AT 9:34 p.m., the NWS issued a Fire Weather Watch for area216, where the Lower North Fork prescribed burn area is located.

On March 25, 2012, the NWS issued a Red Flag Warning for area 216.

Based on the documents provided by the NWS, there was no data showing the wind event that occurred on March 26, 2012, prior to March 24, 2012, and all Fire Weather watches and Red Flag Warnings were issued on or after the date of the prescribed burn.

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Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0012	04/17/2012	06:44

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	12:39:08

Narrative

Prescribed Burn Timeline

02-09-12 - Press Release by CSFS regarding Prescribed burn

03-15-12 - Signing regarding Prescribed Burn placed in area

03-19-12 - Started and completed the black line for the scheduled prescribed burn. 100% mopped up

03-20-12 - CSFS Crews in to check black line and set up hose lays for Prescribed Burn

03-21-12 - Patrolled DWB property before Prescribed Burn

03-22-12 - Prescribed Burn Conducted.
0900 - Briefing at Reynolds Park
1129 - Go/No-Go checklist completed and signed
1130 - 1930 - Burn/Mop Up conducted

03-23-12 - Mop Up completed and burn monitored

03-24-12 - Area patrolled by Kevin Michalak - 2 smokes in interior, stated burn was cold but not out

03-25-12 - No Activity

03-26-12 - Michalak and crew (Ryan Cox and Robert N.) at Prescribed Burn area to monitor and retrieve equipment

12:30 - Michalak sees spots and "duffers" within burn area and begin suppression efforts.
13:30 - Michalak observed a large amount of smoke on the north side of the unit.
13:40 - Michalak radios CSFS Golden office regarding a slop over.

The above timeline regarding the prescribed burn was created through witness interviews and the Colorado State Forest Service Communications Log.

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Jefferson County Sheriff Office	12-8273	0013	04/17/2012	06:45

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

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1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	12:47:49

Narrative

FIRE TIME LINE

The fire timeline for March 26, 2012, was created from the following records:

Colorado State Forest Service Incident Communication/Activity Log
Jefferson County Sheriff's Office 911 recordings
Jefferson County Sheriff's Office Fire and Law Enforcement Radio Traffic
Investigative Interviews

1340 - CSFS Michalak notifies Golden District Office of a "slop over" in Lower North Fork burn area

1350 - CSFS estimates fire at 1.5 acres

1351 - Elk Creek Fire Department dispatched to 13589 Callae Rd. for a smoke Investigation

1400-1403 - JCSO Dispatch tones NFFD and ECFD for assistance with fire in LNF

1412 - JCSO Dispatch advises 1 acre with low spread potential

1428 - 1201 requests second tone fire at about 5 acres

1431 - Inter-Canyon Fire Department dispatched to 13007 Kuehster Rd on a smoke investigation

1438 - North Fork Fire Chief requests type 3 overhead team

1500 - 1640 - Inter-Canyon Firefighter Brutout deploys to Kuehster Rd. - Fire in the valley. Winds are heavy.

1534 - NFFD states fire is 10-15 acres.

1641 - Fire crossed the drainage and making a major run. Evacuations requested for Kuehster Rd.

1701 - North Fork Fire advises fire at 100+ acres. Running crown fire.

1712 - North Fork Chief Rogers estimates within 2 hours structures will be threatened

1714 - Inter-Canyon requests evacuation on Kuehster Rd.

1732 - Inter-Canyon 612 advises that they are loosing structures south end of Kuehster Rd.

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1747 - Inter-Canyon 612 advises head of fire is south of Elk Ridge Rd/Kuehster Rd.

1749 - JCSO Dispatch airs call to 14094 North Trail Cir. - Driveway on fire

1750 - 1810 Deputy Bruening and Hertel drive to Eagle Vista and Kuehster see visible Fire in the trees and head north.

1809 - Inter-Canyon multiple structures lost at end of Kuehster Rd.

1835-1839 - Inter-Canyon Fire structures on Rocky Top Trail fully involved.

1838 - 155 advises dispatch via CAD that flames within 400 feet of structure at 18475 S. Platte River Rd.

1843 - 911 call from resident at 14419 Eagle Vista Dr. - Structure on fire.

2017 - Inter-Canyon 651 residence at 14141 Broadview Cir. total loss.

2133 - Inter-Canyon 651 checks structure at 14409 Eagle Vista Dr. - locates body of Linda Lucas. Structure is lost.

The information listed above was derived from various sources to assist with determining the spread of the fire. The times obtained during witness interviews are approximated.

At 1340 hours, the CSFS identified the "slop over" and at 1350 estimated the size of the fire to be approximately 1.5 acres. Responding units from Elk Creek Fire Department and North Fork Fire Department are advised by JCSO Dispatch that the fire is 1 acre with a low spread potential. Upon the arrival of NFFD Chief Curt Rogers at about 1428, it was reported the fire had spread to 5 acres. The next estimate on the spread of the fire came at approximately 1534, where Rogers reports the fire is at 10-15 acres.

At 1701, Rogers reports the fire is at 100 + acres and has transitioned to a running crown fire. An Inter-Canyon Firefighter positioned on Kuehster Rd., airs at 1732, "loosing structures", which was later determined during an interview to be structures, south of Broadview Cir. The fire then traveled northwest along Kuehster Rd. At 1835 Inter-Canyon Firefighters advise that the structures on Rocky Top Trail are fully involved in fire.

The fire continued to travel in a northwest direction along Kuehster Road, with some spot fires on the north side of Kuehster Rd. Fire spread also affected areas east of the south end of Kuehster Rd.

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Jefferson County Sheriff Office	12-8273	0014	04/17/2012	06:50

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1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0057	04/17/2012	12:40:55

Narrative

INTERVIEWS WITH KIRK WILL

During the investigation into the Lower North Fork Fire, I spoke several times with Colorado State Forest Service Assistant District Forester Kirk Will to identify and clarify documents obtained regarding the prescribed fire. Will was also interviewed by me and BLM Special Agent Shannon Tokos on March 29, 2012. That interview is documented in the BLM Origin and Cause Investigation report.

In the subsequent conversations Will and I went over the personnel, equipment and assignment diagram included in the Incident Action Plan (IAP) for the prescribed burn on March 22, 2012. That information was included in my review for the prescribed burn.

I also spoke to Will about obtaining information from a CSFS "Hobo" weather station that is positioned neared Unit 4. Will stated there were problems accessing the data from the station and they were unable to download the data.

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Jefferson County Sheriff Office	12-8273	0015	04/17/2012	06:51

Status	Nature Of Call
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1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0057	04/17/2012	12:36:01

Narrative

INTERVIEW WITH ROCCO SNART

On April 5, 2012, I conducted an interview with Jefferson County Wildfire Mitigation Specialist Rocco Snart regarding the Colorado State Forest Service prescribed fire at the Lower North Fork unit #4., starting on March 22, 2012.

In speaking with Snart, he stated on March 22, 2012, he and the Jefferson County Fuels Mitigation Crew assisted with the prescribed fire with the Colorado State Forest Service. On that day Snart was assigned as the safety officer for the burn. Along with Snart and the JCSO Fuels Crew there were approximately 6 Open Space Park Rangers at the burn for an annual wild land refresher training.

Snart stated that the briefing for the burn was conducted at 9:00 a.m., and he remained in the area until approximately 7:30. There were no problems encountered during burn and mop-up operations.

I asked Snart if there were adequate resources on scene during the burn and he stated there were "more than enough" resources on scene.

Snart stated he had no additional involvement with the operation but the JCSO Fuels Crew did assist with mop-up operation on March 23, 2012, and that he was advised that mop-up was completed and a 200 foot "cold black" line was created. On April 12, 2012, I spoke with Snart a second time regarding the black line procedures.

Snart went on to explain that normal procedures for a prescribed burn is to create a black line or "cold black" line, along with hand lines in certain area to eliminate organic fuels that could cause fire spread. After ignition occurs and the black line and /or hand lines area created, the interior of the burn area is left to burn itself out to eliminate ground fuels. Snart went on to say it is not uncommon for there to be continued smoke from the burn area as fuels continue to burn on the interior.

On March 25, 2012, Snart was advised of a fire watch in the area of the prescribed burn and sent the information to CSFS personnel via text message. Snart sent out another text on March 26, 2012, at about 10:00 a.m., when he was advised of a Red Flag warning for the area.

I asked Snart if there was anything in the extended forecast prior to the 26th indicating high winds or a Red Flag Warning and he stated there was not.

I then asked Snart about his actions on March 26, 2012 when the fire had been declared an escape. Snart stated he was in his office when he received a phone call from Kirk Will regarding a "slop over" at the Lower North Fork burn area. Snart assisted with coordinating additional resources from North Fork Fire Department, Elk Creek Fire Department and the JCSO Fuels Crew. As more resources became needed he assisted with coordinating the additional crew requests.

Snart then spoke about fire behavior and the conditions regarding the "slop over". Snart stated some of the fuels in the burn area were delignified, which he described as natural fuels that have reached maximum moisture

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capacity, for about 5 years. With the type of fuels in the area, the wind direction and the slope of the terrain and the radiant heat from the outside temperature created ideal conditions for heated lightweight fuels to be blown from the interior of the burn area into an unsecured area.

Snart also stated he conducted a computer model to identify the speed of the fire using estimated fuel levels, wind speed and other identified factors, including the area of burn. The speed model put the speed of the Lower North Fork Fire between 160-200 feet/minute.

On April 12, 2012, I spoke with Snart a second time regarding the black line process as well as certain burn and fire behaviors. During the interview Snart explained that prior to conducting a prescribed burn, where the terrain is appropriate a perimeter is burned around the unit to consume the ground fuels and prevent the interior fire from escaping. The ground fuels are burnt to the soil, or depending on the types of fuel and their depth, burnt until their top layer(s) are burnt to a white ash. The fuels underneath the white ash layer may not be completely consumed, but they lack the required heat and oxygen to sustain open flame.

Snart stated that there is a possibility that during the wind event on March 26, 2012, at the Lower North Fork burn area, some lower level fuels could have existed in the black line areas, could have reheated after the white ash layer was blown off.

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Jefferson County Sheriff Office	12-8273	0016	04/17/2012	06:52

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1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0057	04/17/2012	12:27:56

Narrative

INTERVIEW WITH SCOTT HALLADAY

On April 09, 2012, I conducted an interview with Scott Halladay, JCSO Fuels Crew Supervisor, regarding his response to the Lower North Fork Fire, as well as his duties during the prescribed burn on March 22, 2012.

Halladay stated that on March 22, 2012, he assisted with the prescribed burn on the Denver Water Board Property. On that day, Halladay and members of the Jefferson County Sheriff's Office Fuels crew were assigned as holding resources for the prescribed burn. Halladay stated there were no issues on the day of the burn and that there were plenty of resources available to handle any spot fires or escapes.

I asked Halladay if he had attended a briefing on March 22, 2012, which he stated he did. I also asked him if the briefing included an update on the weather forecast and he stated it did and there were no projected weather issues for the day of the burn.

Halladay stated when they arrived at the burn area the holding crews were briefed and given areas of assignments. When the holding crew assigned to the southeast portion of the burn area reviewed their area, they requested that additional tress be removed and the hand line be improved to better secure the area. After the work on the southeast portion was completed the ignition of the burn began.

Halladay remained at the burn area until about 7:30 p.m., and assisted with initial mop-up after burning. Halladay stated the burn area was mopped-up ½ to 1 chain in on the bottom portion of the burn unit and deeper in other areas.

Halladay and the JCSO Fuels Crew returned to the burn unit on March 23, 2012, and assisted with continued mop-up.

I asked Halladay, who had been involved in fire mitigation work for more than 12 years about prescribed fires. He explained that fire is a natural requirement to promote the natural growth of the forest. Prescribed fires also remove dangerous ground fuels and the growth of small vegetation that can lead to fire growth in the event of a fire in the area.

I also asked Halladay about how prescribed fires are conducted and he stated that when a prescribed fire plan is implemented crews initially develop a boundary or perimeter around the burn unit either by black lining or by hand lines and the removal of potential hazards, or by hose lines. Onces holding crews are stationed the ignition of the fuels begin. Once the burn area is burnt through, crews create a larger perimeter in mop-up, removing identifiable hot spots and heat sources from the perimeter. The interior of the unit is left to burn itself out by consuming the available fuels with fire.

I also spoke with Halladay regarding his response to the "slop over" fire in the burn area on March 26, 2012. Halladay stated when he arrived in the area at about 2:30 p.m., he estimated the fire to be about 10 acres, and that it grew to about 35 acres by about 3:30 p.m. He estimated the winds to be between 18-20 mph, with gusts to

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35 mph.

When he arrived on scene he met with the incident commander and they began initial attack, but were unsuccessful in getting the fire controlled.

Halladay remained on scene until they were instructed to leave the burn area for safety reasons and have resources meet at Reynolds Ranch to be deployed elsewhere.

On April 12, 2012, I spoke with Halladay a second time regarding the fire. While I was speaking with Hallday he told me that while they were on scene at the fire in the burn unit, he and his crew were being hit with "golf ball" sized embers from the interior of the burn unit.

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Jefferson County Sheriff Office	12-8273	0017	04/17/2012	06:53

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0057	04/17/2012	12:22:28

Narrative

INTERVIEW WITH MICHAEL THAYER

On April 12, 2012, I conducted an interview with Michael Thayer, with the Jefferson County Fuels Crew, regarding the Lower North Fork Fire.

In speaking with Thayer he stated that on March 22, 2012, he and other members of the Jefferson County Fuels Crew assisted the Colorado State Forest Service with a prescribed burn on Denver Water Board property. On that date, Thayer and other Fuels Crew members met with personnel working the prescribed burn for a 9:00 a.m., briefing at Reynolds Park. The briefing detailed member's assignments, safety and weather information for the area.

After the briefing personnel assigned to the holding crews had an additional briefing as well as individual squad briefings. Thayer and his squad then assisted the "Juniper Valley" crews assigned to the southeast portion of the burn unit with solidifying the perimeter but removing some trees and improving the hand line. Once the southeast perimeter was improved crews initiated the burn. Thayer stated they completed the burn and began initial mop-up of the unit to a depth of approximately ½ to 1 chain in and there was "no doubt" the line was "cold."

Thayer stated as part of his mop-up duties he moved some of the heavier fuels that were burning away from the black line into the interior.

I asked Thayer if there were any issues on the date of the burn and he stated there were none reported on the day of the burn as well as on March 19, 2012, when he assisted with the black lining of the unit.

Thayer went on to say he and the Fuels Crew had returned to the unit on March 23, 2012, to conduct mop-up operations. Thayer stated he was assigned to an engine crew working the top half of the unit. Mop-up was completed to approximately 2 chains and they had used a "significant" amount of water on the area.

Thayer stated there were no significant winds on either day and there were no weather watches for those days and none in the "futures."

On March 26, 2012, Thayer and the Fuels Crew were working on another project when they were asked to assist with a "slop over" in the Lower North Fork burn area. They responded with a Type 6 engine to the area and arrived around 2:30 p.m. When they arrived he observed spot fires on the ridge along the northwest side as well as a 1/4 acre slop over on the northeast side. There were also spot fires inside of the burn unit.

Thayer stated while he was on scene they were being hit by "large" embers coming up from 400 feet inside the interior of the burn unit due to the strong winds. Thayer stated at one point the winds blew his helmet 30 feet down the hill. Thayer and other responding personnel tended to the spot fires and then attempted to run a hose line down the northeast side of the fire.

During the interview Thayer showed me a video he had taken at about 6:00 p.m., while in the burn area. The video showed the wind conditions at the time as well as the heavy smoke caused by the fire. Thayer later

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Narrative

e-mailed me the video, which was copied to a CD and placed into evidence.

Thayer had no additional information regarding the fire and the interview was concluded.

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Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0018	04/17/2012	06:54

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

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1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0057	04/17/2012	12:16:42

Narrative

INTERVIEW WITH SCOTT COMPERTORE

On April 12, 2012, I conducted an interview with Jefferson County Sheriff's Office Fuels Crew members Scott Compertore regarding his response to the Lower North Fork Fire on March 26, 2012, as well as his involvement in the prescribed burn.

Compertore stated the JCSO Fuels Crew assisted the Colorado State Forest Service with the prescribed burn for Unit #4 of the Denver Water Board property starting on March 19, 2012. On that day Compertore and other personnel conducted a black line operation along the top portion of the unit. According to him the burn went as planned and there was only one small spot fire in the interior of the unit, leaving a solid cold black line.

On March 22, 2012, Compertore and the fuels crew assisted CSFS with the prescribed burn for Unit #4. Compertore attended the morning briefing held at Reynolds Park, which included a weather briefing for the day. Compertore stated the weather conditions were all within the parameters of the burn plan.

Compertore and other personnel initially worked on securing the southeast perimeter of the burn area by removing hazards and improving the hand line and remained as a holding resource for that area until his squad was moved to the northwest side. There were no noted issues regarding the burn.

Compertore returned to the burn unit on March 23, 2012, and did not recall any issues.

On March 26, 2012, Compertore responded to the burn area to assist with the "slop over." When they arrived he estimated the burn to be about 5 acres and observed "spotting" along the road as they drove to the east. While in the area he checked the wind conditions using the wind meter from a Belt Weather Kit, which showed the winds to be sustained at 10-15 mph, with gusts to 30 mph. He also stated that because of the winds he had to use the chin strap on his helmet to keep it from blowing off. Compertore stated they were being hit by "golf ball" size embers from the burn unit.

Compertore then began suppression efforts with other personnel on scene. His efforts included digging lines around spot fires and running a hose line down the northeast end of the fire. While running the hose line Compertore observed the fire start to creep around them.

Compertore had no additional information regarding the fire and the interview was completed.

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ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0019	04/17/2012	06:56

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	12:59:12

Narrative

REYNOLDS PARK CAMP FIRE

On March 26, 2012, I was asked to assist and coordinate the origin and cause investigation into the Lower North Fork Fire (LNF). As part of that investigation I reviewed information regarding a reported unattended campfire in the area of Reynolds Park.

On March 23, 2012, at about 1:50 p.m., the Jefferson County Sheriff's Office received a report of an unattended campfire in the area of Reynolds Park, which is located at 14070 Foxton Road. Jefferson County Sheriff's Deputies Brian Spery and Ronnie Newman were dispatched along with personnel and equipment from the North Fork Fire Department and Elk Creek Fire Department.

According to Jefferson County Sheriff's Office Computer Aided Dispatch (CAD) records, the reporting party saw fire in the trees on the ridge of Eagle View Trail, approximately 1 to 1 ½ miles up from the Reynolds Park Parking Lot. As deputies arrived in the area, they did not observe any visible smoke. Deputy Spery continued up Eagle View Trail. At 2:44 p.m., Deputy Spery advised JCSO Dispatch that he had located 1 burnt tree, 1 burnt stump and no active flames, with less than 1 acre burnt. Deputy Spery stated the winds were low blowing east to west. Law Enforcement resources remained on scene until 4:50 p.m.

A further review of the CAD notes from fire personnel showed that the fire was identified as a smoldering and creeping, surrounded by trails on 3 sides with a low spread potential. At 4:33 p.m., JCSO Dispatch was advised the fire was contained and fire crews were continuing mop up (extinguishing). At 5:43 p.m., the fire was contained and no crews were being left on scene. On march 24, 2012, at 10:47 a.m., Elk Creek Fire Department personnel advised JCSO Dispatch the fire was out.

On March 31, 2012, I spoke with Deputy Spery, who had responded to the Reynolds Park Fire. Deputy Spery stated that when he arrived to the area he walked up the trail about 2 miles from the parking lot. At that point he observed a "snag", which he described as a burnt tree that had fallen, but no visible flames. Deputy Spery also advised that the wind was blowing from the east to the west.

In reviewing the information regarding the Reynolds Park Fire in relation to the Lower North Fork Fire it was determined that the following factors eliminated the Reynolds Ranch Fire from consideration in regards to the origin and cause of the LNF Fire.

-**Distance and Location:** Reynolds Park is located approximately 2.5 miles north west of the identified area of origin on Foxton Road. The area of the Reynolds Park Fire was an additional 1 ½ to 2 miles west of the Reynolds Park parking on Foxton Road.

-**Wind Direction:** The wind direction at the time of the Reynolds Park Fire would have pushed the fire in the opposite direction.

-**Fire response:** The Reynolds Ranch fire was determined to be out on March 24, 2012, by Elk Creek Fire

Jefferson County Sheriff Office

Narrative

Department personnel.

-**Burn Patterns:** There were no burn areas or patterns linking the Reynolds Park Fire with the LNF Fire.

DISPOSITION: Open

Jefferson County Sheriff Office

Reported Date
04/17/2012
Nature Of Call
-AOA
Member#/Dept D#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0020	04/17/2012	06:57

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	13:01:13

Narrative

PHONE INTERVIEW WITH CANDI VALLADO

On April 3, 2012, I received a phone call from Colorado State Forest Service District Forester Allen Gallamore, who stated his office had received a phone call from a Candi Vallado, regarding a fire at Reynolds Park on March 22, 2012. Forester Gallamore provided me with contact information of Vallado.

I contacted Vallado by phone regarding the fire and she stated that on March 22, 2012, at about 3:00 p.m., she and a friend were hiking on Eagle View Train, when two guys came down the trail and said there was a fire. Vallado did not see any visible flame. When they got to the area she described as Eagle View #1, they stopped and ate lunch. At that time a second couple came down the trail and said that there was a fire up on the trail.

Vallado and her friend continued hiking on the trail towards the area she described as Eagle View West. When the reached the promontory, they observed logs, stumps, pine straw and mulch on fire. She estimated the fire to be approximately ½ acre in size with active flames. She and "the kid" began to try and extinguish the fire using logs to drag snow to the burn area. She and "the kid" remained at the fire until approximately 6:30 p.m., thinking that the other hikers had called for a fire response. Since it was getting dark, Vallado and her friend hiked out of the park and then called the Sheriff's Office at about 7:30 p.m., to report the fire.

The following day Vallado contacted the Open Space Ranger to ask about the fire and learned that there was no response by fire of law enforcement personnel.

I advised Vallado that Fire and law Enforcement personnel had received a call about the fire on March 23, 2012 and responded. Information obtained from responding individuals indicated the fire was the result of an unattended campfire.

Vallado stated there was no evidence of a campfire when she was there and that if people thought the logs in the area were a campfire, she and "the kid" had moved them there. She went on to say the logs looked as they had burned for a while.

I asked Vallado what she thought caused the fire and she stated she "believes it was Lower North Fork fire debris that started the Reynolds Park Fire.

I had previously examined any possible links between the Reynolds Park Fire and the Lower North Fork Fire and identified the fires as being separate events. The reasoning for my findings were based on the distance, wind direction and the fact that there was no other affected area between the two locations.

DISPOSITION: Open

Jefferson County Sheriff Office

Reported Date
04/17/2012
Nature Of Call
-AOA
Member#/Dept D#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0021	04/17/2012	10:48

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	13:10:13

Narrative

PHONE INTERVIEW WITH DAVE BRUTOUT

On April 4th and April 5th, 2012, I conducted phone interviews with Inter-Canyon Firefighter Dave Brutout regarding his activities during the Lower North Fork Fire. The following is a synopsis of the interviews.

Brutout explained that on the morning of March 26, 2012, he had received two pages regarding the Lower North Fork Fire. One of the pages stated the fire was 1 acre with a slow spread rate and the second stated the fire was 3-5 acres.

At about 2:31 p.m., he heard the page for Inter-Canyon Fire to response to 13007 Kuehster Road on a smoke check. While he was in route to the Firehouse, he heard the responding unit go in service and then clear the scene after confirming the smoke was coming from the Lower North Fork Fire. Considering the time of day and weather conditions Brutout continued to Kuehster Rd. in his personal vehicle to check on the fire.

Brutout estimated he arrived to the area of Kuehster Rd at about 3:00 p.m., at which time he noticed the fire was lower in the valley and the weather conditions were changing. At about 3:20 Brutout spoke with residents on Arrowhead Springs Trail about the fire and recommended that they evacuate. Brutout recalled a conversation he had with a female resident, in which she asked how long it would be before the fire came through and he replied that it could be two days or two hours. He stated he recalled this conversation because the fire came through the area about 2 hours later. He estimated he was on Arrowhead Springs Trail for approximately 20-25 minutes, and then proceeded to Elk Ridge Rd. At about 4:09 p.m., he called Inter-Canyon Fire Captain Moore and spoke with him regarding his activities.

Brutout stated that he had spoke with Sam Lucas and advised him that he needed to evacuate the area sometime between 4:00 p.m., and 4:20 p.m. At about 4:16 p.m., Brutout called the Elk Creek Fire Department regarding the fire.

At about 4:20 p.m., Brutout began door to door evacuation for residences in the area of Kuehster Rd.

I asked Brutout what the weather conditions were while he was on Kuehster Rd., and he stated the winds were steady at about 60-65 mph, with gusts up to 90 mph. While describing the wind he stated that it was "blowing his helmet off."

I also asked Brutout to provide an estimated time frame the fire came up to Kuehster Rd. He believed the fire reached the area around 4:45 p.m., and that it came into the area in 4 or 5 different waves up the valley and each wave was further north than the last, with the last run near Rocky Top Trail around 5:45 p.m.

Brutout stated that except for the phone calls he made from his cell phone the times provided were estimates and not exact.

DISPOSITION: Open

Jefferson County Sheriff Office

Narrative

Jefferson County Sheriff Office

Reported Date
04/17/2012
Nature Of Call
-AOA
Member#/Dept D#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0022	04/17/2012	11:44

Status	Nature Of Call
OPEN - BEING INVESTIGATED BY DEPUTY	ASSIST OTHER AGENCY

Member#/Dept ID#	Assignment	Entered by
1500/ROACH,DONALD	INVESTIGATIONS INTEL	1500

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	0084	04/17/2012	13:40:16

Narrative

LOWER NORTH FORK FIRE
INVESTIGATIVE SUMMARY

On March 26, 2012, at about 1:51 p.m., the Jefferson County Sheriff's Office Dispatch Center received a call for a smoke investigation from a resident at 13598 Callae Ct. Dispatch tone the Elk Creek Fire Department, who responded along with Jefferson County Sheriff's Deputy Michael Sensanso. It was determined the visible smoke was coming from the area of the Colorado State Forest Service prescribed burn on the Denver Water Board property.

At about the same time CSFS Assistant District Forester Kirk Will called Jefferson County Sheriff's Office Wildfire Mitigation Specialist Rocco Snart to advise him of a "slop over" fire in the Lower North Fork (LNF) prescribed burn area and request additional resources.

As fire personnel from the North Fork Fire Department and the Elk Creek Fire Department were responding they were advised the fire was about 1 acre in size with a "low spread potential." Upon the arrival of NFFD Fire Chief Curt Rogers, JCSO Dispatch was advised the fire had grown to 5 acres.

At 2:31 p.m., Inter-Canyon Fire was dispatched to a smoke investigation at 13007 Kuehster Road. Upon the arrival of ICFD it was determined that the smoke seen by the resident was also coming from the LNF fire.

Several additional 911 calls came into the Jefferson County Dispatch Center regarding visible smoke came into dispatch following the initial 911 call at 1:51 p.m.

Between 3:00 p.m., and 4:40 p.m., Inter-Canyon Firefighter Dave Brutout responds to the area of Kuehster Road to assess the fire. While he is on scene the firefighter observes heavy winds and notices the fire is in the valley. He then begins contacting residents along Kuehster Road advising them to evacuate the area. At about 4:20 p.m., the firefighter speaks with Sam Lucas and advises him to evacuate. The firefighter also goes to 14141 Broadview Circle to contact the residents. He discovers a chain across the driveway and a heavy canopy of tress overhead and a number of pieces of heavy machinery along the road. For safety reasons the firefighter does not attempt to access the driveway to the residence.

At 3:34 p.m., NFFD Chief Rogers advises dispatch the fire is approximately 10-15 acres. Subsequent radio traffic indicates Incident Command has identified "trigger points", which are geographic locations identified by on scene personnel for when/if a wildfire reaches the location evacuations will be requested. In the case of the LNF Fire the "trigger point" was a drainage area between the downward slope of the Denver Water Board property and the up sloping ridge on the other side.

At about 4:41 p.m., JCSO Dispatch is advised through Elk Creek Fire Department that the fire had crossed the drainage and was making a "major run" and that evacuations are needed for Kuehster Road. At 4:54 Dispatch is again advised of the order to initiate evacuation on Kuehster Road. At 5:01 p.m., NFFD advises the LNF Fire has transitioned from a ground fire with tree torching to a 100 plus acre running ground fire. Around 5:32 p.m., ICFD

advises they are losing structures on Kuehster Road. Based on interviews of fire personnel, it is believed that the fire first hit the residences on the south end of Kuehster Road and then moved north, destroying residences along the way.

Between 6:35 and 6:39 p.m., ICFD advises structures on Rocky Top Trail are fully involved. Just prior to that, Jefferson County Sheriff's Deputy David Bruening, who is in the area assisting with evacuations, advises dispatch he is trapped and had driven his vehicle off the road.

March 27, 2012, the Jefferson County Sheriff's Office requested independent investigators conduct the origin and cause investigation. A request is sent to BLM Special Agent Shannon Tokos to lead the investigative team.

On March 28, 2012, BLM Special Agent Tokos along with U.S. Forest Service Special Agent Brenda Shultz and BLM Ranger Troy Schnurr arrived at the ICP for a briefing. Investigators also began their interviews as part of the investigation.

On March 29th and 30th, investigators conducted the origin and cause investigation and related interviews.

The findings of the Origin and Cause Investigative Team listed the cause of the fire as Debris Burnings and stated the following.

Wildfires in this category include fires started by either creeping escapes or windblown embers from trash barrels, small piles of yard debris such as pine needles or leaves, stubble field burns, slash piles or any other controlled burning. On occasion, debris burning activity may not be apparent as the wildfire may have started from a source some distance away or was kindled by a holdover from a pile originally burned days or even weeks before.

The specific origin area, which was located in a saddle along the ridgeline northeast of the prescribed burn in Unit 4, showed evidence of ignition from multiple windblown embers. Investigators identified several cold embers within the specific origin area that would have been competent ignition sources on the day that the Lower North Fork Fire ignited. However, due to the amount of disturbance to the specific origin area resulting from the suppression effort and wind event, investigators could not be certain that the embers had not been disturbed.

In general, research has shown that most windblown embers will self-extinguish after about 40 feet. However, exceptions to this rule occur when the firebrand is thick, wind speeds are high, or the source of fire was large enough to create a convection column that provides lift to increase lateral travel. Investigators believe that most, if not all three of these exceptions are applicable to the Lower North Fork Fire.

In summary, it is the finding of the Origin and Cause Investigation Team that the Lower North Fork Fire ignited on Monday, 03/26/12 at approximately 1340 hours from lightweight, windblown embers from a prescribed burn that was ignited the previous Thursday (03/22/12) by the Colorado State Forest Service.

Investigative activities determined that the prescribed burn was not completely extinguished on 03/26/12, and heavy winds carried embers from the southeast side of the saddle to the northeast side of the road running along the ridgeline, which was the boundary line for Unit 4 of the prescribed burn. The embers landed in unburnt fuels along the edge of the road, igniting the Lower North Fork Fire.

On March 30, 2012, CBI Agent Jerry Means and West Metro Fire Investigator Lt. Bill Maron conducted a check of residences indentified by law enforcement and fire personnel as being damaged or destroyed by the fire. The investigators identified 23 residences that were damaged or destroyed by the fire. All of the damaged/destroyed residences were in the path of the Lower North Fork Fire.

After the on scene origin and cause determination was completed Investigator Roach began his investigation into any possible negligence regarding the prescribed burn.

A review of the prescribed Burn Plan and Incident Activity Plan was conducted along with a review of the applicable standards set by the National Wildfire Coordinating Group (NWCG).

Based on the review of all available documents and witness interviews Investigator Roach determined that the Colorado State Forest Service followed or exceeded the parameters sent by the LNF prescribed burn plan.

In reviewing all of the information obtained during the investigation, which included the above listed documents

Jefferson County Sheriff Office

Narrative

along with spot weather and weather discussions, and witness interviews, Investigator Roach determined that no violation of the Colorado Revised Statutes occurred.

DISPOSITION: Open

Jefferson County Sheriff Office

12-8273

Supplement No
0023

Reported Date
04/17/2012
Nature Of Call
-AOA
Member#/Dept ID#
ROACH,DONALD

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0023	04/17/2012	15:22

Status	Nature Of Call	Member#/Dept ID#
CLOSED	ASSIST OTHER AGENCY	1500/ROACH,DONALD

Assignment	Entered by	RMS Transfer	Prop Trans Stat	Approving Officer
INVESTIGATIONS INTEL	1500	Successful	Successful	0057

Approval Date	Approval Time
04/18/2012	07:00:20

Narrative

CASE STATUS CHANGE

The status of this case will be closed. There was no information discovered during the investigation that indicated any persons or entity involved in the prescribed burn deviated from standard practice or violated any applicable state statute.

DISPOSITION: Closed

Jefferson County Sheriff Office

12-8273

Supplement No
0024

Reported Date
04/17/2012
Nature Of Call

Member#/Dept ID#
CHRACHOL, JERRY

Administrative Information

Agency	Report No	Supplement No	Reported Date	Reported Time
Jefferson County Sheriff Office	12-8273	0024	04/17/2012	15:58

Member#/Dept ID#	Assignment	Entered by
1761/CHRACHOL, JERRY	PATROL MOUNTAIN WATCH A	1761

RMS Transfer	Prop Trans Stat	Approving Officer	Approval Date	Approval Time
Successful	Successful	5027	04/18/2012	07:29:35

Narrative

On 3-26-12, at about 1700 hours, I was contacted by Sgt Taborsky and told to respond to the end of Kuehster Road and begin mandatory evacuations of homes in that area with Deputy Beale. Deputy Beale and I were going to meet in the area of Oehlmann Park and respond to Kuehster Road together. While en route Deputy Beale was informed to divert from the evacuations on Kuehster Road and set up a command post at the Critchell County Shops on Pleasant Park Road. Deputy Beale responded to the shops and I continued to Kuehster Road.

While driving on Kuehster Road from Pleasant Park Road I could see an extremely large cloud of smoke across the mountain tops to the south and east. I noticed several cars driving on Kuehster Road toward Pleasant Park Road. As I approached the area of Kuehster Road and Arrow Springs Trail, there was little to no visibility due to smoke in the air. At this location, I saw a Intercanyon Fire Truck driving west on Kuehster Road. The firefighter identified himself as Intercanyon 612 and informed me that he had performed evacuations on Eagle Vista and Elk Ridge Roads and that the area was filled with heavy smoke and flames were coming up to the road. He then continued west on Kuehster Road. (I contacted Investigator Gove on March 28, 2012 and informed him of this contact).

I heard on the radio that Deputies Bruening, Barnes and Hertel were on their way to Kuehster Road to assist with evacuations. I looked to my left and saw a home located at 13842 Kuehster Road so drove into the driveway to see if people were there to be evacuated, but no one was seen. Deputy Barnes then arrived to my location and it decided to drive to North Trail to assist a male evacuate. While driving on east Kuehster Rd, we were contacted by a female in a white SUV who informed us that her husband was trapped in his driveway by the fire. We followed the female to 13874 North Trail Court and contacted James Chambers in the driveway. James stated that he was wanting to evacuate the area, but that he did not want to leave his 4 cows and 2 horses. James stated that he doesn't have a trailer large enough to take all of the animals and asked if we would assist in loading his two horses into the trailer. James assured us that once the horses were in the trailer, that he would evacuate. Deputy Barnes and I assisted in loading up the horses and then informed by James that he has worked too hard for this and that he was not going to leave the area. Deputy Barnes informed dispatch of James's name and date of birth and his refusal to leave.

Deputy Hertel and Bruening arrived at our location and informed us they had seen flames in the trees and spot fires on the ground in our area. For our safety it was decided that the four of us would attempt to leave the area and drive toward Pleasant Park Road. Deputy Bruening was the first car followed by Deputy Hertel, myself and Deputy Barnes was the fourth car. All four vehicles had the emergency lights activated while driving. As I drove behind Deputy Hertel, there were times that I could not see his vehicle or lights. Their was little to no visibility and I was unable to look out of the side of the car to see the edge of the road. Visibility would change from a smoke filled air, turning into dark black smoke and an orange glow with embers hitting the windshield.

I then heard Deputy Bruening air that he was in trouble and that he needed help. I continued driving, thinking that he would be a short distance ahead of me and off of the road to the left or right. As I continued on, I could see emergency lights to the left of my car and informed Deputy Bruening of my location by telling him about how far I as from his passenger side. Deputy Bruening aired that he could not see my vehicle, so I turned on my flood light and shined it toward his vehicle. Deputy Bruening stated that he was able to see me and that he would leave his

Jefferson County Sheriff Office

Narrative

car and run to mine. Deputy Bruening made it to my car and myself, Deputy Barnes and Deputy Hertel drove east on Kuehster Road to the area of 14206 Kuehster Road as there was a large field, with no trees, that was already black. Shortly after being at this address, a firefighter crew drove up and stated that had just driven up Kuehster Road and that we should be able to make it out of the area.

The three vehicles and four deputies drove on Kuehster Road and made it back to Pleasant Park Road. Once at Pleasant Park Road, I saw several large fire trucks, about 50 citizens and 1 Colorado State Trooper at the intersection. I was told to close down east bound Pleasant Park Road about a quarter mile west of Pleasant Park Road to reduce the number of citizens into the area. I was later informed to block traffic in the area of Pleasant Park Road and Broken Arrow Drive. I was later ordered to the area of Pleasant Park Road and Oehlmann Park Road to assist at that traffic control point.

DWB LOWER NORTH FORK IAP

Wildland Fire Investigation

	ORIGIN & CAUSE	Incident Number	CO-JEX-000176
		Incident Date	03/26/2012

LOCATION

Fire Name	Account Code	State	District	Field Office	Region	County
Lower North Fork Fire	PN GP8W	Colorado	N/A	N/A	N/A	Jefferson

Origin Location: geographical landmarks, highways, roads, trails, etc.	Township	Range	Section	¼ Sec	Meridian
Denver Water Board Property, near the North Fork of the Platte River and Foxton Road, Jefferson County, Colorado	7S	70W	15	N/A	6th PM, CO

Latitude (D – M' – S")			Longitude (D – M' – S")		
39	25	52.4827	105	12	49.06173

JURISDICTION

Jurisdiction (Land Status)	Lead Origin & Cause Investigator	Cost Estimate
Private - Denver Water Board	BLM Special Agent Shannon Tokos	N/A

EVENT SEQUENCE

Estimated Time of Ignition				Time Fire Reported				Time Origin Protected				Time Origin Released			
Mo.	Day	Year	HHMM	Mo.	Day	Year	HHMM	Mo.	Day	Year	HHMM	Mo.	Day	Year	HHMM
03	26	2012	1340	03	26	2012	1340	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Official	Kevin Michalak			Reporter	Kevin Michalak			Official	N/A			Official	N/A		

FIRE BEHAVIOR

Estimated Acres	Fuel Type @ Origin Material First Ignited	Weather Observer (On Scene)	Temperature	Relative Humidity	Wind Direction	Wind Speed
4140	Masticated Fuels/Fine Dry Grasses	C. Rogers/J. Graves	68 F	13%	Out of the SW	Sustained 50 mph @ 1430-1445 hrs.

Slope %	Aspect: N E S W	Elevation	Weather Station	Temperature	Relative Humidity	Wind Direction	Wind Speed (20')
Approx. 20%	NE	6800	See Summary in Attachments	N/A	N/A	N/A	N/A

CAUSE DETERMINATION (I) = Included Cause (E) = Excluded (State Reasons of Determination & Elimination)

E Lightning (Detection Method)

Lightening occurrence records were obtained from the National Interagency Fire Center (Attachment A). These records showed no lighting occurring for the period of 03/09/12 to 03/26/12. Actual physical evidence of a lighting strike may include the object the lighting struck, most commonly a snag or tree, which would leave a fresh lighting scar running down a main branch or the trunk. The Investigation Team was unable to locate any physical signs of a lighting strike on nearby vegetation or on the ground near the general origin area.

E Equipment Use (Exhaust, Brake Shoe, Aircraft, Vehicle Fire, Other)

Equipment use covers a wide variety of possible ignition sources (excluding railroad operations), related to the use of mechanical equipment. With equipment use, investigators look for indications of ignition from sources such as exhaust particles, friction, fuel and lubricate use, mechanical breakdown and radiant or conductive hear transfer. In most cases, physical evidence of the equipment presence is observable. No evidence of equipment caused ignition was found in or near the general or specific areas of origin. Further, witness interviews revealed no evidence of equipment caused ignitions.

E Smoking (Tobacco, Other)

A very narrow range of environmental conditions and physical circumstances must be present for a cigarette to successfully ignite a wildland fire. Temperatures, relative humidity, wind speed and direction, and fuel moistures must all fall within specific limited parameters as defined by extensive research. In addition to direct contact of the cigarette's surface, several environmental factors are important when considering a cigarette as a possible ignition source. Critical factors are the host fuel bed and the weather conditions.

The environmental conditions that were in existence at the probable time of ignition for the fire did not fall within the specific limited parameters as defined by research. The Investigation Team acquired data from the five closest functioning Remote Automatic Weather Stations (RAWS) to the Lower North Fork Fire point of origin (Attachment B). The first critical environmental component is ambient temperature. On average, a temperature of 80 degrees

Fahrenheit or higher is most conducive to ignition from a cigarette. RAWS data showed temperature readings ranging from 62 to 66 degrees Fahrenheit at the five stations. Wind speed has been demonstrated to play a material role in cigarette caused ignitions. A wind speed of 3 mph. has been suggested as an ideal speed to support ignition. Wind speeds greater than 3 mph. can increase the burn rate, but tend to pull the heat away from the fuelbed, which reduces the probability of ignition. In this case, the RAWS data showed a range of wind speeds from 17 mph. to 74 mph.

Relative humidity must also be taken into consideration. According to research, relative humidity in excess of 22% will preclude a cigarette from igniting wildland fuels. RAWS data from the five weather stations showed RH readings ranging from 4 to 6%.

Although the relative humidity levels fell within the appropriate parameters for a smoking fire, the temperature and wind speed did not. In addition, investigators did not locate any cigarette remains within either the general or specific origin area.

E	Campfire	(Cooking, Warming, Ceremonial, Other)

A campfire is defined as any fire made from wood or other combustible material that is being used for cooking, heating or lighting purposes. This category includes barbecues and gas camp stoves. Most campfires are usually built within the confines of a descendible rock ring. Campfires also leave physical remains in the form of coals and partially burned fuels that are easily recognizable due to the volume and arrangement. No evidence of these indicators was present in the specific origin area, nor was there any obvious sign of camping activity near the general or specific origin areas. Further, the origin area is on the private property of the Denver Water Board and is closed to motorized public entry via locked gates. Witness interviews revealed no evidence of campers or public campfire activity in the origin area.

The Investigative Team was advised of two possible campfires in the general vicinity of Foxton Road. Both campfires were ruled out as potential ignition sources due to their distance from the specific origin area as well as the fact that they both occurred days prior to the ignition of the Lower North Fork Fire.

I	Debris Burning	(Land, Slash, Refuse, Other)

Wildfires in this category include fires started by either creeping escapes or windblown embers from trash barrels, small piles of yard debris such as pine needles or leaves, stubble field burns, slash piles or any other controlled burning. On occasion, debris burning activity may not be apparent as the wildfire may have started from a source some distance away or was kindled by a holdover from a pile originally burned days or even weeks before.

The specific origin area, which was located in a saddle along the ridgeline northeast of the prescribed burn in Unit 4, showed evidence of ignition from multiple windblown embers. Investigators identified several cold embers within the specific origin area that would have been competent ignition sources on the day that the Lower North Fork Fire ignited. However, due to the amount of disturbance to the specific origin area resulting from the suppression effort and wind event, investigators could not be certain that the embers had not been disturbed.

In general, research has shown that most windblown embers will self-extinguish after about 40 feet. However, exceptions to this rule occur when the firebrand is thick, wind speeds are high, or the source of fire was large enough to create a convection column that provides lift to increase lateral travel. Investigators believe that most, if not all three of these exceptions are applicable to the Lower North Fork Fire.

E	Railroad	(Ignition Activities Associated with Railroad Companies)

Railroad related fires are defined as any fires that are associated with railroad operations. Examples of potential ignition sources include diesel locomotive exhaust carbon or brake shoe particles. There are no railroad operations near the general origin area.

E	Incendiary	(Ignition Component / Material First Ignited)

Incendiary, or arson fires, are defined as those fires started deliberately and with willful or malicious intent and that burn any grass, brush, timber or property that belongs to another. The Investigation Team did not locate an arson device within the origin area, or any evidence that would support a deliberate start. Investigative interviews illuminated no indication of arson activity in the area, and public access to the origin area is restricted by locked gates. Furthermore, interviews with fire and law enforcement officials that were routinely in the vicinity of Unit 4 of the prescribed burn

around the time that the Lower North Fork Fire ignited reported seeing no unauthorized personnel on the Denver Water Board property.

E	Children	(Ignition Activities Associated with Children)

The origin of the fire is in a remote area far from any schools, parks, playgrounds, or residential homes. No evidence of children, such as small footprints, discarded candy wrappers, juice containers, toys or clothing was found by the Investigation Team. Furthermore, the origin area is on the private property of the Denver Water Board and is closed to public entry. Witness interviews revealed no evidence of children being in or near the origin area around the probable time of ignition.

E	Miscellaneous	(Blasting, Structure, Fireworks, Pest Control, Logging, Power line, Glass, Target Shooting, Spontaneous Combustion, Other)

This category includes such causes as power lines, fireworks, blasting, cutting, welding and grinding, reflective glass and spontaneous combustion. There were no power lines near the general or specific origin areas. In addition, participation in many of the other ignition sources included in this category would generally result in some sort of physical evidence being left behind at the scene. For example, if fireworks had been used in the area, investigators should have found spent devices or charred portions thereof. If target shooting was occurring, investigators may have located spent shells, target material, and evidence of shooting on vegetative material. Welding and grinding activities generally leave evidence in the form of slag, discarded welding flux rods, waste metal and other small metal fragments.

Investigators did not find any evidence of such activities in either the general or specific origin areas.

X	**Cause Determined:** State brief reason & include in the narrative		**Cause Undetermined:** State brief reason & include in the narrative
Reference Narrative under “Debris Burning” above.		N/A	

Wildland Fire Investigation

	NARRATIVE	Incident Number	CO-JEX-000176
		Incident Date	03/26/2012

SYNOPSIS: (Date, Fire Name, Estimated Acres, Location, Jurisdiction) (Estimated Cost, Damage; Property / Resource) (Cause; Determined / Undetermined)

On Wednesday, March 28, 2012, a Wildland Fire Origin and Cause Investigation Team responded to the Lower North Fork Fire, near Conifer, Colorado, upon the request of the Jefferson County Sheriff's Office, Golden, Colorado. The Lower North Fork Fire ignited on Monday, 03/26/12 on the private property of the Denver Water Board. The Investigation Team consisted of Special Agents from the Department of the Interior, Bureau of Land Management (BLM) and the USDA Forest Service, and a BLM Park Ranger.

The Investigation Team conducted the on-scene origin and cause investigation and related interviews from 03/28/12-03/30/12. It is the finding of the Origin and Cause Investigation Team that the Lower North Fork Fire ignited at approximately 1340 hours on 03/26/12, and was caused by windblown embers from a prescribed fire burn that was conducted by the Colorado State Forest Service on 03/22/12.

DETAILS OF INVESTIGATION: (Initial Report, Initial Attack, Initial Investigation, Fire Behavior Analysis, Origin Examination, Cause Determination & Elimination)

Wednesday, March 28, 2012

On Wednesday, 03/28/12, a Wildland Fire Origin and Cause Investigation Team responded to the Lower North Fork Fire. The team was requested by the Jefferson County Sheriff's Office. Upon arrival, the team met with Andy Parker in Confer, Colorado for an entrance briefing (Attachment C). Parker was the Planning and Operations Chief for the Jefferson County Incident Management, Type 3 Team on the Lower North Fork Fire. The following is a summary of the pertianent informaiton that Parker provided.

On 03/26/12, at approximately 1915 hours Parker received a call at home from James "Tim" McSherry, Director of Emergency Management with the Jefferson County Sheriff's Office. McSherry requested Parker's assistance with the Type 3 Team. At 1950 hours Parker arrived at the Incident Command Post for the Lower North Fork Fire in Conifer, Colorado.

According to Parker, the Colorado State Forest Service (CSFS) ignited a prescribed burn on the previous Thursday (03/22/12). The burn was also used as a training exercise, so there were over sixty people in attendance from various agencies, operating in several disciplines. The fuels were previously masticated. Parker stated that the prescribed burn unit had been black-lined approximately a week before the fire escaped.

On 03/26/12 crews were on-site to conduct mop-up. The Burn Boss was Kirk Will, CSFS Golden District, Golden, Colorado. Will had a trainee with him by the name of Kevin Michalak, CSFS Golden District. There was an Ignition Boss from Platte Canyon Fire Protection District near Fort Collins, Colorado. The Holding Boss was Sam Parsons from Fairmount Fire Protection District in Arvada, Colorado. Parsons had a trainee with him by the name of Rich Palestro, CSFS Boulder District, Longmont, Colorado. The Safety Officer was Rocco Snart, Fire Management Officer with the Jefferson County Sheriff's Office of Emergency Management, Golden, Colorado. Parker was under the impression that mop-up was not complete when the fire escaped.

Parker relayed the following information that he had received from Snart, who was reading from his notes. On 3/26/12 at approximately 1300 hours Snart received a call from Inter-Canyon Fire Protection District Fire Chief, Curt Rogers (later determined to be the Fire Chief for the North Fork Fire Protection District) and Bill McLaughlin, Fire Chief, Elk Creek Fire Protection District. Rogers and McLaughlin reported that the fire had escaped the controlled burn boundaries and that it was currently approximately 1.5 acres in size.

Michalak, who was the Incident Commander for the mop-up operation on 03/26/12, transitioned to the Type 4 Incident Commander when the escape occurred. Snart, who was acting as a quasi-dispatcher for the incident received a call from Will at approximately 1300 hours requesting three Type 6 engines.

At 1330 hours on 03/26/12, Dell Clineschmidt, Captain of Patrol with the Jefferson County Sherriff's Office, contacted his patrol units to see if they had checked on some reports of smoke in the area. Deputies replied that they had looked into the matter and that the fire was approximately five acres. Clineschmidt told the Deputies to get back to the fire. Upon returning to the fire, the Deputies reported that it had grown to ten acres in size.

Parker stated that the next report (time unknown) relayed that the fire had grown to 20 acres. This report came from an unknown person on scene.

At 1436 hours on 03/26/12, radio traffic relayed that the fire was making a massive run, and that the conditions were very windy. Parker did not know what channel the traffic was aired on.

In regard to the current situation, Parker stated that on 3/28/12 at approximately 1226 hours the fire was transitioned to a Type 1 Team and that the Incident Command Post was at the High School in Conifer, Colorado. Parker stated that Don Roach, Investigator with the Jefferson County Sheriff's Office had requested the Investigation Team on behalf of the Sheriff. The objective was to find out what happened. Parker informed the team that they were to work with Roach. The Type 1 Incident Commander for the Lower North Fork Fire was Paul Broyles (later determined to be the Deputy Incident Commander).

Parker informed the Investigation Team that the origin area was on State land (later determined to be the private property of the Denver Water Board). He said that he had requested that the origin area be protected and that the Jefferson County Sheriff's Office had been keeping people from entering the area. Parker defined the origin area as the location where the fire escaped the control line. He said that the Colorado State Forest Service thought they had the fire mopped up. Parker did not know if there was a burn ban in place when the prescribed burn was ignited on 03/22/2012. He informed the investigation team that a red flag warning had been issued for Friday, 03/30/12, 2012 and that 35-80 mph. winds were predicted.

When asked about other activity in the area, Parker stated that there were no known reports of suspicious activity or incidents. He mentioned hearing about an illegal campfire form Clineschmidt. He recalled that it was reported before the escape, but he did not know an exact location (Attachments D and E).

On 03/28/12, the Investigative Team met with Don Roach in Conifer, Colorado for an entrance briefing (Attachment F). Roach was the team's liaison with the fire's Incident Command Team. Following is a summary of the information that Roach provided regarding the Lower North Fork Fire.

In regard to the area where the fire occurred, Roach stated that the property was under the jurisdiction of the Denver Water Board. No one had been allowed near the potential origin area, which was in a location that was under evacuation and road closure restrictions.

Roach mentioned that the Jefferson County Sheriff's Office had four people on the prescribed burn on 03/22/12.

When asked about activities that have been occurring in the vicinity of the Lower North Fork Fire, Roach stated that there was an unattended campfire in Reynolds Park. He did not have an exact location and did not believe that the origin on the campfire had been protected.

Roach stated that he was an Arson Investigator with the Jefferson County Sheriff's Office; therefore, he would know if there were any arson problems in the vicinity of the fire, and he was not aware of any. The last known arson issue occurred last year (2011) and the subject is currently incarcerated.

Roach mentioned that there are two Deputies with the Jefferson County Sheriff's Office that work the area where the Lower North Fork Fire occurred, Mike Sensano and Ronnie Newman. According to Roach, Sensano and Newman

would be able to provide the Investigative Team with information about the activities that occur in and around the origin area of the fire.

Roach accompanied the Investigation Team to the Incident Command Post (ICP) in Conifer, Colorado, and proceeded to work through the logistics of arranging for the team to access the origin area of the Lower North Fork Fire the following day.

On 03/28/12, at 2000 hours, Schultz, Schnurr and Roach interviewed Bill McLaughllin, Chief, Elk Creek Fire Department regarding the Lower North Fork Fire (Attachment G). The interview took place at the ICP in Conifer, Colorado. The following is a summary of the information McLaughllin provided.

McLaughlin stated that at approximately 1355 hours [on 03/26/12] his Department was requested as mutual aid for the fire in the North Fork Fire Protection District. The request was for a Type 6 engine on a one acre slopover on Denver Water Board property.

McLaughlin stated that the CSFS crew was talking to their Golden office on the radio and the information was relayed to Jefferson County Fire Management Officer Rocco Snart. Snart then contacted Jefferson County Dispatch who requested the mutual aid response. Snart was at his Golden office when Kirk Will with CSFS contacted him. McLaughlin was in Aspen Park at a grass fire at the time of the mutual aid call and it took him approximately 30 minutes to respond to the fire scene.

When McLaughlin arrived he observed two engines from the North Fork Fire Protection District, an ATV from CSFS and a Type 6 engine. The North Fork responders were Chief, Curt Rogers and a volunteer and the Type 6 engine was Alex Parks and Scott Byars. Kevin Michalak with CSFS was with the ATV.

Rogers was already on scene doing size-up and told McLaughlin that Michalak was in charge and that they had a "slopover" that was burning downhill to the northeast.

McLaughlin stated that the winds were 20-22 mph, with gusts to 60-80 mph. The wind was blowing so hard they couldn't keep hardhats on. Rogers had a Kestrel that recorded the wind speed and McLaughlin recalled that the Kestrel maxed out at the 80 mph reading. McLaughlin estimated the temperature was in the 70's.

The control line for the prescribed burn was the dirt road on the ridge top. McLaughlin stated the fuel bed of the prescribed fire was masticated fuel, 4-6 inches deep that had burned on the top layer and was reburning deeper in pockets in locations inside the prescription unit. The masticated fuel was primarily ponderosa pine debris.

McLaughlin observed the fire on the downhill side of the ridgeline, to the northeast of the prescribed fire unit. He observed flame lengths of 1-2 feet, with pockets of flame lengths of 4-8 feet, and occasional single tree torching.

McLaughlin stated the fire was not crowning when he observed it. The ponderosa pine trees were approximately 30 feet apart and were not supportive of a crowning fire at that location.

McLaughlin's Type 6 engine started a wet line along a flank of the slopover area, but anything they put water on was such heavy fuel it was reigniting so he directed his crew to work a scratch line.

While McLaughlin and his crew were on scene the fire had not crossed the drainage to the north and was approximately 200' downhill of the ridgeline.

McLaughlin marked on a map the location where they put the wet line and where the fire was burning when he arrived. In addition, McLaughlin marked on the map the locations where the portable pump hose lines were laid on the northeast (escape) side of the ridge. McLaughlin initialed and dated the map and it is part of this interview record.

On 03/28/2012 at 2037 hours, Tokos, Schultz, Schnurr and Roach interviewed Boyd Lebeda, District Forester, CSFS, Fort Collins District Office, Fort Collins, Colorado at the ICP in Conifer, Colorado (Attachment H). Following is a summary of the information provided by Lebeda.

Communications for the entire Lower North Fork Fire took place on VHF radio frequencies. He stated that the command, holding and firing units all used car-to-car, tactical channels. CSFS does not have a manned dispatch. The only manned dispatch in relation to the fire would have been Pueblo Interagency Dispatch. Lebeda did not have any knowledge if there was actual communication with Pueblo Dispatch via the repeater on Devil's Head during the incident. He suspects that the Burn Boss used County Dispatch on 03/26/12. He mentioned that the Burn Boss had indicated that he could communicate with Pueblo.

Lebeda did not think there were any recordings of the radio traffic on the car-to-car channels. He stated that Pueblo Dispatch may have a recording (Attachment I).

Lebeda said that in regard to the Lower North Fork Fire, a burn plan was written, and burn units were identified. A hydro-axe machine was used to thin vegetation, in particular, Ponderosa pine trees. The fuel in the area was not consistent, there were open areas. Unit 4 was a bowl with three prominent drainages.

On Monday, 3/19/12, crews blacklined the top of the ridge. The blackline was approximately 100' wide. The sides were completed with a handline.

Lebeda stated that the burn plan identified a holding crew and a firing crew. On Thursday, 03/22/12, there were more holding resources on site then what was called for in the burn plan. According to Lebeda, the prescribed burn on Thursday was successfully fired and held.

Lebeda mentioned that on 03/23/12, resources went back up to the burn location and secured and mopped up some small spot fires. All spot fires were contained and extinguished. On 03/24/12, patrol and monitoring occurred. He did not believe anyone went back up to the unit on 03/25/12.

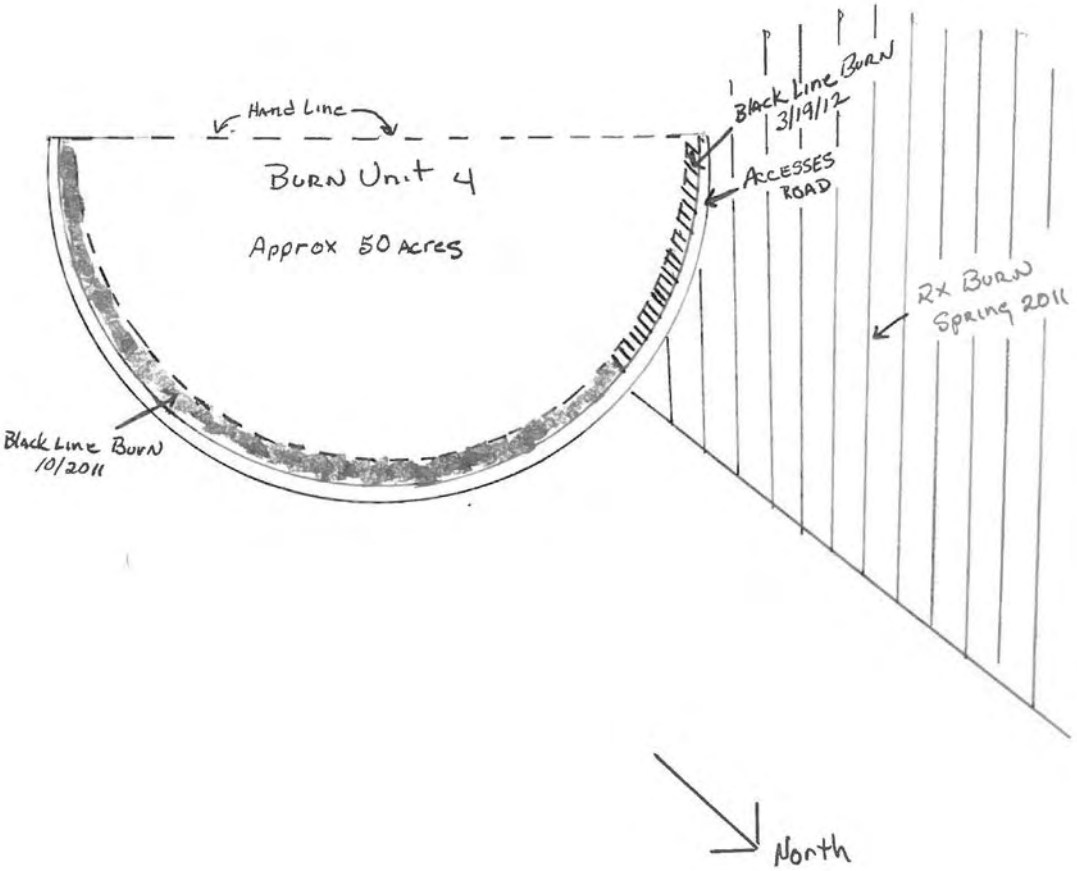
Lebeda said that on 03/26/12, a crew consisting of Kevin Michalak, Robert Kriegbaum (CSFS Technician II/Engine Crew, Golden District Office) and others went up to the burn unit in the morning. He did not think that they saw too much fire activity until the afternoon when the wind picked up and the fire took off.

Thursday, March 29, 2012

On Thursday, 03/29/12, the Investigation Team, accompanied by Roach, Fire personnel and Kevin Michalak drove to location of the Unit 4 of the prescribed burn area. Investigative Team members Shannon Tokos (BLM Special Agent) and Troy Schnurr (BLM Park Ranger) interviewed Michalak (Attachment J). Following is a summary of the information that Michalak provided regarding the Lower North Fork Fire.

Unit 4 of the prescribed burn was bordered by the road that ran the ridgeline with a hand line running roughly parallel to the ridge, closing the unit. Michalak stated that Unit 4 contained approximately 50 acres. Roughly four years ago the fuels within the unit were masticated. A hydro-axe was used to treat the fuels below the road, approximately one chain deep (66 feet). After that, the terrain became too steep to use the machine. The goal of the prescribed burn in Unit 4 was to only burn between the road and the handline.

Michalak mentioned burning a test plot near Unit 4 in the spring of 2011 in order to determine how the fire would burn given the fuels and terrain. In October 2011 crews put in a blackline below most of the road along the ridge in anticipation of the upcoming burn. The black line below the road was finished on 03/19/12. According to Michalak, the burn was on property owned by the Denver Water Board.

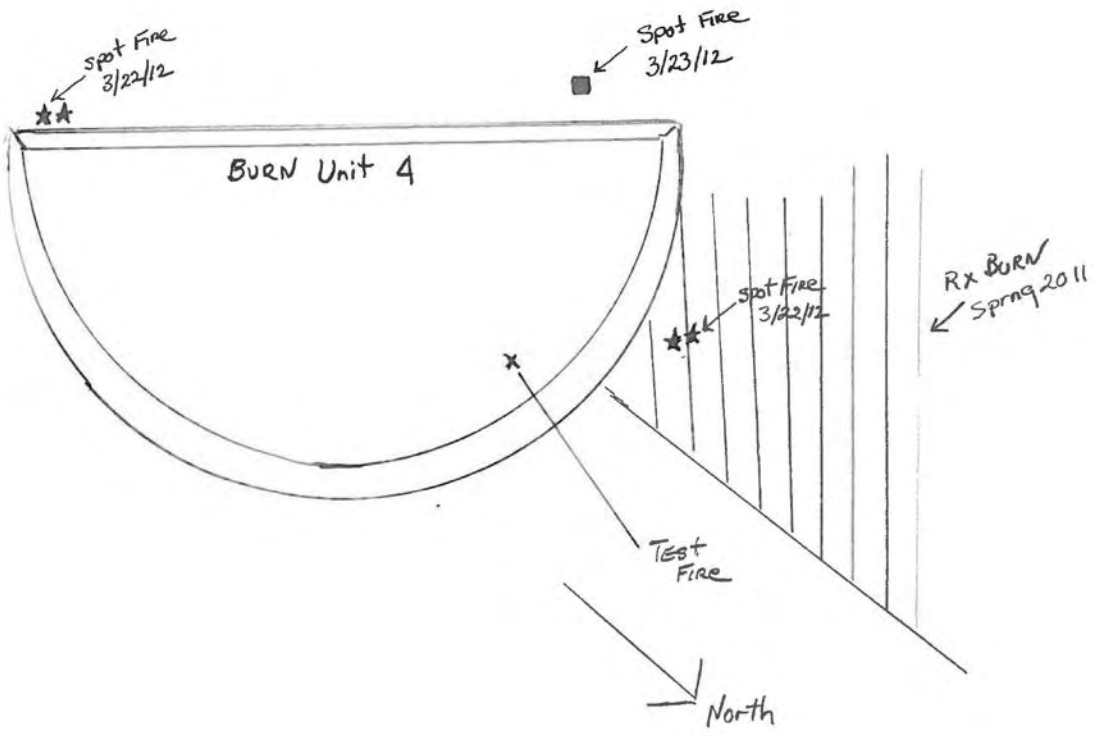


On 03/22/12, the day that the prescribed burn in Unit 4 was ignited, there were approximately 80 people in attendance, including but not limited to:

- 20 person SWIFT (Department of Corrections) crew,
- 20 person Type 2 CSFS crew,
- 6 Type 6 Engines,
- A Type 5 Engine in standby,
- A Type 7 Engine in standby,
- 2 people monitoring Colorado air quality,
- Jefferson County Fire Management Officer, Rocco Snart with a refresher class, and
- A 6 person firing crew from the Platte Canyon Hot Shots.

Unit 4 was ignited on Thursday, 03/22/12 at approximately 1045 hours. The burn began with a test fire that expanded for about 50'. Winds were variable from multiple directions at the time of ignition, but the weather was still in prescription. Michalak stated that there was no burn ban in effect and a red flag warning had not been issued. He said that hazardous weather was not predicted until Monday, but the warning about Monday did not come out until Saturday night or Sunday (3/25/12).

According to Michalak, the plan for Unit 4 was to burn from the black line down to the handline. Michalak stated that the burn was a little difficult due to the shifting winds but the project was successful. During the prescribed burn, Michalak stated that there were 4-5 small spot fires outside of the perimeter. He believed that they were caused by rolling material due to the steep grade and wind conditions. The spot fires ignited in duff and smoldered. Crews were able to completely extinguish them. Michalak also mentioned some isolated tree torching in the interior of the prescribed burn. The burn ended at approximately 1630-1700 hours. Crews remained on site to mop-up until approximately 2000 hours. At the time the final crews left the burn area, there were a few stumps burning and cold weather was setting in. There were no known spot fires when the crews left the area.



On Friday, 03/23/12, Michalak arrived at Unit 4 at approximately 0900 hours. The SWIFT crew, four Type 4 Engines and a Utility Terrain Vehicle (UTV) with water were on scene that day. According to Michalak, there were two areas of heavy smoking in the interior of the burn. There was also one spot fire that had ignited below the handline. Engine crews were working from the road into the burn unit for approximately 100 feet. A hand crew worked the handline and spot fire until the spot fire was completely extinguished. They worked the entire length of the hose lay from the road, which accounted for 1200 feet. Michalak stated that the mop-up work on the unit that day was successful and that there were no other smoking areas or spot fires. The fire was put into patrol status and he left the burn unit at approximately 1700 hours.

On Saturday, 03/24/12 Michalak arrived at Unit 4 at approximately 1030 hours. The SWIFT crew was not on scene that day. Upon arrival, Michalak walked the west (weather station) side of the unit and did not see anything active within two chains (approximately 132') from the road. Michalak did notice one spot in the interior of the unit where an area of needle cast and litter was still smoldering. He knew that the SWIFT crew had worked at that location the previous day (03/23/12) and when they had finished there was very little smoke coming from the site. Michalak also walked the south side of the unit, down to the handline and did not notice anything of concern. According to Michalak, the entire blackline of the fire was completely cold. He left the area at approximately 1400 hours.

Michalak decided not to go up to Unit 4 on Sunday, 03/25/12 because the site looked good the previous day, the weather prediction was favorable, and he intended to visit the site the on Monday (03/26/12).

On Monday, 03/26/12, Michalak returned to Unit 4 around 1030 hours. He was accompanied by Rob Kriegbaum, Fire Fighter I, CSFS, Golden District Office and Ryan Cox, Fire Fighter II (seasonal), CSFS, Golden District Office. Michalak stated that his intention that day was to check the unit and then remove all of the remaining suppression equipment (e.g. hose, pump, signs, UTV). The crew started by collecting Global Positioning System (GPS) data on the unit. Michalak drove Kriegbaum to the west corner. Kriegbaum then walked the bottom handline with the GPS. Michalak then drove to the south side to meet with Kriegbaum. At that time, Kriegbaum informed Michalak that the unit looked good. The only visible smoke was from the interior of the unit at the needle cast area that the SWIFT team had worked on 03/23/12 and from a downed log that was also in the interior of the unit. Michalak then drove the UTV back to the west side of the unit to complete his mapping. Kriegbaum and Cox remained on the south side of Unit 4 pulling up a hose line.

According to Michalak, by about 1230 hours on 03/26/12, he and his crew were on the south side of Unit 4. They had packed everything into their vehicle and loaded the UTV. Michalak noticed that the winds were starting to pick up. He estimated them to be 10-15 mph. out of the south/southwest at that time. Michalak and his crew drove in their truck to the northeast side of the burn unit. At that time, he estimated that the winds were 15 mph. with gusts to 20 mph. out of the south/southwest. Michalak stated that he and his crew noticed small puffs of smoke; he called “duffers”, emerging inside the burn unit, below the road. Kriegbaum and Cox jumped out of the truck and began working the area with hand tools. Michalak took the UTV down to a water source near the red gate. He was gone approximately 15 minutes. He stated that when he returned with the UTV, his crew was working 2-3 small spot fires that had jumped the road on the north/northeast side of Unit 4. Michalak said that all of the spots were within five feet of the road, and that nothing went over the lip of the ridge [beyond the shoulder of the road]. Kriegbaum and Cox were using hand tools, and were getting the spots under control. By this time, it was around 1300 hours.

Michalak said that when they were finished with the spots, the crew began working on numerous fires that had ignited on the burn unit side of the road. He mentioned that when they put water on the fires they would dry out in 10-15 minutes and re-ignite. Michalak called Will, on the radio and requested a Type 6 Engine. Will was the Acting Fire Duty Officer. Michalak stated that Kriegbaum may have called Will first, but he was not sure.

Michalak, Kriegbaum and Cox continued to work the area, inside the burn unit, below the road, on the north/northeast side, for 10-15 minutes. Michalak stated that the winds were picking up to 20-30 mph. and gusting.

Michalak started noticing more smoke coming from the south side of Unit 4. Kriegbaum walked toward the south side to check on the smoke. He told Michalak that he did not see anything, only smoke coming from the interior of the burn unit. They continued to work on the area where the fires were occurring on the north/northeast side of the unit. They ran out of water. It was now between 1330 and 1340 hours. Michalak stated that he began noticing more smoke coming from the south side of Unit 4. He took the UTV down to check, and noticed similar “duffing” as they were fighting on the top of the ridge (north/northeast side). Since all of the duffing was coming from inside the black line, Michalak drove back up to his crew.

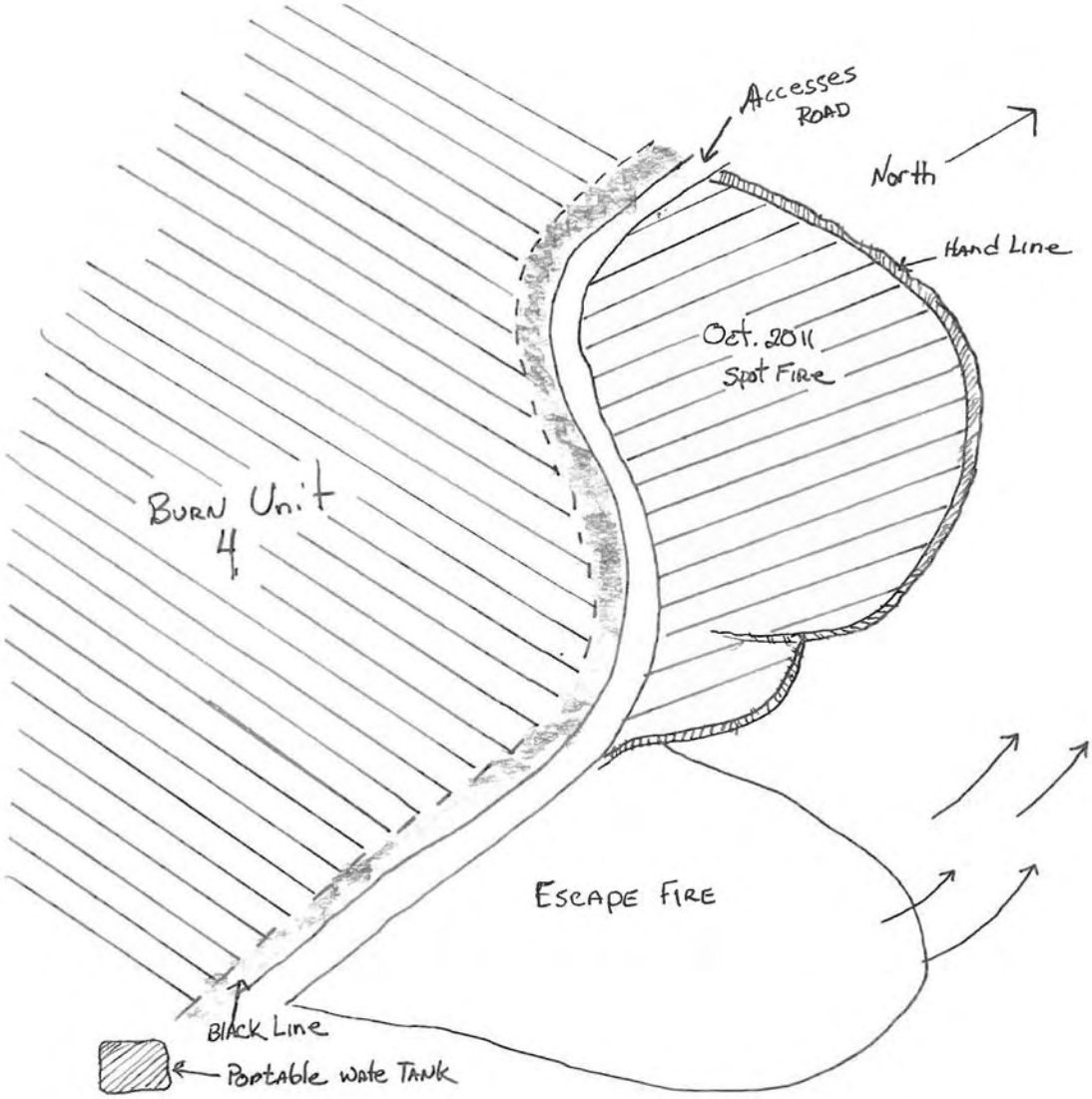
Michalak got ahold of CSFS Engine 862, and they informed him that they were five minutes from the red gate. He and his crew continued to work the area on the north/northeast side with hand tools. They were out of water. He said they were working fires on both sides of the road, but none of fires that were outside of Unit 4 went over the lip of the ridge.

Michalak then noticed, what he described as, a significant amount of smoke on the south side of the unit. He drove the UTV down to check and noticed a fire, approximately 1/10 to 2/10 of an acre in size, outside of the burn unit. The fire was in unburnt masticated fuels. He estimated the winds to be 20-30 mph. Michalak drove the UTV back up to his crew and the vehicle and called Will on the radio. Michalak advised Will of the fire and requested four additional engines and two hand crews. He also requested a Fire Duty Officer and advised Will to check on the availability of the Jefferson County Type 3 Incident Management Team.

By this time, Michalak stated that the CSFS Type 6 Engine had arrived at their location. The CSFS employees that brought the engine to the scene returned to the CSFS Golden District Office in the chase truck, leaving Michalak, Kriegbaum and Cox at the fire, with the Type 6 Engine. Michalak took the UTV back down to the fire on the south side of Unit 4. He stated that the smoke was heavy.

At this point in the interview, Michalak and Tokos were standing at the location where the fire escaped on the south end of Unit 4. Michalak informed Tokos that the day after they burned part of the blackline in Unit 4 in October 2011, they (CSFS) received a call requesting that they go back up to the site and check on the unit. Upon arrival Michalak located a spot fire on the south/southeast side of the unit. The fire was outside of the burn perimeter. They used handline to put it out. Michalak indicated the area where the October 2011 spot fire occurred and identified the associated handline, which was still visible on the ground.

Michalak stated that when he came back down to the fire on the south side on UTV on 03/26/12 the fire had wrapped around the area that was burnt in the October 2011 spot fire and was moving back toward the unit.



Michalak returned to the top of the ridge and staged at that location with Kriegbaum and Cox. He said that they did not initiate any suppression effort on the fire at that time due to the weather conditions and their limited resources. They knew that additional resources were enroute to the scene. Michalak then reiterated that nothing on top of the ridge (the north/northeast side of the unit) went over the lip.

Michalak took the UTV down a two-track road that runs along the bottom of the drainage below the ridgeline. He stated that the fire was still contained between the two roads (the two-track and the ridgeline road). It was heading north with winds of 20-30 mph. and gusting with heavy smoke.

Michalak went back to his crew at the top of the ridge. Additional resources from Aspen Park and Indian Hills arrived on scene along with a fire crew from the Jefferson County Sheriff's Office. At this point the suppression effort began.

When asked about weather data, Michalak stated that there was a weather station near the west side of the unit. He was under the impression that it was functioning, and agreed to obtain weather information for the Investigation Team upon his return to the office (it was later determined that the station was malfunctioning).

When asked about other types of activities in the area, Michalak provided the following information.

- During the unit preparation, which began in the spring of 2011 and continuing through 03/26/12, Michalak did not recall seeing anyone other than authorized personnel in the vicinity of the Lower North Fork Fire. He said that the red gate was locked and only the Denver Water Board and CSFS employees had keys to access the area.

- Michalak stated that on 03/22/11, he observed some of the personnel on scene smoking, but he said that they were primarily in the black.

- On 03/22/12, during the execution of the prescribed burn in Unit 4, Michalak heard some unspent shells go off in the interior of the unit. There were no people associated with the shells, and no shooting activity was taking place in the vicinity of the fire. He advised that the firing crew had used drip torches and flares to ignite the prescribed burn.

- Michalak stated that the area had not seen any rain or weather in "awhile".

- The local community had been made aware of the prescribed burn before it took place on 03/22/12. Michalak stated that signs were posted on 03/18/12 advising of the pending activity and providing a phone number to call with questions or concerns. He was not aware of any calls or complaints.

- Michalak was not aware of any arson activity in the area.

- Michalak mentioned that on Saturday, 03/24/12, he went to the south end of the burn unit and used binoculars to view the area on the other side. He mentioned that he saw an attended fire that was at least one mile down from the burn unit near the South Platte River. He was not sure if it was a campfire or if it was associated with a residence.

- On Friday, 03/23/12, Michalak was on scene at Unit 4 when a campfire in Reynolds Park was reported. He believed that the campfire was approximately 1.5 miles from the red gate, or 1-1.5 miles as the crow flies from Unit 4 on the west side of Foxton Road.

Later that day, Michalak provided the team with a copy of the prescribed burn plan (Attachment K), a map of the burn units (Attachment L), and a record of CSFS radio communications from 03/26/12 (Attachment M).

On 03/29/12, after concluding the interview with Michalak, the Investigative Team initiated the physical examination of the origin area. The team started with a systematic approach in determining the general origin area by walking around the area identified by Michalak as the perimeter of the initial escape on 03/26/12. The investigators identified and examined macroscale and microscale indicators to determine if the physical evidence left by the progression of the fire matched the information presented by Michalak. The team determined the general origin area, which was documented with photographs (Attachment N) and sketches (Attachment O).

As fire travels through an area it leaves physical indicators on objects in its path. Investigators use the indicators to determine the fire's progression. The Investigation Team entered the general origin area from an area of advancing fire and continued to examine burn indicators. They worked through a search pattern placing colored flags delineating indicators that showed the fires progression. Through this process, the team identified a specific origin area, which was approximately 20' 10" x 10' 10".

Due to decreasing natural light, the Investigation Team left the general origin area at approximately 1730 hours, with the intention of returning the following day to complete the origin and cause determination. Roach made arrangements to secure the origin area.

Friday, March 30, 2012

On Friday, 03/30/12, Tokos, Schnurr and Fire personnel returned to the general origin area. Tokos and Schnurr began by documenting the scene with photographs (Attachment P). The specific origin area was then divided into grid lines and each line was examined in detail, visually and scanned with a magnet. During this process, the team continued to identify microscale burn indicators that confirmed the location of the specific origin area. While Schnurr and Tokos were working the origin area, Schultz took aerial photographs (reference Attachment N).

During the examination of the specific origin area, Tokos and Schnurr did not locate a single point of origin or an ignition source. However, evidence of several ignition points was located. These specific points were defined by burn indicators and appeared to be in a scattered pattern within the specific origin area. The burn pattern that the investigators identified showed advancing fire generating from the specific origin area and continuing into the general origin area. Schnurr and Tokos also located what appeared to be the remnants of lightweight airborne embers in a few of the ignition points. These embers were more significantly charred then the surrounding burn indicators. Unfortunately, suppression efforts and wind had damaged the specific origin area to the point that the investigators were not able to confirm whether or not the embers had been disturbed.

The team had the information on the general and specific origin areas layered onto maps for reference (Attachment Q).

On 03/30/12, Tokos and Schnurr returned to the ICP. Schultz was in the process of interviewing Rocco Snart, Fire Management Officer for the Jefferson County Sheriff's Office (Attachment R). The interview took place at the ICP in Conifer, Colorado. Following is a summary of the information provided by Snart.

On 03/16/12 Snart had checked the fuel moisture near the prescription unit and the 1,000 hour fuels were at 34%. Snart stated it is difficult to forecast the winds in that area because of the terrain; it has always been known as a difficult wind area.

Unit 4 had been blacklined the Monday prior (03/19/12). The top of the unit was blacklined approximately one chain deep.

On 03/22/12 Snart was at the Lower North Fork Fire Prescribed Burn briefing. Snart was assigned as the Safety Officer on the prescribed burn as a collateral duty. He had a training crew with him that day (8 people) for their annual fireline refresher training. Snart stated he had the trainees with him most of the day on the prescribed fire unit then he released them at approximately 1430 hours. The trainees were Parks and Open Space Staff and Rangers.

Snart recalled that by approximately 1500 hours the prescribed burn crew had split the firing crews and were igniting in additional locations in Unit 4. The fire was burning well in the interior of the unit. Snart stated that he established the line was secure and there were no imminent threats to the line. At one point there was what Snart referred to as "one tiny spot" outside the blackline and it was recognized immediately and taken care of. Snart marked on a map where he recalled the spot was. That map was initialed and dated by Snart and is included as part of the investigation record with this interview. The spot Snart referred to is to the west of the 03/26/12 slopover areas.

Snart stayed on the prescribed fire until approximately 1930 hours. He recalled that the ignition action had been completed by approximately 1600-1700 hours. The fire was consuming the masticated fuels on the ground and had moved into some of the stringer fuels in the drainages.

Snart stated they started the ignition on 03/22/12 along the west side of Unit 4 and carried it east along the ridge. Schultz showed Snart a map of the area and he marked the location where the prescribed burn ignition started. Snart stated he was not on the "go/no go" checklist signature line for the prescribed burn on 03/22/12. Snart stated he was the one making the "go/no go" decision on that unit last fall (2011) and had cancelled that prescribed burn due to the conditions. At that time (fall 2011) he had blacklined some of Unit 4 and the conditions had led to slopovers during the blackline work so he cancelled the burn. The slopover of the blackline in the fall of 2011 was in the saddle at the ridgeline along the northeast side of Burn Unit 4 so when he heard that the 03/26/12 slopover was in the same area as the fall slopover he knew where it was located.

Snart stated there is a RAWS station, the North Waterton RAWS in the area, but it was not functioning.

Snart stated he has a Type 6 Engine and crew and they returned to the prescription unit at approximately 0900 on Friday (03/23/12) and started mopping up. Snart spoke to Allen Gallamore (CSFS, District Forester) on Friday and was told by Gallamore that the line was secure. Snart understood the crews were going to continue patrol and monitoring on Saturday and Sunday (03/24-03/25/12).

The fire behavior Snart expected during the patrol and monitoring is that the fire would not have surface spread, but would burn out the heavier fuels within the interior of the unit. The purpose of the patrol was to monitor that nothing was jumping the line.

Snart did not receive any phone calls regarding the prescribed fire on Sunday, 03/25/12. On Monday, 03/26/12 Snart's fuels crew returned to their normal operations.

On 3/30/12, Tokos and Schnurr interviewed Ronnie Newman, Deputy, Jefferson County Sheriff's Office, Golden, Colorado (Attachment S). Deputy Newman provided local history and access information in relation to the Lower North Fork Fire.

Deputy Newman's patrol sector includes the area in which the Lower North Fork Fire occurred. The land, upon which the fire ignited, is under the jurisdiction of the Denver Water Board. He advised that public access into the area is controlled by locked gates. Deputy Newman patrols the area often and at no time has he come into contact with unauthorized personal behind the locked gates. He did state that the Denver Water Board leased access to the previous land owner; however, approximately five years ago the lease was revoked due to abusive use.

Deputy Newman mentioned a report of a campfire in the vicinity of Reynolds Park on 3/23/12. He stated that the location of the campfire was approximately three miles from where the Lower North Fork Fire ignited on 03/26/12.

Deputy Newman stated that in the fall of 2011 he responded to a smoke report on the Denver Water Board property, behind the locked gates. Upon arrival he found that a previously ignited prescribed burn on the south end of Unit 4 had crossed the road and reignited. He expressed concerns over the lack of oversight. Deputy Newman stated that he initiated suppression and that the Colorado State Forest Service responded.

On 3/30/12, Tokos and Schnurr interviewed Rich Palestro Technician II/Engine Boss, CSFS, Boulder District Office (Attachment T). Following is a summary of the information Palestro provided regarding the Lower North Fork Fire.

On 3/26/12, approximately 1350 hours Palestro received a call from Gallamore to assist on a "slop over" fire located south of Conifer, Colorado. The fire was reported to be approximately one acre in size at the time Palestro received the call for assistance. Previously that week (specifically on 03/22/12) Palestro had been involved with a prescribed burn that was near the reported location of the "slop over".

At approximately 1530 hours Palestro arrived on scene and estimated that the fire had grown to 20 acres with 30 to 40 mph. sustained winds. Palestro staged his engine to the far south end of the fire were there was a foldable tank with water. He proceed to work with a fire crew to set up a portable pump and establish a hose lay of approximately 600 ft. to try and flank the fire. While the crew was attempting to flank the fire Palestro hiked down the northeast flank to get a better view of how fast the fire was progressing. Once Palestro got into a better position to size up the fire, he found that the fire was making a fast run and that it would be difficult to head off the fire and try to stop the progression. He made the decision to pull himself and the crew out for safety reasons.

On 03/30/12, Schultz and Schnurr interviewed Allen Gallamore at his office in Golden, Colorado (Attachment U). Gallamore is the District Forester for the Golden District, CSFS. Following is a summary of the information provided by Gallamore.

Gallamore explained that the project site of the Lower North Fork prescribed fire is on Denver Water Board land and is a locked site, closed to the public. There is no public access, camping, or picnicking allowed and no public fires are allowed.

Gallamore was present on site the day the controlled burn was ignited (03/22/12). Gallamore stated that on the day of the burn he received a report from Jefferson County Dispatch (JeffCo) that there was an individual at Reynolds Ranch Open Space Park, up on the Eagle Cliff Trail, toward the top of the hill, who came down the day of the prescribed burn and reported a fire that they had seen from the Eagle Creek Trail. JeffCo Dispatch called the CSFS and wanted to know if it was the CSFS prescribed burn the reporting party was seeing. From the information provided by the reporting party, Gallamore at the time, thought it was the prescribed fire

As Gallamore left the prescribed fire area that evening (03/22/12) at approximately 1900 hours, he stopped at the Eagle Creek trailhead parking area on Foxton Road and looked back toward the prescribed fire area as well as toward the area of Reynolds Ranch where the fire report had come from and he saw no smoke or fire activity in the Reynolds Ranch area. The only smoke he observed was in the area of the prescribed fire. Gallamore did not see or contact the reporting party of the Reynolds ranch fire report.

On 03/23/12 Gallamore was aware of a fire page that he believed turned out to be the Reynolds Ranch campfire report from the previous day. The page was for an escaped campfire on the Eagle Creek Trail in Reynolds Ranch. Gallamore stated that Scott Halladay responded and confirmed there was an escaped campfire, burning less than one acre in size. The fire was extinguished and did not escape further. This campfire site was in excess of one mile from the area of the Lower North Fork prescribed fire (reference Attachments D and E).

On 03/26/12, Gallamore was at home when he heard about the prescribed fire escape. He does not recall the exact time, but believes it was around 1300. Gallamore called into the Golden District Office to find out what was happening with the fire response and he later drove into the office.

Gallamore stated that he recalls that on 03/26/12, at the time of the prescribed fire escape, Kirk Will was on his way back from another CSFS prescribed fire in White Ranch and was hearing radio traffic between Kevin Michalak and Brenda DeHerrera in the Golden CSFS District Office related to a slopover on the Lower North Fork prescribed burn. Gallamore stated he understood that Kirk Will was communicating both on the radio and on the phone with DeHerrera and with Rocco Snart at JeffCo.

Gallamore stated that DeHerrera does not normally keep a radio report log of the radio discussion, but Gallamore told DeHerrera to go back and jot some notes down regarding the events surrounding the escaped fire. It is Gallamore's understanding that DeHerrera received the radio calls from Kevin Michalak and was relaying Michalak's information to Kirk Will via the radio or to Kirk Will's cell phone. The radio traffic with the Golden District Office is not recorded.

Wildland Fire Investigation

On 03/30/12, Tokos and Roach interviewed Kirk Will, Assistant District Forester, CSFS, Golden District Office (Attachment V). Following is a summary of the information provided by Will.

On Monday, 03/19/12, Will was the Burn Boss for the prescribed burn in Unit 4. The crews completed the blackline below the road in anticipation of the upcoming prescribed burn. When they were finished, the blackline was one to two chains in width (66'-132'). The area was mopped up completely and there were no issues with spot fires that day.

On Tuesday, 03/20/12, Will remained at the Golden District Office. He sent a crew up to check on the unit and install a hose lay, porta tank and pump. Will did not receive any report of smoke or fire activity from the site that day.

On Wednesday, 03/21/12, Will was involved with burning a unit called White Ranch near Colorado State Highway 93. He sent someone up to the Lower North Fork to check on Unit 4, and they reported that there were no issues at the site.

That evening (03/21/12) Will worked on making arrangements for the prescribed burn that was scheduled to take place the following day. He confirmed that there would be two 20 person crews on site along with the Platte Canyon Firing Crew, Type 6 Engines from Boulder, Fort Collins, Lyons, and Canon City as well as overhead personnel. Will mentioned that signs alerting local residents about the pending prescribed burn had been posted the previous Thursday (03/15/12).

On Thursday, 03/22/12, Will was the Burn Boss for the prescribed burn in Unit 4. He explained that he had double the resources on site, then what was called for in the burn plan. The crews met in Reynolds Park for a briefing at 0830 hours. When Will arrived at the unit, the blackline was cold and looked great. He completed the "Go No-Go Checklist" and determined that the burn was in prescription.

In regard to communication, Will stated that they were utilizing "Jeffco South" and each unit had their own channel (e.g. holding, firing etc.) All channels were being monitored. There was an 800 mhz. radio on scene, and both the Jefferson County Sheriff's Office as well as the Pueblo Interagency Dispatch were notified of the burn.

According to Will, the prescribed burn was lit and the fire progressed without incident. It burnt to the blackline and died out. Will reported that there were 4-5 spot fires during the burn. They were all within feet of the line and were barely expanding. The fire was not spotting frequently, so there was no need to stop the prescribed burn. Mop-up was initiated to secure the line. Will stated that the fire line was secured one to two chains in toward the interior of the burn (66'-132'). The interior of the unit was left to burn itself out. The crews left the area between 1900 and 1930 hours. Will stated that there were no known problems with the burn that day.

On Friday, 03/23/12, the 20 person SWIFT crew returned to Unit 4 along with at least four Type 6 Engines. The crews continued to mop-up the area. According to Will the unit was bordered by two to three chains (deeper in places) of solid black line. Will received a report from Kevin Michalak that there were no issues with the unit.

On Saturday, 03/24/12, Michalak reported to Will that there were two small areas within the interior of the burn unit that were still smoking. Michalak stated that there were at least two chain lengths (66'-132') of cold line surrounding the fire, and nothing was threatening. Will and Michalak discussed the need for crews to return to the unit on Sunday, and they decided that it was not necessary.

On Sunday, 03/25/12, Will stated that the unit was not checked by CSFS personnel.

On Monday, 03/26/12, Will checked the burn unit at White Ranch in the morning and headed back to the Golden District Office. He was hoping to be able to put the Lower North Fork prescribed burn into patrol status by the end of the day. At approximately 1300 hours, while enroute back to the office, Will overheard Michalak call the Golden District Office on the radio and request a Type 6 Engine. Will contacted Michalak on the radio and asked if he needed to respond. Michalak stated that he did not need him at that time.

Will arrived at the CSFS Golden District Office at approximately 1330 hours. He heard Michalak state that the winds had picked up and they had a fire slop over the line. Michalak requested more resources.

At approximately 1345 hours, Michalak called Will on the phone and stated that the unit was experiencing heavy winds and that he needed more resources. Will mentioned that his tabular forecasts did not predict the winds that Michalak was experiencing until that day.

On 03/26/12, at approximately 1346 hours, Will called Rocco Snart, on the phone. Will informed Snart that there was a slopover on the Lower North Fork Fire prescribed burn and requested contingency resources. According to Will, Snart called in additional resources. Will also requested suppression resources from the CSFS, Boulder District Office.

At approximately 1350 hours, Will received a call from Michalak. Michalak stated that the fire was growing fast and requested more resources. Will then called Allen Gallamore and advised him of the situation.

At approximately 1415 hours, Will called Michalak for a status check. Will stated that at 1430 hours, the Lower North Fork Fire was declared as an “escape” because it could not be controlled with on-scene resources even though it was still within the boundaries of the Maximum Management Area, as defined by the prescribed burn plan. Will requested that the Jefferson County Type 3 Incident Management Team be activated along with additional resources. Will stated that there was some discussion regarding activating air suppression, but it was determined that the wind conditions were too high for aircraft to fly.

On 03/26/12, at approximately 1515 hours another fire was reported in the foothills near Lookout Mountain.

According to Will, at approximately 1530 hours Gallamore headed up to the Lower North Fork Fire as the Fire Duty Officer. A Type 7 Engine was sent up to act as a radio repeater. At this point a third fire was reported in the vicinity of Stagecoach and Grapevine. That fire was reported to be approximately 30 acres in size.

At 1600 hours, Michalak reported over the radio that the Lower North Fork Fire escape was approximately ten acres in size. Will then assumed the role of agency representative/liaison and Snart became the contact for resource requests.

On 03/26/12, at approximately 1630 hours the Type 3 Incident Command Team from Jefferson County began taking over the incident.

At 1643 hours, Will heard that Curt Rogers, Fire Chief, North Fork Volunteer Fire Department, had assumed the role of Incident Commander on the fire (reference Attachment E).

Some of the information that Will reported, came from radio transmissions that he heard while in his vehicle or in the CSFS Golden District Office. Additional information was obtained via phone conversations. Will said that he took notes on a CSFS Incident Communications/Action Log, which he referred to during the interview. However, he mentioned that he did not make the notations contemporaneous to the actions. Roach obtained a copy of the log, which is included in the investigative file.

At this point on 03/26/12, Snart requested that Will respond as the State Agency Representative to the Grapevine Fire.

Will finished with the Grapevine fire around 1830-1900 hours on 03/26/12. He then drove to Golden, Colorado to meet with Snart.

On 03/30/12, Schultz and Schnurr interviewed Ryan Cox at the CSFS Office in Golden, Colorado (Attachment W). Cox is a seasonal firefighter (Firefighter 2) with CSFS.

Cox stated he left the CSFS Golden District Office at approximately 1000 hours on 03/26/12 and arrived at the prescribed fire site at approximately 1100 hours. He stated they were pulling the prescribed fire signs down along the way then they proceeded up to the burn unit. At approximately 1245 hours, when they got up to the ridge the winds were really kicking up so Michalak told them to sit on it and pay attention because of the winds. Cox stated Michalak was on the UTV monitoring hotspots and flare ups and he was along the ridgeline and was dealing with slopover spots. Mostly he was able to extinguish the slopover starts by stomping on the starts. While he was dealing with the spots across the line higher up on the ridge Michalak called on the radio for Engine 862 to get more water because of the spots.

Cox stated the slopover was in two locations along the ridge, but it was the southern location that escaped.

Cox provided a typed note page to Schultz at the end of the interview. That note page is included in the investigation file.

Additional Information

On 03/29/12, the Colorado Bureau of Investigation received a call on their Arson Hotline (Attachment X). The caller, who identified himself as Bill Tyler, stated that he had a "hunch" about the cause of the Lower North Fork Fire.

Roach followed up on the tip. On 04/02/12, Roach received a call from Tyler. In the call, Tyler stated that he had a "hunch" about several fires that had occurred in the last year along roadsides in Jefferson County as well as fires along Parker Road, all the way to Colorado Springs, Colorado. Tyler went on to say that his "hunch" came from information he had gathered from watching the news, which indicated several fires had occurred along roadsides and appeared to be 15 minutes apart. Tyler had no specific information in regards to locations, dates of fires or cause, but it was his belief that an individual was going around and lighting fires.

At this time, the Jefferson County Sheriff's Office does not anticipate any follow-up investigation into the information provided by Tyler.

SUMMARY: (Cause Determined / Undetermined, Causes Excluded / Not Excluded, Subjects Known / Unknown, Actions)

In summary, it is the finding of the Origin and Cause Investigation Team that the Lower North Fork Fire ignited on Monday, 03/26/12 at approximately 1340 hours from lightweight, windblown embers from a prescribed burn that was ignited the previous Thursday (03/22/12) by the Colorado State Forest Service.

Investigative activities determined that the prescribed burn was not completely extinguished on 03/26/12, and heavy winds carried embers from the southeast side of the saddle to the northeast side of the road running along the ridgeline, which was the boundary line for Unit 4 of the prescribed burn. The embers landed in unburnt fuels along the edge of the road, igniting the Lower North Fork Fire.

Wildland Fire Investigation

	IDENTIFICATION	Incident Number	CO-JEX-000176
		Incident Date	03/26/2012

(CODE: S – Subject, W – Witness, V – Victim, RP – Reporter, O – Other)

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Cox, Ryan**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home) Parent's Residence*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Fire Fighter II (seasonal) **Colorado State Forest Service-Golden District Office** **1504 Quaker Street** **Golden, CO 80401**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Gallamore, L.M., Allen**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
District Forester **Colorado State Forest Service-Golden District Office** **1504 Quaker Street** **Golden, CO 80401**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Kriegbaum, Rob**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone (Home)	Hair Color	Eye Color	SSN
12619 W. Dakota Ave. Apt. 13A **Lakewood, CO 80228-2573**	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Technician II/Engine Crew **Colorado State Forest Service-Golden District Office** **1504 Quaker Street** **Golden, CO 80401**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Lebeda, Boyd**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone (Home)	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
District Forester **Colorado State Forest Service** **Fort Collins District** **5060 Campus Delivery, CSU** **Fort Collins, CO 80523**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **McLaughlin, Bill**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Fire Chief, Elk Creek Fire Protection District **11993 Blackfoot Road** **Conifer, CO 80433**	[redacted]	**N/A**	**N/A**	**N/A**

Wildland Fire Investigation

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Michalak, Kevin**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Technician II/Engine Boss **Colorado State Forest Service-Golden District Office** **1504 Quaker Street** **Golden, CO 80401**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Newman, Ronnie**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Deputy **Jefferson County Sheriff's Office** **200 Jefferson County Parkway** **Golden, CO 80401**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Palestro, Rich**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Technician II/Engine Boss **Colorado State Forest Service-Boulder District Office** **5625 Ute Highway** **Longmont, CO 80503**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Parker, Andy**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Cell)*	Hair Color	Eye Color	SSN
6023 Yank Court **Arvada, CO 80004**	[redacted]	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Home)*	Height	Weight	License / ID
Retired	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Rogers, Curt**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone (Home)	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Fire Chief, North Fork Volunteer Fire Department **P.O. Box 183** **Buffalo Creek, CO 80425**	[redacted]	**N/A**	**N/A**	**N/A**

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Snart, Rocco**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business) (Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Fire Management Officer-Jefferson County Sheriff's Office **800 Jefferson County Parkway** **Golden, CO 80401**	[redacted]	**N/A**	**N/A**	**N/A**

Wildland Fire Investigation

Name *(Last, First, Middle)*	Alias	DOB	Race	Gender
W **Will, Kirk**	**N/A**	**N/A**	**N/A**	**M**
Address *(Home)*	Phone *(Home)*	Hair Color	Eye Color	SSN
N/A	**N/A**	**N/A**	**N/A**	**N/A**
Address *(Business)* *(Tax Identification Number if Required)*	Phone *(Work)*	Height	Weight	License / ID
Assistant District Forester **Colorado State Forest Service-Golden District Office** **1504 Quaker Street** **Golden, CO 80401**	[redacted]	**N/A**	**N/A**	**N/A**

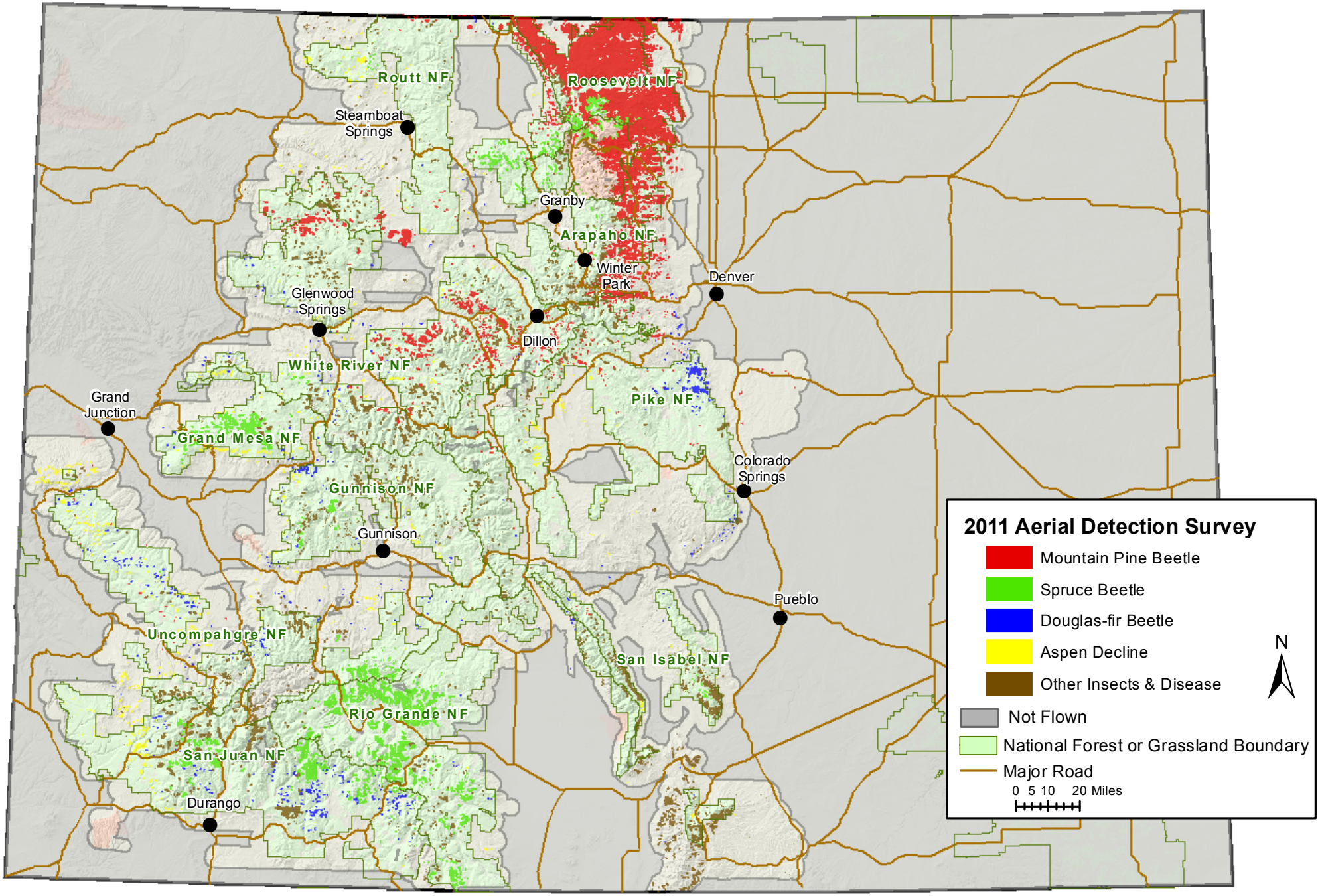
Wildland Fire Investigation

	ATTACHMENTS	Incident Number	CO-JEX-000176
		Incident Date	03/26/2012

	Attachment Name
A	Lower North Fork Lightening Map, Created by the Department of the Interior, Bureau of Land Management on 04/04/12.
B	North Fork Fire Weather Data Summary created by B. Schultz.
C	Department of the Interior, Bureau of Land Management, Memorandum of Activity, Andy Parker, created 04/11/12.
D	Jefferson County Sheriff's Office, Narrative of Phone Interview with Michael Mulvaney, conducted 04/05/12.
E	Jefferson County Sheriff's Office, Narrative of Phone Interview with Curt Rogers, conducted 04/03/12.
F	Department of the Interior, Bureau of Land Management, Memorandum of Activity, Don Roach, created 04/11/12.
G	USDA, Forest Service, Memorandum of Interview, Bill McLaughllin, conducted 03/28/12.
H	Department of the Interior, Bureau of Land Management, Memorandum of Interview, B. Lebeda, conducted 03/28/12.
I	WildCAD Incident Card – Pueblo Interagency Dispatch Center: CO-JEX 2012-176, "Lower North Fork Fire" Wildfire 03/26/12 14:39:00 Order Number: CO-JEX-176, printed 03/31/12.
J	Department of the Interior, Bureau of Land Management, Memorandum of Interview, Kevin Michalak, conducted 03/29/12.
K	Denver Water Board, Lower North Fork 2012 Prescribed Fire Incident Action Plan, undated.
L	Lower North Fork-Holding & Contingency Map, undated.
M	Colorado State Forest Service, Incident Communications/Action Log, dated 03/26/12.
N	Photographs taken by B. Schultz on 03/29/12 and 03/30/12, including the USFS Photographic Record, a general overview of photo points, a photo point sketch, contact sheets of the photographs and an electronic copy of the images.
O	Field Sketches of the general origin area, the burn indicators, and the specific origin area, documented on 03/29/12 and 03/30/12.
P	Photographs taken by T. Schnurr on 03/30/12, including the Department of the Interior, Bureau of Land Management Photo Log and associate images.
Q	Computer generated maps of the Lower North Fork Fire general and specific origin areas, created 04/04/12.
R	USDA, Forest Service, Memorandum of Interview, Rocco Snart, conducted 03/30/12.
S	Department of the Interior, Bureau of Land Management, Interview Report, Ronnie Newman, conducted 03/30/12.
T	Department of the Interior, Bureau of Land Management, Interview Report, Rich Palestro, conducted 03/30/12.
U	USDA, Forest Service, Memorandum of Interview, Allen Gallamore, conducted 03/30/12.
V	Department of the Interior, Bureau of Land Management, Memorandum of Interview, Kirk Will, Conducted 03/30/12.
W	USDA, Forest Service, Memorandum of Interview, Ryan Cox, conducted 03/30/12.
X	Jefferson County Sheriff's Office, Narrative of Follow-up to CBI Arson Tip Line call, conducted 4/2/12.

Prepared By *(Signature)*:		**Submitted To (*Name/Title*):**	Ted Mink/Sheriff through Don Roach/Investigator
Name/Title:	Shannon Tokos/Special Agent	**Agency:**	Jefferson County Sheriff's Office 200 Jefferson County Parkway Golden, Colorado 80401
Date:	04/12/12	**Date:**	04/12/12

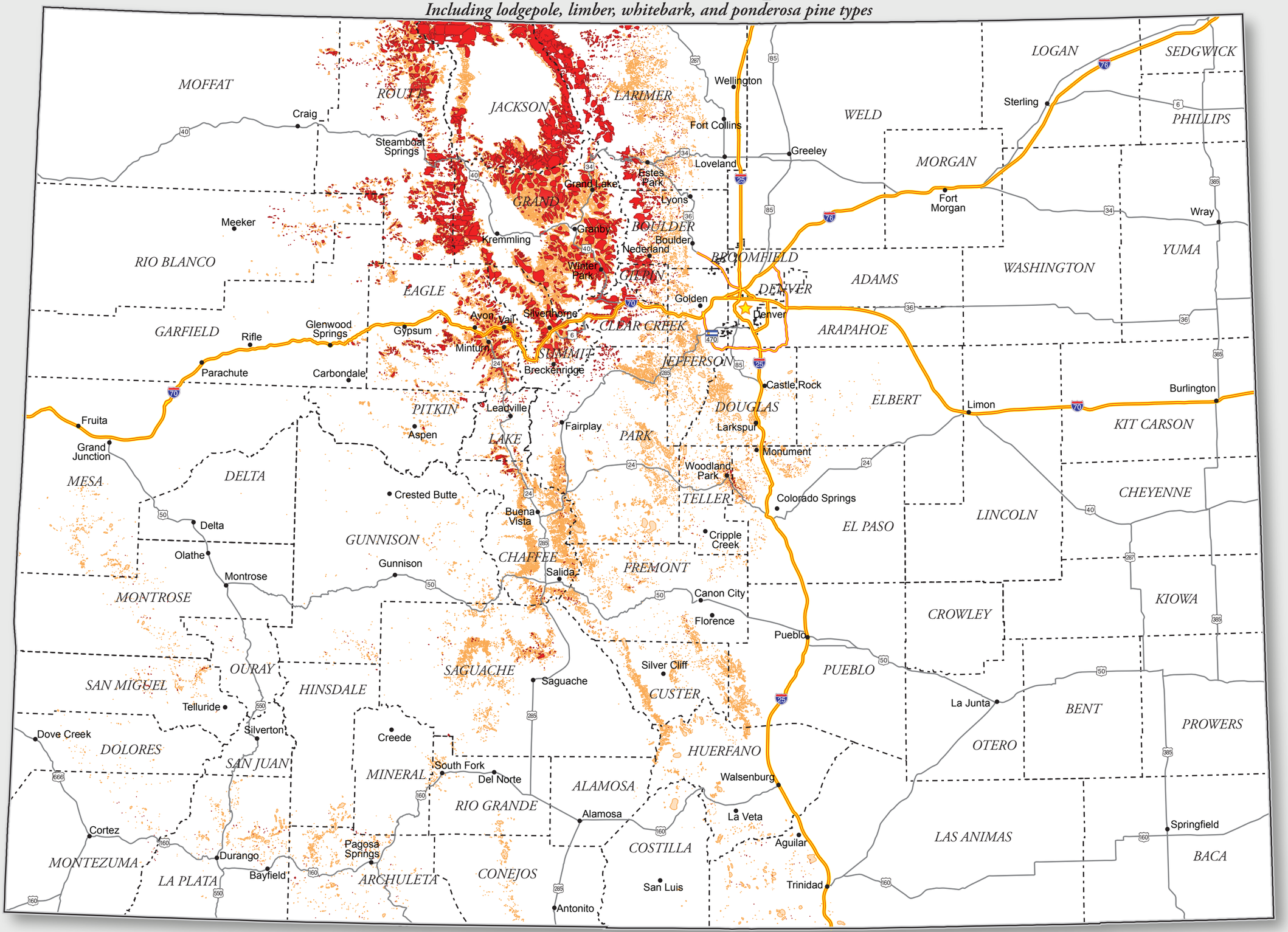
2011 Aerial Detection Survey



Due to the nature of aerial surveys, the data on this map will only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. Many of the most destructive diseases are not represented on this map because these agents are not detectable from aerial surveys. The data presented on this map should only be used as a partial indicator of insect and disease activity, and should be validated on the ground for actual location and causal agent. Shaded areas show locations where tree mortality or defoliation were apparent from the air. Intensity of damage is variable and not all trees in shaded areas are dead or defoliated.

Colorado Mountain Pine Beetle Epidemic 1996 - 2007

Including lodgepole, limber, whitebark, and ponderosa pine types



Mountain Pine Beetle 2007
980,000 Acres

Mountain Pine Beetle
1996 - 2006

Interstate

US Highway

County

Cities

Mountain Pine Beetle

Tree mortality from the current mountain pine beetle infestation is unprecedented in Colorado's recorded history. Since the infestation began in 1996, approximately 1.5 million acres of lodgepole pine have been infested in Colorado.

Beetle epidemics are a natural part of forest ecosystems, but the old age of many of the state's lodgepole pine forests makes them susceptible to large-scale epidemics. Old forests, drought, and warm temperatures all have had a role in fueling this epidemic.

At current rates of spread and intensification, it is likely that MPB will kill the majority of Colorado's mature lodgepole pine forests by 2013. However, younger lodgepole pines will survive and seedlings will regenerate naturally.

During the first few years following infestation, needles turn red on infested trees and the trees die. Fifteen to 20 years later, the dead trees fall over. Wildfire is a real threat to life and property in beetle-killed areas whether trees are red and dead or years later when they fall over and litter the ground.

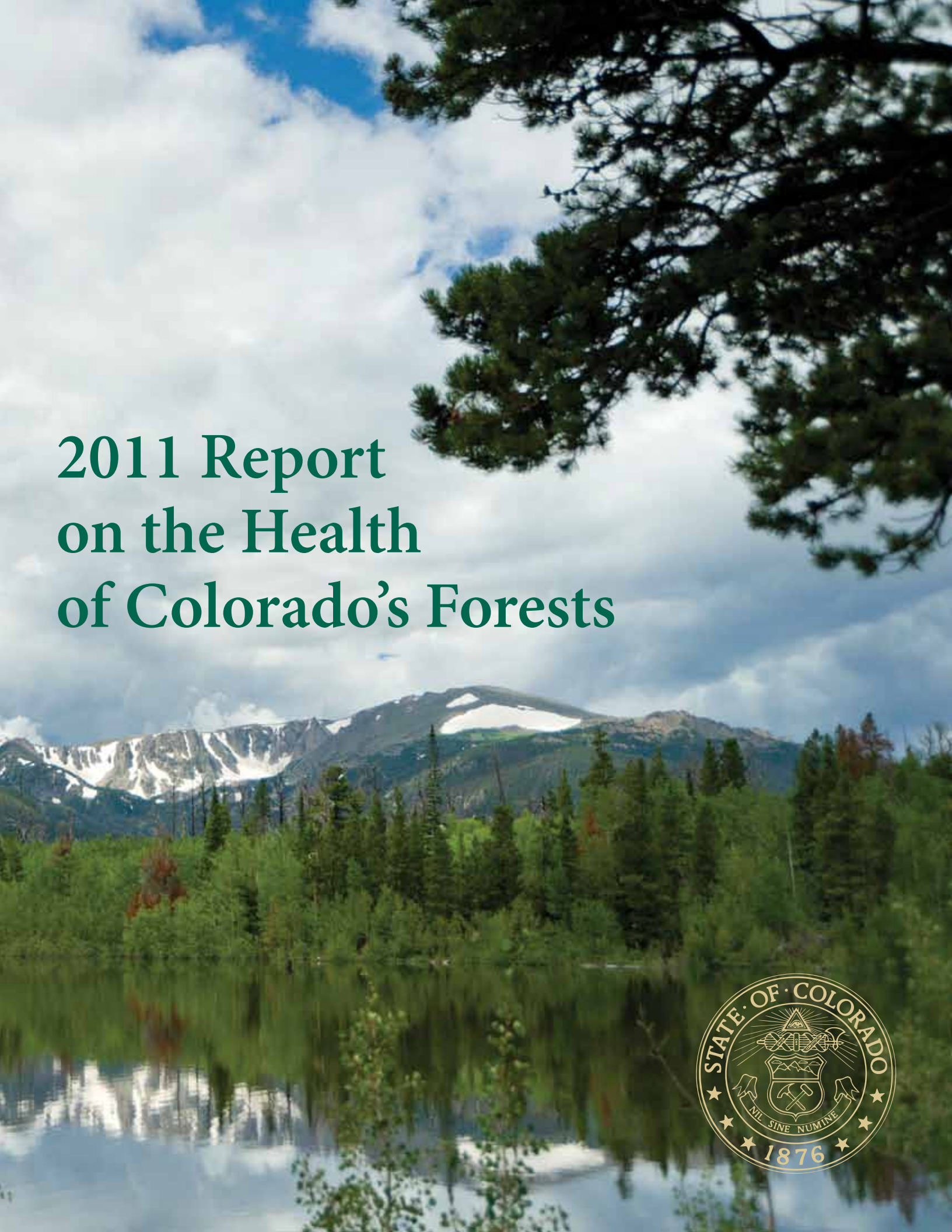
Aerial Survey Data

Due to the nature of aerial surveys, the data on this map will only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. The data presented on this map should only be used as a partial indicator of insect and disease activity, and should be validated on the ground for actual location and causal agent. Shaded areas show locations where tree mortality was apparent from the air. Intensity of damage is variable and not all trees in shaded areas are dead.

The insect and disease data represented on this map are available digitally from the USDA Forest Service, Region Two Forest Health Management group. The cooperators reserve the right to correct, update, modify or replace GIS products. Using this map for purposes other than those for which it was intended may yield inaccurate or misleading results.

Map created January 2008
For more information:
http://csfs.colostate.edu/

2011 Report on the Health of Colorado's Forests



Acknowledgments

Thanks to William M. Ciesla, Forest Health Management International, Fort Collins, Colo., for his assistance in the development of this report and his work as a contributing author and photographer.

Thanks to the following Colorado State Forest Service employees who served on the Report Working Group and/or provided information, guidance and feedback.

Joseph A. Duda (Project Lead), Forest Management Division Supervisor, State Office
S. Sky Stephens, Forest Entomologist, Forest Management Division, State Office
Shelly Simmons, Assistant District Forester, La Junta District
Rich Edwards, Assistant Staff Forester, Forest Management Division, State Office
Jan Hackett, Policy and Legislative Affairs Program Manager, Outreach Division, State Office
Megan Halford, Assistant District Forester, Franktown District
Ryan Lockwood, Public and Media Relations Coordinator, Outreach Division, State Office
Lisa Mason, Outreach Forester, Outreach Division, State Office
Benjamin Pfohl, Assistant District Forester, Boulder District
Kelly Rogers, District Forester, Grand Junction District
GayLene Rossiter, Web Manager, Outreach Division, State Office
Gregory D. Sundstrom, Assistant Staff Forester, Forest Management Division, State Office
Matt Tansey, GIS Program Manager, State Office

Thanks to those who reviewed and/or provided information for this report:

Justin Backsen, Forestry Technician, Forest Health Protection, USDA Forest Service
Kelly Sullivan Burns, Forest Pathologist, USDA Forest Service
Bob Cain, Entomologist, Forest Health Protection, USDA Forest Service
Whitney Cranshaw, Extension Entomologist, Department of Bioagricultural Sciences and Pest Management, Colorado State University
Brian Howell, Aerial Survey Program Manager, Forest Health Protection, USDA Forest Service
William Jacobi, Professor of Plant Pathology, Department of Bioagricultural Sciences and Pest Management, Colorado State University
Dave Leatherman, Forest Entomologist (Retired), Colorado State Forest Service
Roy Mask, Gunnison Service Center Group Leader, Forest Health Protection, USDA Forest Service
Ned Tisserat, Extension Plant Pathologist, Department of Bioagricultural Sciences and Pest Management, Colorado State University
Ralph Zentz, Assistant City Forester, City of Fort Collins

Special thanks to:

Judy Serby, Conservation Education Program Manager, and Katherine Timm, Outreach Division Supervisor, Colorado State Forest Service, for providing leadership in the production of this report.

All photos by Bill Ciesla unless otherwise noted.
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Photo, page 19, Kathryn Hardgrave
Photo, top of page 23, Shelly Simmons
Photo, page 37, Clinton Bellingar

January 2012

It is once again my pleasure to present the annual report on the health of Colorado's forests. This is the 11th consecutive year we have produced a report on the issues affecting Colorado's forests, as well as the actions we can take to address those issues for the benefit of present and future generations.

Over the last 10 years, Colorado's forests have undergone significant changes. I have heard the public and political concerns about the condition of our forests, and related questions regarding what the future holds. The information we have developed and presented in this series of forest health reports, along with our collective experience in managing forested land, addresses these concerns and provides a sound foundation for planning. The fundamental questions we need to ask are *What do we want our future forests to look like?* and *What do we want them to provide for us?* Now is the right time to address these questions.

We depend on our forests to provide a variety of resources and values; one of the most important is clean water. Forest planning is a long-term process, and the decisions we make today will have profound impacts on the form, function and productivity of our future forests.

I hope you will find the information contained in this report to be informative and helpful. Please feel free to contact any Colorado State Forest Service office to learn more about our forests and what you can do to help manage and protect this important resource.

Jeff Jahnke
State Forester/Director
Colorado State Forest Service

Colorado State Forest Service

Executive Summary

The objective of the *2011 Report on the Health of Colorado's Forests* is to provide information on the condition of our forests to the Colorado General Assembly and citizens of Colorado. In the first 10 reports, we provided this information, along with sections that specifically addressed the various forest types in Colorado. This year's report again presents a comprehensive overview of the health of Colorado's forests. It also provides insight on the stewardship of our forests and the wood products they produce, as well as a special section on the forests of the Great Plains.

As always, the primary data source for this report is the annual aerial survey conducted by the Colorado State Forest Service and USDA Forest Service (USFS). Another data source for these reports is the Colorado Forest Inventory and Analysis (FIA) Program, funded by the USFS and conducted on the ground by CSFS personnel. Every year, 10 percent of the 4,500 permanent forest plots in Colorado are surveyed as part of the program. In 2011, the first 10-year cycle of forest inventory data across Colorado was completed. A subset of FIA plots also are revisited annually to measure and track changes to forest conditions. The FIA Program and other forms of forest monitoring data will continue to provide essential information that will guide our forest management activities and help us be proactive in addressing changing forest conditions.

Mountain pine beetle (MPB) continued to be Colorado's most damaging forest pest in 2011, with the heaviest damage again occurring in Larimer County. However, new tree mortality as a result of MPB declined in comparison to past years, with a total area of 752,000 acres infested, compared to 878,000 acres in 2010. The decline in MPB activity is due to the loss of mature lodgepole pines in previous years of the outbreak. Despite the overall decline in acres infested by MPB, the area of active infestation in ponderosa pine forests increased for the third successive year to 275,000 acres in 2011. Most of the mortality in ponderosa pine forests occurred in Larimer County, north of the Big Thompson River.

In the *2007 Report on the Health of Colorado's Forests*, we identified spruce bark beetle as the next forest insect challenge. This year, spruce beetle continued to impact mature Engelmann spruce forests in many areas of the state. The largest outbreak, in the San Juan Mountains and upper Rio Grande Basin, has spread north and now poses a threat to spruce forests on adjacent private lands. Most of the mature spruce trees already have been killed in the Weminuche Wilderness, but active infestations continue in younger stands and in krummholz at the edge of timberline. Spruce beetle infestations also continued to build in the Greenhorn Peak area of the Wet Mountains, where blowdown events occurred in 2007 following a severe storm. Additionally, infestations in Larimer County continued to impact mature spruce stands in the vicinity of Cameron Pass, Long Draw Reservoir and the Cache La Poudre Basin.

Other bark beetles that continued to damage Colorado forests in 2011 include Douglas-fir beetle, which killed many mature Douglas-fir trees in the Sangre de Cristo and San Juan mountains, and western balsam bark beetle, which affected many high-elevation subalpine fir forests. An increase in activity by the piñon ips beetle also was noted in piñon pine forests north of Cañon City.

Defoliation of Douglas-fir and white fir by western spruce budworm continued across portions of the Wet Mountains, Sangre de Cristo and Culebra ranges, and Spanish Peaks and San Juan Mountains, but at lower infestation levels than in the recent past. A total area of 90,000 acres with some western spruce budworm defoliation was mapped in 2011. Forests in portions of the Culebra Range, which have suffered defoliation for a number of years, have extensive top kill and tree mortality due to weakened trees caused by repeated western spruce budworm defoliation.

The area of aspen forests affected by sudden aspen decline (SAD) continued to decrease in 2011. Foresters believe this is due to a return to normal or near-normal precipitation levels, recovery of some individual trees and a release of natural aspen regeneration in the understory of many stands with overstory mortality.

Thousand cankers disease continued to kill ornamental black walnut trees in urban forests and was observed for the first time in Fort Collins. Special surveys once again were conducted to ensure early detection of gypsy moth and emerald ash borer – two exotic insects that pose a threat to Colorado's urban forests. Neither of these insects was detected in Colorado in 2011.

Other pest activity detected in 2011 includes insect defoliation in aspen forests in portions of the Wet Mountains, Sangre de Cristo and Culebra ranges and San Juan Mountains, and an outbreak of an as-yet-unidentified defoliating insect in Gambel oak forests south of Castle Rock in Douglas County.

This year, our report also contains a special section on the forests of the Great Plains. These forests provide a sharp contrast to the dominant conifer forests of western Colorado. Located within the Central Shortgrass Prairie ecoregion, as identified by The Nature Conservancy, the Great Plains of Colorado represent a diverse landscape, primarily dominated by shortgrass prairie. However, intermittent forests also exist on the plains of Colorado; these include riparian forests, piñon-juniper woodlands and forests planted as windbreaks or in urban settings within our communities. These unique forests provide many essential benefits for people and wildlife.

The CSFS continues to work with private forest landowners, other cooperators and stakeholders to manage Colorado's forested lands by providing technical assistance, information and outreach that helps them meet their individual and collective stewardship objectives.

Forest Insect and Disease Update

Aerial surveys using small high-wing aircraft are a key source of information on the status of many insects, diseases and other damaging agents in Colorado's forests.

This section provides an update on the status of the most prominent insects and diseases that affected the health and vitality of Colorado's forests in 2011. The data comes from several sources, including the annual forest health survey, which is the principal source of information.

Annually, the USDA Forest Service (USFS) and Colorado State Forest Service conduct a cooperative aerial survey over most of Colorado's forestlands, excluding low-elevation piñon pine and juniper forests, and dispersed forests of the Great Plains. The survey is conducted from July through early September using high-wing aircraft, such as Cessna models 206 and 210. Trained aerial observers map the location of recent forest damage – usually dying or defoliated trees – using a touch-screen computer equipped with digital mapping software. Often, two observers, one from the USFS and another from the CSFS, work as a team to map the damage. Resulting data are analyzed using a geographic information system (GIS) and then are posted on the Internet for public use (see www.fs.usda.gov/goto/r2/fh). Most of the acreage figures presented in this report were calculated using the aerial detection survey data and represent acres impacted by a specific insect or disease agent. The total numbers of acres impacted by each agent does not reflect the severity of impact, which can vary significantly on each mapped acre.

Other sources of information also were utilized for this report. Special surveys designed to ensure early detection of potentially invasive forest pests such as gypsy moth and emerald ash borer were assessed, as were surveys of the statewide distribution of thousand cankers disease. In addition, CSFS foresters, as part of their day-to-day activities, observe and report forest pest occurrences.

Indigenous Pests

Conifer Forests

Mountain Pine Beetle

(*Dendroctonus ponderosae*)

Mountain pine beetle (MPB) continued to be Colorado's most damaging forest insect pest in 2011. The current outbreak, which started on the Western Slope in

Heavy MPB activity occurred in both lodgepole and ponderosa pines along the Pingree Park Road in Larimer County.

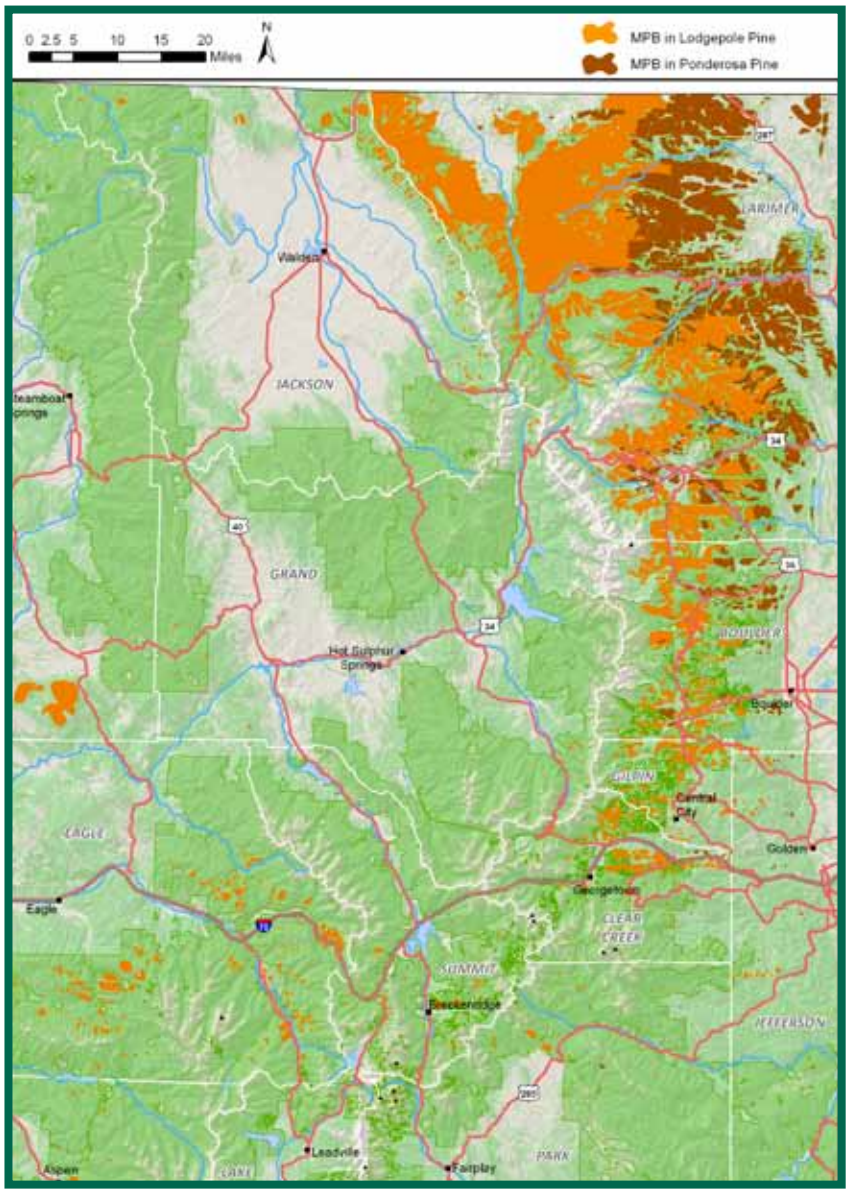
the late 1990s, has continued to spread eastward. In 2011, foresters observed an overall area of 752,000 acres of lodgepole, limber and ponderosa pine forest in which MPB had killed trees during the past year. This represents a decline in the total area damaged statewide compared to recent years (878,000 acres in 2010 and 1,046,000 acres in 2009); however, heavy mortality continued to occur, especially in areas where beetle populations increased during the past few years. While the overall area of active infestation declined in 2011, the area of ponderosa pine forests affected by MPB increased for the third consecutive year, from 22,000 active acres in 2009 and 234,000 acres in 2010 to 275,000 acres in 2011. Most of the observed ponderosa pine infestation occurred in northern Larimer County, north of the Big Thompson River.

Severe and widespread tree mortality occurred in lodgepole pines in portions of the Cache La Poudre (including the South Fork Cache La Poudre) and Buckhorn Creek basins, as well as areas west of Red Feather Lakes in northern Larimer County. Many of these infested areas occur within the viewsheds of homes in the wildland-urban interface. Most of the mature lodgepole pine stands near Cameron Pass and the Upper Cache La Poudre Basin were attacked during previous years of the outbreak; with many trees already dead, MPB populations there are declining.

High levels of mortality continued in lodgepole, limber and ponderosa pine forests in the Big Thompson River Basin. Infestations in ponderosa pine forests persisted in Rocky Mountain National Park and in the Estes Park vicinity. Infestations in lodgepole pine stands in the upper Fall River and Big Thompson River basins, near Bear Lake and on the western slope of Rocky Mountain National Park have declined, largely due to loss of mature host trees. Beetle activity

MPB infestations are declining in areas where most of the mature lodgepole pines have been killed during previous years.

2011 Mountain Pine Beetle Activity by Host Species

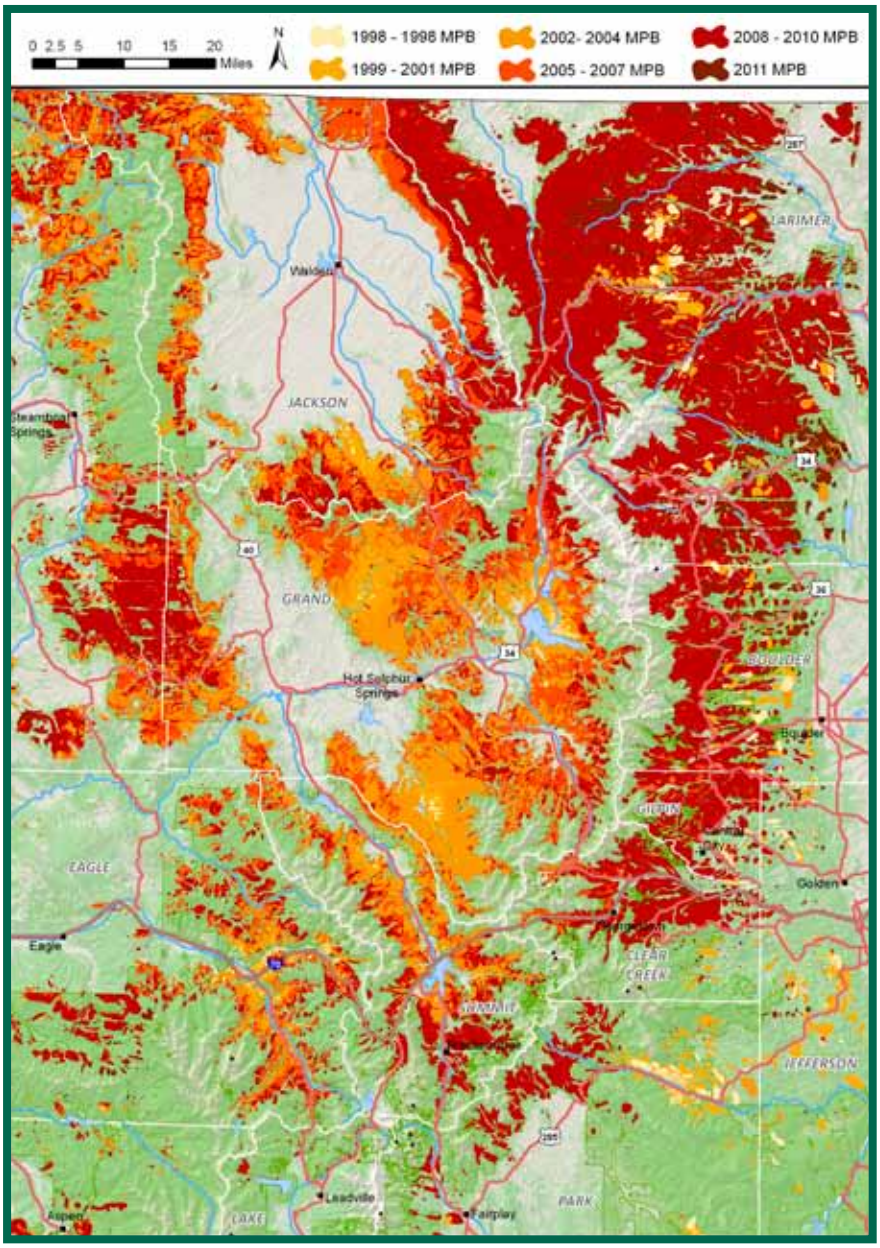


continues at moderate to high levels in most lodgepole pine stands, from Longs Peak in the park south to South Boulder Creek. Infestations also continued in lodgepole pine forests in and near the Snowmass ski area and on the slopes of Smuggler Mountain near Aspen. In addition, MPB continued to attack pines in urban areas along the Front Range and in pine shelterbelts on the Great Plains.

MPB activity continued to decline in lodgepole pine forests in Jackson, Grand and Summit counties, where the outbreak already has killed most mature lodgepole

Mountain pine beetles continued to attack pines in urban areas along the Front Range in 2011.

Mountain Pine Beetle Progression, 1996 – 2011



pines. Some activity still is present in portions of the Colorado State Forest and along the eastern slopes of the Rawah Range in lodgepole pine stands less than 60 years old. Aerial surveyors also noted a decline along the I-70 corridor, from Empire west to Berthoud Pass and the Eisenhower Tunnel; this decline also is attributed to the loss of mature host trees.

A decline in activity was observed in lodgepole pine forests south of I-70, including the area from Georgetown south to Guanella Pass and in the Chicago Creek Basin north of Mount Evans. Reduced activity also was noted in the Geneva Creek Basin south of Guanella Pass, where heavy damage occurred from 2008-2010. Infestations in lodgepole pine forests on the west side of South Park, from Kenosha Pass south to Fairplay, which also have been observed for approximately three years, decreased significantly in 2011. These areas still contain a high percentage of mature lodgepole pines, so the decline in MPB activity in these areas does not appear to be due to host depletion.

Responding to the Mountain Pine Beetle

The current mountain pine beetle outbreak, which was first detected in Colorado in the late 1990s, has impacted 3.3 million acres of our pine forests and caused widespread tree mortality. Numerous activities are underway to prevent future attacks on high-value trees, make use of wood from dead trees and reduce the hazards presented by falling trees. These activities are being undertaken by private landowners, communities and local, state and federal government agencies.

Individual high-value pines can be protected from bark beetle attacks by applying preventive sprays. Currently, three chemical insecticides – carbaryl, permethrin and bifenthrin – are registered for use by the Colorado Department of Agriculture as preventive sprays, which can be up to 95 percent effective when used properly. Private landowners in Colorado's forested and urban communities have been treating individual pines with high rates of success. Preventive sprays also have been used extensively by the USDA Forest Service to protect valuable trees in campgrounds and other high-use recreation areas.

The use of pouches containing the anti-aggregant chemical verbenone is another way to prevent bark beetle attacks. Verbenone is a pheromone produced by attacking beetles, which communicates to other beetles that a tree already has been attacked and is unavailable. Verbenone pouches provide an alternative to spraying trees when chemical use is prohibited or restricted by label instructions, such as near bodies of water. Verbenone has proven less effective than preventive sprays in areas with heavy MPB pressure.

Forest thinning, especially in ponderosa pine forests, also tends to make stands less susceptible to beetle attack. In addition, thinning reduces fuels available for wildfire and can increase growth rates of standing trees. Removal and utilization of beetle-killed trees is an effective way to make use of the dead wood. Trees that are still infested can be cut, chipped, peeled or burned to destroy beetle broods. In addition, cut logs containing MPB can be placed under clear plastic sheeting in direct sunlight to kill developing beetle broods through solar radiation. All of these activities currently are being utilized to help control MPB populations on private and public lands.

Large swaths of MPB-killed trees can threaten infrastructure, including buildings, power lines, roadways and water conveyances because they are subject to windthrow (the uprooting or snapping of trees during high-wind events). Standing dead trees also pose a hazard to travel and outdoor recreation. In many areas, beetle-killed pines already have been cut along roads, hiking trails, campgrounds, recreation sites and other areas to reduce the risks associated with falling trees. These dead and dying trees also are changing the characteristics of wildland fuels in Colorado's forests.

Many foresters and firefighters share concerns about the potential nature and severity of wildland fires in areas impacted by MPB. These concerns have resulted in numerous studies and models to predict fire behavior in beetle-killed stands. As fuel characteristics change over time, and as trees fall, the risk of high-intensity, long-duration fires may increase. Fires of this nature can pose additional threats to public infrastructure and private property. For example, intense fires could drastically alter soil characteristics and negatively impact watersheds. Many landowners and forested communities have begun to remove dead trees from surrounding forests to mitigate fuels and provide for defensible space around structures, should a wildfire occur.

One of the most effective methods for responding to MPB and any other forest insect or disease is active forest management. Forest management can boost local economies, reduce wildfire risk and promote more resilient forests. Actively managing for healthy forests today will ensure future forests that are resilient to change, and will reduce impacts of forest insects, disease and wildfire. The Colorado State Forest Service continues to assist landowners in developing responses to MPB by providing outreach and educational materials on prevention and wood sanitation methods.

Roller-choppers are used to convert infested trees into wood chips and destroy MPB broods.

Spruce Beetle

(*Dendroctonus rufipennis*)

Spruce beetle, a relative of the mountain pine beetle, is the most destructive bark beetle in spruce forests throughout North America. In Colorado, this beetle can cause extensive damage to Engelmann spruce forests. Outbreaks typically occur several years after storms cause windthrow in spruce trees, which are susceptible to blowdown because of their shallow root system. Spruce beetles initially breed in the freshly windthrown trees, and subsequent generations attack and kill live, standing trees. Typically, it takes two years for a generation of the beetles to mature.

Although the spruce beetle currently is causing extensive mortality in Colorado's spruce forests, outbreaks tend to be less conspicuous than those caused by mountain pine beetles or other bark beetles. Following a bark beetle attack, the needles of pines, true firs and Douglas-firs are easily seen because they turn brilliant hues of yellow, red-orange or red as the trees die. The needles of bark beetle-infested Engelmann spruce, on the other hand, turn a subtle shade of yellow-green as the trees die. Needles often drop from dying trees while they are still green, littering the forest floor.

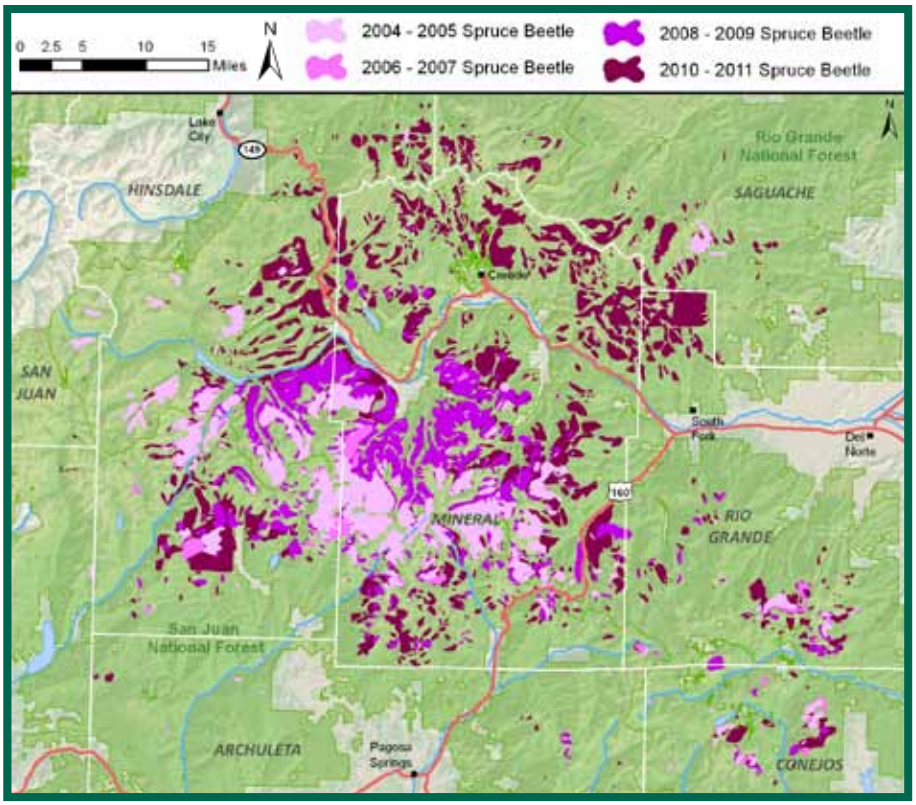
Spruce bark beetle adult (approximately 1/4-inch).

Moreover, because Engelmann spruce is a high-elevation species generally found in Colorado at elevations above 10,000 feet, few people witness the large-scale mortality caused by spruce beetles.

During the 1940s, a spruce beetle outbreak that developed after a severe storm caused extensive windthrow in the Flat Tops Wilderness Area of the White River National Forest resulted in the loss of 3.8 billion board feet of timber. (This is enough to provide framing lumber to build approximately 240,000 2,000-sq. ft. homes). In 1997, high winds caused extensive spruce windthrow in the Mount Zirkel Wilderness Area of the Routt National Forest. This triggered a spruce beetle outbreak that killed much of the mature spruce in the area. During the past six to seven years, spruce beetles have caused extensive damage to many of

In portions of the Weminuche Wilderness, where a spruce beetle outbreak has been underway since approximately 2002, most of the mature spruce trees have been killed and attacks now are occurring in krummholz near timberline.

Spruce Beetle Progression in Southwestern Colorado, 2001 – 2011



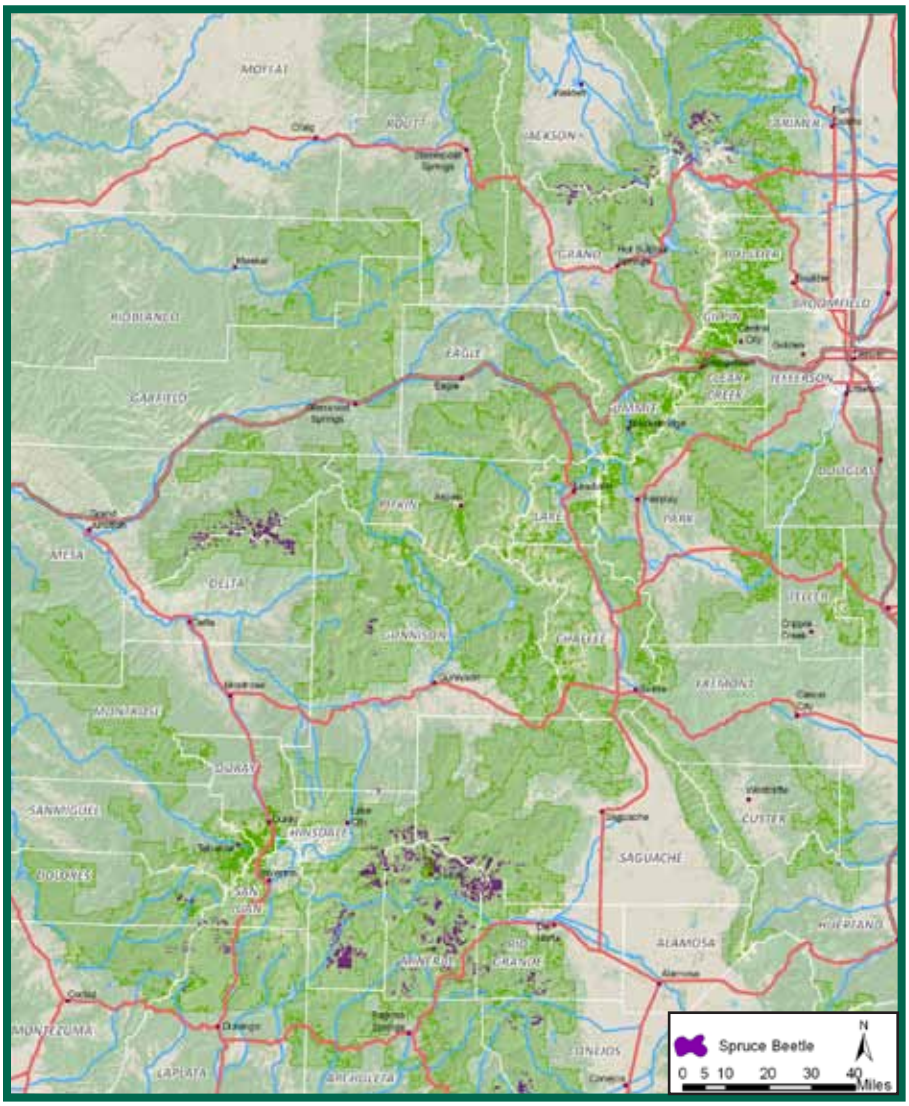
Colorado's high-elevation spruce forests. In 2011, outbreaks continued in several areas across the state, impacting a total area of 262,000 acres, compared to active infestations on 208,000 acres in 2010.

A massive spruce beetle epidemic in the San Juan Mountains and upper Rio Grande Basin has been underway since 2002, expanding northward in 2010 and 2011. As a result, heavy spruce mortality now is visible throughout much of the northern half of the upper Rio Grande Basin, including the La Garita Wilderness. Tree mortality was observed as far north as Spring Creek Pass in Hinsdale County, and many of the mature spruce trees now have been killed over large portions of the Weminuche Wilderness on the Rio Grande and San Juan National Forests. However, new attacks on small pockets of trees are still present throughout the area, often in young spruce stands and krummholz forests at the edge of timberline. In western Colorado, spruce beetles have been active in Mesa, Delta and Gunnison counties.

Tree mortality caused by spruce beetle also continued to increase in Engelmann spruce forests in the Greenhorn Peak area of the Wet Mountains on the San Isabel National Forest. This outbreak is believed

Spruce beetle attacks close to Zimmerman Lake near Cameron Pass.

2011 Statewide Spruce Beetle Activity



to be the result of beetles building up in windthrow following a severe storm that occurred in the area in June 2007.

Severe damage continued in the upper portions of several drainages on the south-facing slopes of the Big Thompson River in Larimer County in the Roosevelt National Forest and Rocky Mountain National Park. High rates of tree mortality also occurred from Cameron Pass to the upper Cache La Poudre River Basin and the upper slopes of the South Fork Cache La Poudre River Basin to the east.

Infestations declined over the eastern slopes of the Rawah Range in northern Colorado, where most of the mature spruce has been killed by an outbreak first detected in 2005. However, a few active infestations remained along the banks of the Laramie River.

Many areas where spruce beetle outbreaks occur are remote, inaccessible or in designated

Spruce bark beetle mortality in the upper Rio Grande Basin. [photo: Joe Duda]

wilderness areas. Therefore, in most cases, foresters can take little or no action to reduce losses caused by this aggressive bark beetle. However, individual trees can be protected on some landscapes.

Douglas-fir Beetle

(Dendroctonus pseudotsugae)

The Douglas-fir beetle is a relative of the mountain pine beetle and spruce beetle, and represents an important threat to mature Douglas-fir forests. In 2011, approximately 25,000 acres of Douglas-fir mortality was detected, compared to 37,000 acres in 2010. Infestations occurred in the southern and western regions of the state. Areas with significant tree mortality caused by Douglas-fir beetle included portions of the Sangre de Cristo and Culebra ranges. Continued tree mortality also was detected in several tributaries of the Crystal River near Aspen, and infestations continued in several canyons in El Paso and Fremont counties, from Manitou Springs and Cheyenne Mountain south to Phantom Canyon, east of Cañon City.

Douglas-fir beetle infestations tend to occur in mature stands. Many current infestations have been underway for several years and now appear as groups of trees with bright-red crowns, indicative of recent attacks, amid trees with gray crowns caused by attacks in previous years.

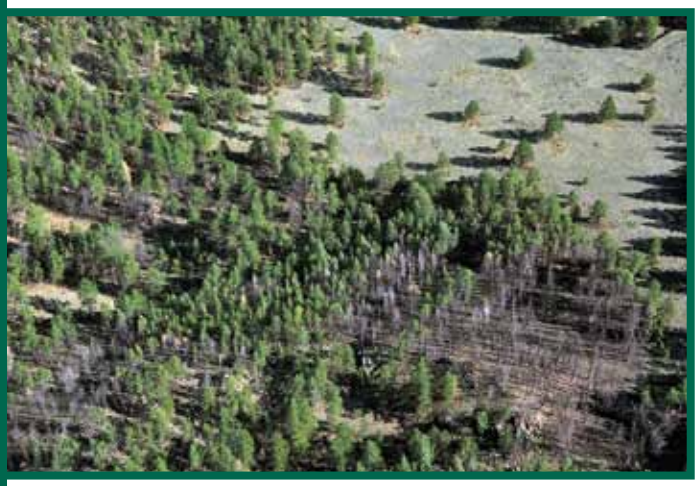
Subalpine Fir Decline

Chronic levels of tree mortality continued in many high-elevation subalpine fir forests across the state. Subalpine fir decline often is the result of two species of fungi, *Armillaria* spp. and *Heterobasidium parviporum* (formerly *H. annosum*), that invade root systems and weaken trees, and the subsequent attack by western balsam bark beetles (*Dryocoetes confusus*). In 2011, approximately 180,000 acres of subalpine fir decline were mapped in Colorado; this represents a decrease from the 265,000 acres detected in 2010. Areas with particularly heavy damage included portions of the Culebra and Sangre de Cristo ranges; the Maroon Bells; the western portion of South Park from Kenosha Pass south to Trout Creek Pass; portions of the Rawah Range; and from Rocky Mountain National Park south to South Boulder Creek and the East Portal of the Moffat Tunnel.

Douglas-fir beetle infestation is visible in mature Douglas-fir in Ouray County. [photo: S. Sky Stephens]

Ips Engraver Beetles
(Ips spp.*)*

Ips engraver beetles often are found in pines weakened by fire, drought or injury. Elevated populations of engraver beetles also are being observed in lodgepole and ponderosa pine forests impacted by mountain pine beetle, and have been observed throughout much of Colorado.



Scattered dead and dying ponderosa pines at the edge of the 2008 Nash Ranch Fire near Guffey is an indication of ips engraver beetle attack.

In 2011, scattered tree mortality caused by ips engraver beetles occurred in ponderosa pine stands adjacent to the 2008 Nash Ranch Fire that burned near the community of Guffey in Park County. Small groups of fading piñon pines, suggestive of piñon ips beetles (*Ips confusus*) attack, were detected in piñon-juniper forests in Four Mile Canyon, north of Cañon City. Groups of five to 20 fading trees were commonly observed.

Western Spruce Budworm
(Choristoneura occidentalis)

This defoliating insect of Douglas-fir, true fir and spruce trees has been at epidemic levels in portions of southern Colorado since 1998. In 2011, a total of 90,000 acres of visible defoliation were mapped during the annual aerial forest health survey. This represents a significant decrease over the 213,000 acres impacted in 2010 and 382,000 acres impacted in 2009. In 2011, defoliation also appeared to be more scattered and less intense than in the recent past.

Defoliation continued in portions of the Culebra and Sangre de Cristo ranges. Patches of defoliation were mapped from La Veta Pass south to Cucharas Pass on the eastern slopes of the Culebra Range. Many of the stands in this area, which have suffered more than 10 years of defoliation, now contain extensive top kill and tree mortality. Areas with the heaviest damage were mapped on the south-facing slopes of the Spanish Peaks and the north-facing slopes of Mount Maestra, Sheep Mountain and Little Sheep Mountain north of La Veta Pass. Patchy defoliation occurred on the east-facing slopes of the Culebra Range, from Cucharas Pass south to the New Mexico state line. Aerially visible defoliation also was seen for the second successive year in the Wet Mountains, from Saint Charles Mountain south to the southern limit of the range and north along the west-facing slopes to upper Bear Creek.

Most of the Douglas-fir stands in the upper Vallecito Creek, Animas River and Dolores River basins (San Juan County) were defoliated to some degree by western spruce budworm. Scattered defoliation

Buds and new shoots defoliated by western spruce budworm larvae.

also occurred in portions of the upper San Miguel Basin and on the northern slopes of the Mount Sneffels Range in San Miguel County.

Deciduous Forests

Community Forests

Thousand Cankers Disease

Walnut twig beetle (*Pityophthorus juglandis*) is native to portions of Arizona, New Mexico and Mexico, where it breeds in already-stressed branches of Arizona walnut and is not considered a pest. Beginning in 2001, dieback and death of ornamental black walnut trees was reported in several western states, including Colorado. The damage was attributed to walnut twig beetle, which has expanded its range and developed an association with a fungus, *Geosmithia morbida*, which causes thousand cankers disease (TCD) on several species of walnut. The disease results in branch dieback and eventual tree death, as the walnut twig beetle transports the fungus from tree to tree.

Since 2004, thousand cankers disease has caused extensive tree death of ornamental black walnuts in several areas of Colorado. TCD now is known to occur in 16 Colorado counties: Adams, Arapahoe, Boulder, Crowley, Delta, Denver, Douglas, El Paso, Fremont, Jefferson, Larimer, Mesa, Montrose, Otero, Pueblo and Weld. TCD was not detected in any additional counties in 2011; however, the disease was confirmed in two new locations in Fort Collins – the northern-most site in which TCD has been found in the state to date. Damage continued to occur in areas where TCD is present, and many walnut trees in Aurora, Boulder, Denver, Cañon City, Longmont and Pueblo have either been killed or are in decline.

During the past two years, TCD also has established itself in several eastern states, within the natural range of black walnut. In 2010, the disease was detected near Knoxville, Tenn., and in 2011, it

S. Sky Stephens, CSFS forest entomologist, examines a white fir damaged by western spruce budworm near North La Veta Pass.

was reported near Richmond, Va., and Philadelphia, Pa. The known area of TCD occurrence also expanded in the West and was observed for the first time in western Nevada.

Nine states – Kansas, Michigan, Missouri, Nebraska, Oklahoma, Indiana, Minnesota, North Carolina and Wisconsin – now prohibit, through state quarantines, importation of certain walnut items from states known to be infested with TCD, including Pennsylvania, Virginia, Tennessee and nine western states.

Branch dieback indicative of thousand cankers disease was detected for the first time in Fort Collins in 2011.

Aspen Forests

Quaking aspen is one of Colorado's most recognizable trees. This is especially true in autumn when the state's aspen forests turn a patchwork of yellow, gold and orange. A number of insects and diseases are detrimental to aspen forests and have caused concern over the past six to seven years.

Sudden Aspen Decline

Beginning in approximately 2004, many mature aspen forests in Colorado and other western states suddenly died off. In Colorado, approximately 541,600 acres of dead and dying aspen were mapped during aerial forest health surveys in 2008. This represented nearly 11 percent of Colorado's 5 million acres of aspen forests. Referred to as sudden aspen decline (SAD), this condition raised serious concerns over the future of aspen forests.

SAD is believed to be the result of several interacting factors, including pervasive maturity in the state's aspen stands. Quaking aspen is a relatively short-lived species, but many trees in the state's aspen forests, which now are more than 100 years old, were subjected to severe stress during the drought that occurred from 1998-2002. The stressed trees were subsequently attacked and killed by several species of fungi, wood boring insects and bark beetles. Aspen stands at the lower elevation limits of tree growth, where conditions are drier and marginally suitable for trees, were more likely to be affected.

Since 2008, progressively smaller areas of SAD have been mapped each year: 342,000 acres in 2009; 190,000 acres in 2010; and only 46,000 acres in 2011. Reasons for the decline in areas where aspens are affected by SAD include a return to normal moisture levels and a decline in overstory mortality. In addition, some declining trees recovered after the drought.

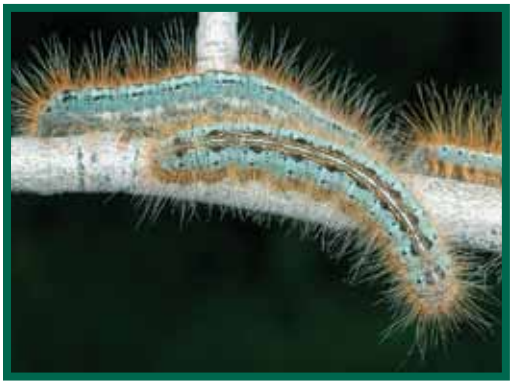
Although there are clear indications that the recent episode of SAD has subsided, a potential for additional episodes of this complex exists, should extended periods of abnormally warm, dry weather occur in the future.

Defoliating Insects in Aspen

Several caterpillar species can defoliate aspen forests. During outbreaks, these caterpillars can cause complete defoliation, usually by mid to late June. In Colorado, two species of defoliating caterpillars can reach epidemic levels and cause widespread defoliation of aspen forests: western tent caterpillar (*Malacosoma californicum*) and large aspen tortix (*Choristoneura conflictana*). The larvae of western tent caterpillar build large nests of silken webbing on aspen trees, which provide protection for the young larvae. Larvae of large aspen tortix roll aspen leaves, tie the leaves with silken strands and feed inside the shelter provided by the rolled leaves.

Defoliation of aspen forests by these insects continued in 2011, but fewer areas were detected compared to the past five years. All areas of aspen defoliation occurred in the southern portions of the state, from the Wet Mountains south and west to the Culebra Range and San Juan Mountains. A large area of aspen

Understory aspen regeneration now is occurring following death of the mature overstory due to sudden aspen decline.



Larvae of western tent caterpillar.

Silken cocoons containing the pupal stage of western tent caterpillar.

defoliation again was detected in the upper North Purgatory River Basin of the San Isabel National Forest, where approximately 1,400 acres were completely defoliated; this outbreak has been underway since 2007. Ground-checks of this area in 2011 again confirmed that defoliation was caused by western tent caterpillar. A large area of aspen defoliation, also caused by western tent caterpillar, occurred for the third consecutive year on the slopes of Grouse Mountain in the Park Creek drainage of the Rio Grande National Forest. Another area of defoliation by western tent caterpillar occurred on the slopes of Baldy Peak near Durango.

Aspen defoliation along the North Purgatory River is due to western tent caterpillar. [photo: S. Sky Stephens]

A smaller area of defoliation was detected on the eastern slopes of the Wet Mountains above Lake San Isabel. Aspen defoliation also was detected for the fourth consecutive year on a ridge between Turkey Creek and Dry Creek Canyon on the western slope of the Wet Mountains, and a new area of defoliation was detected north of Turkey Creek. The insect responsible for defoliation in these areas was not determined.

Gambel Oak Forests

Gambel oak is a low-lying tree that can form dense thickets at elevations between 6,000 and 9,000 feet in Colorado. It is found along the Front Range from Castle Rock south and on the Western Slope as far north as Steamboat Springs. Gambel oak thickets, often considered a nuisance that requires control or removal, are subject to attack by several insects and diseases that can cause concern. Between 2006 and 2007, several thousand acres of Gambel oak and other broadleaf shrubs in Garfield and Delta counties on the Western Slope were defoliated by an inchworm known as the linden looper (*Erannis tiliaria*). In 2011, two additional damaging agents were detected in Colorado's Gambel oak forests.

Defoliating Insects

Several landowners in Douglas County, south of Castle Rock and Franktown, reported seeing large numbers of green caterpillars feeding on Gambel oak foliage in late May and early June. The affected oak thickets, ranging in size from five acres to several hundred acres, suffered moderate to heavy defoliation. An insect observed at these sites has been identified as a moth in the genus *Alsophila*.

This stand of Gambel oak south of Castle Rock shows heavy defoliation caused by Alsophila.

The brown discoloration and leaf curl of Gambel oak foliage is caused by a fungal infection.

Leaf Diseases

Brown foliage discoloration accompanied by leaf curl was observed in a number of Gambel oak stands south of Cucharas Pass in Costilla County. The symptoms are suggestive of infection caused by one of two leaf fungi: taphrina leaf blister, caused by *Taphrina caerulescens*, or anthracnose disease of oaks, caused by *Apiognomonia quercina*. Similar symptoms were reported in late summer in portions of Douglas County.

Exotic Pests

Gypsy Moth

(Lymantria dispar)

Larvae of gypsy moth, an insect native to Eurasia, feed on foliage of both broadleaf trees and conifers. This insect first appeared in the United States in 1869 when it was introduced in Massachusetts by a French scientist trying to develop an alternate source of silk. A few of the insects escaped, became established in the surrounding oak trees and spread rapidly. Today, much of the northeastern and north-central United States is included in what is known as a "generally infested" area, which may experience several million acres of defoliation in a single year. Gypsy moth females can lay eggs on almost any surface, including lawn furniture and hubcaps of motor vehicles. Consequently, the insect is easily transported to distant locations, where new outbreaks can develop.

Colorado is at high risk of gypsy moth introduction, as people and goods move into the state from generally infested areas. The CSFS, in partnership with the Colorado Department of Agriculture and USDA Animal and Plant Health Inspection Service (APHIS), monitors gypsy moth occurrence using traps baited with the female moth's sex attractant, which is highly appealing to male moths. Delimiting trapping and on-site surveys around a trap location with moths in 2010 revealed no additional moths, and no gypsy moths were trapped anywhere in Colorado in 2011.

Emerald ash borer

(*Agrilus planipennis*)

Emerald ash borer, an insect native to Asia, is a colorful but highly invasive, exotic insect that attacks and kills all ash tree species native to North America. Since its initial detection in and around Detroit, Mich., during the early 1990s, this insect has killed tens of millions of ash trees across 14 states and two Canadian provinces. Several ash cultivars, such as autumn purple ash, which are popular for their spectacular fall colors, are widely planted as landscape trees in Colorado.

In some communities, such as Fort Collins, approximately 20 percent of the shade and ornamental trees are ash. Ash trees also have been planted extensively for windbreaks and shelterbelts across Colorado's Great Plains.

As with gypsy moth, the CSFS conducts a special survey to ensure early detection of potential emerald ash borer infestations in the state. The survey consists of deploying purple-colored panel traps, baited with an attractant that mimics the unique odors produced by stressed ash trees, which are highly attractive to the beetles. To date, the insect has not been found in Colorado.

White Pine Blister Rust

(Cronartium ribicola)

White pine blister rust, native to Asia, was introduced into North America during the early 1900s and has since caused heavy damage to white or five-needle pines across the United States. To complete its life cycle, the fungus that causes this disease requires two separate host plants. Five-needle pines serve as one host, and either currants or gooseberries (*Ribies* spp.), Indian paintbrush (*Castilleja* spp.) or *Pedicularis* spp. serve as the other. This disease causes cankers on the branches of white pines, resulting in dieback and eventual tree death. Infection of regenerating pines can be extensive, and impacted stands display reduced levels of seedling establishment. Mortality of young pines increases the long-term impacts of white pine blister rust infections in stands.

This fungus was not discovered in Colorado until 1998, when damage was detected on limber pine in Larimer County near the Wyoming border. Presently, the disease is known to occur in five other relatively localized areas in the state: Rocky Mountain National Park, Boulder County near Ward, the north slopes of Pike's Peak, the Wet Mountains and the Mosca Pass area of the Sangre de Cristo Range. No new areas of infection were detected in 2011, but the level of infection is increasing in some areas where the disease already is established.

Wild currants are one alternate host of the fungus that causes white pine blister rust.

Branch canker and spores of white pine blister rust on a limber pine.

Colorado's Forests: An Overview

Colorado's forests and woodlands are a critical resource – one that provides many benefits to its residents, as well as visitors and those living elsewhere. They are a source of wood and non-wood products, fresh water and wildlife habitat, and offer many forms of outdoor recreation. Colorado's forests also remove carbon dioxide, a greenhouse gas, from the atmosphere, and store the carbon in woody tissue. Our forests are composed of a mosaic of species that includes both conifers and broadleaf trees. Their distribution and abundance is defined by the state's complex topography of plains, mountains and plateaus; soil types; temperature; past land uses; and available moisture.

Colorado's nine broad types of forests and woodlands (*Table 1*) cover 24.4 million acres of Colorado's land surface. Conifer forests are the most abundant and widespread, dominating the mountains and high plateaus of the Western Slope. These forests are interspersed with stands of quaking aspen, which contribute diversity and beauty to the mountain landscape and comprise nearly 21 percent of Colorado's forest cover. Woodlands of piñon pine and juniper, interspersed with patches of Gambel oak, are the dominant trees of the lower elevations in the southwestern and western portions of the state. Piñon-juniper forests of predominantly one-seed juniper also are common in canyons and the transition zones between canyons and the shortgrass prairie of southeastern Colorado. Collectively, they comprise slightly more than 30 percent of Colorado's forest cover. Many of Colorado's rivers are lined with riparian forests composed of plains cottonwood on the Great Plains, and narrowleaf cottonwood, alders and blue spruce in the western part of the state.

The state's forests fall under a variety of ownerships. Nearly 68 percent of Colorado's forests are managed by federal agencies. The USDA Forest Service is the principal owner, managing approximately 11.3 million acres, or 47 percent of the state's forests, which are subdivided into 11 national forests. Other federal agencies that manage forestlands in Colorado include the Bureau of Land Management (BLM), National Park Service, Bureau of Indian Affairs and Department of Defense. Approximately 30 percent of Colorado's forestlands are privately

Table 1 - Area of forestland in Colorado by forest type, 2002-2009

Forest Type	Area (Thousands of acres)	Percent
Spruce-fir	4,571,066	18.69
Lodgepole pine	1,662,570	6.80
Aspen	5,065,277	20.71
Mixed conifer	1,783,740	7.29
Ponderosa pine	2,527,660	10.34
Montane riparian	934,666	3.82
Piñon-Juniper	5,177,926	21.18
Oak shrubland	2,365,998	9.58
Plains riparian	246,493	1.01
Introduced riparian vegetation	116,899	0.48
Total	**24,452,476**	**100.00**

Source: 2010 Colorado Statewide Forest Resource Assessment

Table 2 - Average net annual growth of forest growing stock on Colorado timberlands by species group, 2002-2009

Species group	Net Annual Growth (Thousand cubic feet per year)
Conifers	
Ponderosa pine	15641
Douglas-fir	18209
Lodgepole pine	-70688
True fir	-29349
Spruce	59186
Other conifers	2979
Subtotal	*-4022*
Broadleaf	
Cottonwood and aspen	49809
Other species	27
Subtotal	*49836*
All species groups	**45814**

Source: USDA Forest Service, Forest Inventory and Analysis

owned by some 186,000 individual landowners. Most of these private forestlands are located at lower elevations. The remaining forestlands in the state are located on a combination of Native American reservations, municipal and state lands. The Colorado State Land Board owns approximately 370,000 forested acres throughout the state. The largest parcel of state forestland is the Colorado State Forest, located east of Walden.

Approximately 11 million acres, or nearly half of all forestlands in Colorado are classified as "timberlands." These are forested lands where trees are either capable of or currently are producing 20 cubic feet of wood per acre annually and, if properly managed, can produce wood products on a sustainable level. Forestlands with special classifications, such as wilderness, are excluded. Approximately 79 percent of Colorado's timberlands are located on public lands.

Recent inventories of Colorado's timberlands indicate that in some of the state's conifer forests, tree mortality has been exceeding tree growth, at least since 2002 (*Table 2*). The heaviest rates of tree mortality currently are located in the lodgepole pine and true fir forest types, with losses of 70,688 cubic feet/year and 29,349 cubic feet/year, respectively (*Table 3*). According to one study of Colorado Forest Inventory and Analysis data, lodgepole pine mortality from 2002-2007 averaged 12.1 million trees per year, compared with 4.1 million trees per year from 1997-2002. Most of this mortality, which averaged 10.5 million

Aspen fall colors are visible during an aerial survey flight in September. [photo: S. Sky Stephens]

trees per year, was attributed to the current mountain pine beetle outbreak. Mortality of true fir averaged 15 million trees per year from 2002-2007, compared with 6.8 million trees per year from 1997-2002. This increase in mortality is largely due to chronically high levels of subalpine fir decline in high-elevation forests. These data clearly demonstrate the destructive capabilities of forest insects and diseases.

The CSFS Statewide Forest Action Plan (Colorado Statewide Forest Resource Assessment and Strategy) identified 5.5 million acres of forestlands that have a high to very high potential for proactive use of forest management to mitigate forest insect and disease damage, through alleviation of tree stress or competition. This type of forest management can restore forest resilience to levels that existed prior to insect and disease infestations (Colorado State Forest Service 2010).

Table 3 – Average annual mortality of growing stock on timberland by species group, 2002-2009

Species group	Average annual mortality (Thousand cubic feet per year)
Conifers	
Ponderosa pine	21,425
Douglas-fir	28,231
Lodgepole pine	142,350
True fir	104,016
Spruce	59,130
Other conifers	2,052
Subtotal	*357,205*
Broadleaf Trees	
Cottonwood and aspen	48,602
Subtotal	*48,602*
All species groups	**405,807**

Source: USDA Forest Service, Forest Inventory and Analysis

Forest Inventory and Analysis –

The Key Data Source for Colorado's Forests

The principal source of information used to assess the status of America's forests is the Forest Inventory and Analysis (FIA) Program. The FIA Program is conducted under the leadership of the Forest Research Stations of the USDA Forest Service. Authorized by the McSweeney-McNary Forest Research Act of 1928, the first forest inventories conducted under this program began in 1930. The program provides statewide, regional and national data on:

- area and location of forest cover type
- tree species composition
- size and health of trees
- tree growth
- tree mortality
- removal by harvesting

These data are obtained from a combination of aerial-image interpretation and on-the-ground observations in a network of permanent sample plots distributed across the nation's forests.

Beginning in 2001, the FIA Program was revised to provide information on an annual rather than periodic basis. In addition, data collection on a subset of sample plots was expanded to include information on soil, understory woody vegetation, tree crown condition, volume of coarse woody debris and lichen composition – a key indicator of air quality.

In Colorado, 4,500 permanent forest inventory plots have been established statewide; approximately 10 percent of these plots are examined annually. Additionally, expanded data is collected each year on 25 of these plots. Colorado is the first state in the Rocky Mountain Region where leadership of the forest inventory process has been assumed by a state agency. The CSFS is responsible for hiring field crews and collecting all data on the sample plots. The USDA Forest Service provides oversight in the process to assure quality of the collected data.

A summary of Colorado's inventory results has previously been published (Thompson 2010). In addition to published reports, the USDA Forest Service provides data collected in each inventory to those interested in further analysis. Data are stored in a nationally consistent standard format referred to as the Forest Inventory and Analysis Database (FIADB). Annual inventories also require a common plot design and common data collection procedures nationwide, resulting in greater consistency among FIA work units than seen in earlier inventories. Users can access this data in a variety of ways, including customized retrieval tools that generate tabular summaries. Currently, Colorado data collected through 2009 are available online; 2010 data also will be available soon.

Standard reports of FIA data always include estimates of forest area, number of trees, wood volume, tree growth, tree mortality and total biomass. Nearly 50 percent of Colorado's forestland is administered by the USDA Forest Service. Softwood forest types, or forestland primarily comprised of conifer species, account for 16 million acres – or 70 percent – of all forestland in Colorado. The most abundant forest type is piñon-juniper woodlands, which account for 5.2 million acres. Forestland comprised of firs and spruce account for another 4.5 million acres. Aspen is by far the most abundant hardwood tree species in Colorado, occupying approximately 5 million acres.

An FIA technician measures downed woody material, duff and litter depth. [photo: Claudia Stout]

One of the primary objectives of the FIA annual inventory is to provide baseline data on forest inventory and condition, and to measure changes in these areas over time. This helps foresters identify major issues that may be of concern to forest resource managers. As previously indicated, Colorado is experiencing one of the largest outbreaks of mountain pine beetle in lodgepole pine forests since record-keeping began in the state. The current epidemic in Colorado has provided an opportunity to test the usefulness of the FIA annual inventory system for quantifying rapid change in mortality of the state's major conifer species. For example, the annual estimate of lodgepole pine mortality volume from just the plots measured by CSFS crews in 2009 averaged 352 million cubic feet. This represents a seven-fold increase from the annual average of 50 million cubic feet of lodgepole pine mortality volume recorded in 2002. One of the benefits of the annual inventory system is that consistent data collection over a period of many years allows for correlation with other time-series data, such as temperature and rainfall. Because the power to detect significant effects related to mortality and trends in forest condition should increase substantially with estimates derived from the re-measurement of plots, a second 10-year cycle of plot measurement in Colorado will begin in 2012.

Special Section

East of the Mountains

The Forests of the Great Plains

The Great Plains – a vast expanse of rolling grassland interspersed by streams, rivers, wetlands and canyonlands – lie to the east of the Rocky Mountains within the Central Shortgrass Prairie ecoregion (CSP). The CSP ecoregion covers approximately 55.7 million acres, encompassing nearly all of eastern Colorado, parts of southeastern Wyoming, western Kansas and Nebraska, the panhandles of Oklahoma and Texas, and northeastern New Mexico. The climate of this region is semi-arid, and forests develop only where sufficient moisture is available. On the Great Plains of Colorado, shortgrass prairie is the dominant vegetation type. Hundreds of grass species are present, such as blue grama, alkali sacaton, side oats grama, sand dropseed, buffalo grass, western wheatgrass and galleta.

This region sustains some of the most diverse wildlife populations in the state. Colorado's plains are an international destination for birders, as they support several hundred species of birds. This avian abundance is due in large part to the region's location, which falls within key migration paths of both Western and Eastern bird species. Pronghorn antelope, mule and white-tailed deer, sage hens and other wildlife species also are found in relative abundance on the Great Plains.

Colorado's Great Plains provide unique recreational opportunities, as well. Of special note is the longest preserved dinosaur trackway in North America, located in the Picket Wire Canyonlands of the Comanche National Grassland. Other popular tourist destinations include the Santa Fe Trail National Scenic and Historic Byway, Bent's Old Fort National Historic Site and the Sand Creek Massacre National Historic Site.

The Great Plains of Colorado also support a vibrant agricultural economy that sustains both state and local economies, and produces food for the entire country.

A flock of wild turkeys along the Purgatoire River in Otero County. [photo: Shelly Simmons]

Pronghorn antelope are native to the Great Plains.

Native Forests of the Plains

Riparian Forests

Native forests on Colorado's Great Plains are riparian forests, which grow near streams and rivers where there is adequate moisture for tree growth. These forests are composed of plains cottonwoods, willow species and other broadleaf trees, such as boxelder, oak species, netleaf hackberry and western soapberry. Riparian forests dominate areas near rivers and their tributaries that flow across the Great Plains, including the Platte, South Fork of the Republican, Arikaree and Arkansas rivers.

Piñon-Juniper Forests

Conifer forests also exist on the Great Plains. Isolated pockets of Rocky Mountain juniper grow in northeast Colorado's Pawnee National Grasslands and several other areas. Tens of thousands of acres of piñon-juniper forests comprised of one-seed juniper and piñon pine, with a smaller component of Rocky Mountain juniper, dominate canyons and the transition zones between canyons and shortgrass prairie in the southeastern counties of Colorado, including Baca, Bent, Otero, Pueblo, Huerfano and Las Animas. In Douglas, Elbert and El Paso counties, ponderosa pine also ranges east into the prairie.

The native forests of the Great Plains are largely confined to river banks where cottonwoods and willows can obtain adequate moisture.

A healthy riparian ecosystem along Chacuaco Creek in southeast Colorado. [photo: Shelly Simmons]

Great Plains ecosystems in southeast Colorado include piñon-juniper canyonlands dominated by one-seed juniper. [photo: Shelly Simmons]

Planted Forests of the Great Plains

Windbreaks and Living Snow Fences

As the Great Plains were settled, pioneers planted trees to help modify the harsh, windy environment and make it more suitable for humans, domestic animals and crop production. Windbreaks and living snow fences are still valued on the Great Plains of eastern Colorado. Strategically placed rows of trees, in the form of windbreaks and living snow fences, greatly reduce wind speed near home sites, roads, barns, corrals and crop fields. Living snow fences help protect roads and railroad rights-of-way from drifting snow, and windbreaks moderate temperatures around structures, which can help reduce heating and cooling costs. Livestock also benefit from windbreaks, which provide them with protection from extreme weather conditions. In addition, windbreaks provide cover and habitat for wildlife, and keep fertile soil in place.

Windbreak plantings provide protection for homes, agricultural crops and livestock.

Living snow fences provide protection of highways and railroad rights-of-way from drifting snow. [photo: Rich Straight]

Planting Trees Helps Plains Community Heal from Wildfire

In April 2008, areas of Crowley County were hit hard by a 9,000-acre grass fire, driven by winds exceeding 60 mph. The wildfire burned through rural areas of the county and the small town of Ordway, destroying homes, structures and property. Many members of the Crowley County community were impacted by this fire, and immediately afterward, the community was ready to begin rebuilding their lives.

Driven by interest from those affected by the fire who wanted to replant trees lost to the blaze, a partnership of county, state and local organizations was formed to lead the effort. Partners included the Colorado State Forest Service, Crowley County, Colorado State University Extension-Crowley County, West Otero-Timpas Conservation District and the Ordway Tree Board. The partnership received a $7,500 grant from the Colorado Tree Coalition's Reforest Colorado Grant Program, which 80 volunteers from across the state used to plant more than 350 trees for landowners affected by the fire.

After the 2008 Ordway Fire, volunteers planted trees to replace those that were destroyed. [photo: Shelly Simmons]

Planting trees in plains communities offers many aesthetic and environmental benefits. [photo: CSFS archives]

Community Forests

As cities and towns began to emerge on the Great Plains, so did the need to plant trees. Pioneer J. Sterling Morton, who became known as the "Founder of Arbor Day," recognized this need. The first Arbor Day celebration was held on April 10, 1872, in Nebraska City, Neb. Historians estimate that more than 1 million trees were planted in the State of Nebraska that day.

Today, community forests on the plains continue to help purify air and water, moderate temperatures, reduce noise and conserve energy by providing shade and reducing wind speed. Trees also create structure and beauty, add economic value and are a vital part of the infrastructure of plains communities. For example, studies conducted by the University of Washington have shown that people prefer tree-lined shopping districts and are more likely to stay longer, spend more money and make repeat visits if trees are present.

Cities and towns across the Great Plains region still celebrate Arbor Day and actively manage their community forests. Short- and long-term planning is critical for maintaining healthy community forests, and must include such practices as new tree plantings, tree replacement, pruning, watering, mulching, storm-damage mitigation and electrical line clearance. Many eastern Colorado plains communities participate in the National Arbor Day Foundation's annual Tree City USA Program, which recognizes and awards communities that are good stewards of their community forests.

Threats to Forest Health on the Plains

Trees planted on Colorado's Great Plains are especially subject to stress because of the semi-arid climate and high winds. Other agents that can affect the health and productivity of forest ecosystems are both natural and human in origin.

With the exception of Rocky Mountain juniper, most of the trees (ash, elm, pine, Russian-olive, etc.) planted by pioneers were exotic to the Great Plains, being native to portions of eastern North America, Europe or Asia. With proper irrigation and care, many of these trees

readily adapted to their new environment and thrived. Some adapted too well, became invasive and began to slowly invade native riparian forests.

Invasive Trees

Many tree species have been introduced to the Great Plains. While most species were beneficial and thrived under irrigation, a few escaped cultivation and became invasive. Trees are considered invasive if they are exotic or non-indigenous species introduced into environments in which they did not evolve. Invasives have no natural enemies to limit their reproduction, and thus can displace native vegetation (Federal Interagency Committee on Management of Noxious and Exotic Weeds 1998). At least two small- to medium-sized trees introduced into Colorado and adjoining states for shelterbelt and windbreak plantings – Russian-olive and tamarisk – have become invasive. Both of these tree species now are listed by the Colorado Department of Agriculture as noxious weeds, which means it's illegal to plant and propagate them.

Russian-olive is a medium-sized tree, native to portions of Europe and Asia, that was introduced into North America as a shelterbelt and windbreak tree during the late 1800s. Russian-olive displays silvery-green foliage, tiny yellow flowers in spring and olive-like fruit in late summer or early fall. It proved to be especially suitable for the harsh growing conditions of the Great Plains, and escaped cultivation. These trees have invaded riparian areas, fields and open areas where they compete with and displace native vegetation. Due to the planting that previously occurred and the dispersion of seed by birds, this invasive tree has been widely distributed in Colorado and other states.

Russian-olives have invaded this field in Larimer County.

Tamarisk, or salt cedar, is a group of small- to medium-sized trees native to southern Europe, northern Africa, the Near East and Central Asia. Like Russian-olive, tamarisk was originally introduced to North America during the late 1800s as an ornamental tree and for use in shelterbelts, windbreaks and stream-bank stabilization. Tamarisk readily adapted to the semi-arid climate of the West, invaded riparian areas – especially in the Great Plains and Great Basin regions – and displaced native forests of cottonwood and willow. Today, tamarisk commonly is found in floodplains and along riverbanks, stream courses, salt flats, marshes and irrigation ditches. This tree can form

Tamarisk established along Chacuaco Creek in southeastern Colorado has impacted this riparian ecosystem. [photo: Shelly Simmons]

dense, pure thickets that extend for miles.

Tamarisk thickets alter the ecology and hydrology of riparian areas. These trees have a high evapotranspiration rate, so water loss is caused by tamarisk. Sites invaded by these trees typically dry out over time, resulting in reduced stream flows. Therefore, tamarisk communities generally are less ecologically valuable than the native riparian plant communities they replace. In Colorado, the Arkansas River Basin of the Great Plains accounts for approximately 69 percent of the state's total tamarisk infestation (Colorado State Forest Service 2010; The Tamarisk Coalition 2009; Utah State University 2002; USDA APHIS 2005).

Spores of Gymnosporangium *rust on serviceberry.*

Tree Insects and Diseases of the Plains

Both native and planted forests on the Great Plains are subject to damage by a variety of insects, including defoliators, borers, aphids and scales, as well as damage from fungi, nematodes and bacteria. The following are a few of the more prominent concerns.

Fire blight is a disease caused by a bacterium (*Erwinia amylovora*) that attacks blossoms and growing tips of its host trees. Leaves of infected branches wilt rapidly, giving affected trees a scorched appearance; later, dark cankers form on the branches. Branches eventually die and the tips typically curl into what is known as a "shepherds crook." Fire blight attacks several fruit tree species, including pear, apple and crabapple. Certain cultivars of cotoneaster, which are important plantings in shelterbelt and windbreak plantings, also are affected (Riffle & Peterson 1986).

***Gymnosporangium* spp.** fungi require two separate host plants to complete its life cycle. Juniper and serviceberry, apple, crabapple and hawthorn serve as one host; plants in the rose family are the second host. Infections from these fungi often are referred to as **cedar-apple** or **cedar-hawthorn rusts**. Telial horns, which are fungi in spore form, appear as bright orange, fleshy structures on juniper branches in spring and are especially abundant during wet years. In some cases, masses of orange teliospores appear on the branches. Alternate spore stages form on the leaves of serviceberry, apple, crabapple or hawthorn and can cause premature loss of foliage and reduced fruit crops. One species (*Gymnosporangium nidus-avis*) forms conspicuous witches' brooms on the branches of Rocky Mountain juniper (Riffle & Peterson 1986).

***Melampsora* spp.** leaf rusts infect both cottonwood and willows growing in riparian areas of the Great Plains. Heavy infections cause premature loss of leaves, decreased tree vigor and noticeable declines in windbreak plantings. Like most rust fungi, the life cycle of *Melampsora* leaf rusts is complex and requires two hosts to reproduce. The alternate host varies depending on the species of *Melampsora* leaf rust involved, and can include conifers such as fir or a variety of broadleaf plants. The most conspicuous evidence of *Melampsora* leaf rust infection is the presence of powdery, bright orange spore masses on cottonwood and willow leaves. Heavy infections can cause the foliage to have an orange cast, and result in premature loss of foliage (Ming Han Pei & McCracken 2005, Riffle & Peterson 1986).

Fall webworm larvae construct conspicuous tents in branches of host trees.

Fall webworm (*Hyphantria cunea*) is a common mid- to late-summer defoliating insect of cottonwoods and other broadleaf trees throughout much of North America, including the Great Plains. Larvae feed in colonies and form large, tan-colored tents over portions of infested tree crowns. Heavy infestations can enclose much of the tree crown in webbing. This webbing may be unsightly, but the insects cause little or no permanent damage to infested trees.

Lilac/ash borer (*Podosesia syringae*) is a clearwing moth that somewhat resembles a wasp. Its larvae bore into the boles of ash and lilac trees, making this insect a common pest of ash trees in urban settings, shelterbelts and windbreak plantings, where infestation rates as high as 50 percent have been reported. Repeated infestations scar and can severely weaken or kill trees. Adults emerge from infested trees in early spring.

Elm Insects and Diseases

Elms, which historically were planted in many plains shelterbelts, windbreaks and urban settings, are subject to damage by several insects.

Elm leaf beetle (*Pyrrhalta luteola*) is an introduced species that feeds on all species of elms. Larvae and adults are both damaging. Larvae skeletonize leaves and cause them to turn brown, while adults chew larger holes in the leaves. Damage is unsightly, and heavy infestations can weaken trees. In 2011, this insect caused widespread damage to elms planted in and around Cañon City.

Elm leaf mining sawfly (*Fenusa ulmi*) is another exotic species introduced from Europe. The larvae feed inside the leaves and cause brown, discolored patches. The adult stage is a small wasp that appears in spring, just as the buds burst, and lays eggs on developing leaves.

European elm flea weevil (*Orchestes alni*) also is native to Europe and was first discovered in the United States during the 1980s. Adults chew small holes in elm leaves in spring; later, in summer, larvae mine inside the leaves.

European elm scale (*Gossyparia spuria*) is a sucking insect that infests elm branches and forms large colonies. Heavy feeding can kill branches, and honeydew produced by the feeding scales is a medium for growth of black, sooty mold, which can turn portions of the tree crown black.

Other insects and diseases that pose an immediate threat to the forests of the Great Plains include **emerald ash borer**, **gypsy moth** and **thousand cankers disease** – all described in earlier sections of this report. Emerald ash borer, in particular, is the subject of the Great Plains Tree and Forest Invasives Initiative. This initiative,

Elm leaf beetle adult (approximately 1/4-inch).

funded by a grant from the USDA Forest Service and matching state funds, gives state forestry agencies in four Great Plains states east of Colorado – Kansas, Nebraska, South Dakota and North Dakota – the opportunity to prepare for the arrival of this devastating insect. They are doing this through public awareness, promotion of tree species diversity and by assessing the region's tree resources and the potential impacts of invasive pests on these resources.

Herbicide Use on the Plains

Herbicides are important tools for managing unwanted plants in agriculture and forestry. Misapplied herbicides, however, can damage non-target vegetation. Windbreak plantings can be especially susceptible to herbicide damage because they often are located at the edges of cultivated fields, where they are subject to drift from herbicidal spray. Trees located near rights-of-way, railroads, roadsides or other areas treated for noxious weed control also have a higher risk of herbicide exposure if sprays are applied incorrectly. Symptoms of herbicide exposure include cupped or curled leaves, chlorotic or yellow foliage, abnormal growth, foliage with a pebbled or weather-beaten texture and branch dieback. Repeated exposure can severely weaken and sometimes kill trees. Boxelder, elm, ash, hackberry, hickory, apple, sycamore, willow, birch, horse chestnut and various maple trees are especially susceptible to herbicide exposure.

Many tree plantings in plains communities are declining due to age, herbicides, drought and high winds. Recognizing the importance of healthy community forests, several communities are replacing these dead and dying trees.

Biological Control of Tamarisk

Tamarisk is an invasive tree species found throughout Colorado's riparian forests. Tamarisk often displaces native vegetation and can alter water availability to surrounding plant and animal communities. A biological control program was initiated by the USDA Agricultural Research Service to control tamarisk throughout the western United States. Biological control is a pest management technique that involves the introduction of natural enemies of an invasive species (from its native habitat) to control it in its new (introduced) environment. This technique has been used with varying degrees of success against a number of invasive insects and plants worldwide.

A Diorhabda *beetle adult on tamarisk (approximately 3/16-inch).*

A group of leaf beetles of the *Diorhabda* genus are associated with tamarisk in its natural range. Both the larvae and adults feed on tamarisk leaves and green stems, which causes large portions of the trees to dry and turn yellow beginning in mid to late June (tamarisk foliage normally turns brilliant yellow in autumn). In parts of China and Russia, *Diorhabda* beetles are considered pests of tamarisk planted for shelterbelts or sand-dune stabilization, and infestations often require direct control. In Colorado, however, *Diorhabda* beetles meet an important criterion for an introduced biological control agent: they feed only on tamarisk trees, and therefore do not pose a threat to native vegetation.

The tamarisk biocontrol program in the West started in the late 1960s and gained momentum approximately 20 years later as the magnitude of the tamarisk problem became clearer. By 1998, after extensive safety testing, the first tamarisk biocontrol agent was ready for application. The first trial releases of the tamarisk beetle in North America were made along the Arkansas River in Colorado, below Pueblo Reservoir. The beetles survived and effectively defoliated tamarisk locally. These encouraging results helped launch the program across the western United States.

Following biological control on the Western Slope of Colorado, tamarisk now shows reduced canopy cover and vigor following multiple defoliations by *Diorhabda*. Observations from 10 monitoring sites on the Western Slope show an average of 15 percent mortality in tamarisk stands, with some sites exceeding 40 percent mortality. Vigorous regrowth of native vegetation also has been especially evident along many water courses where *Diorhabda* has been active, and a resurgence of willow stands is occurring at some sites where tamarisk was dominant only a few years ago.

After release of Diorhabda *beetles, tamarisks are dying, while willows are growing back along this portion of the Colorado River. [photo: Dan Bean]*

Weather Patterns and Forest Health

An unusual weather pattern occurred in Colorado during the fall, winter and early spring of 2010-2011. While the high mountains received record snowfall, the Front Range foothills and Great Plains experienced prolonged dry weather accompanied by frequent high winds. These conditions set the stage for large wildfires that burned thousands of acres of forest, woodland and prairie, destroyed numerous homes and other structures, and forced the evacuation of entire communities of people, pets and livestock. In September 2010, the Fourmile Canyon Fire burned near Boulder destroying 169 homes, making it the most costly wildfire in Colorado's recorded history. Then in April 2011, the Crystal Fire destroyed 13 homes and additional structures in the wildland-urban interface of Larimer County.

Aerial view of damage to lodgepole pine and other trees on Tennessee Mountain (Boulder County) caused by a severe hailstorm.

A severe hailstorm that occurred in late July 2010 caused damage to conifer forests on the slopes of Tennessee Mountain and around the community of Eldora in Boulder County. This damage became more visible in 2011. The hail damaged approximately 410 acres of lodgepole pine, spruce and subalpine fir, in addition to several stands of quaking aspen. Affected forests had a distinct gray-brown cast that could be seen for several miles. Hail damage is common in Colorado, particularly on the Great Plains. Hail and other storm-related damage to trees may predispose them to attack by insects and diseases.

In late October 2011, an early snowstorm deposited a blanket of heavy, wet snow over a large area of Colorado. The storm caused severe damage to urban broadleaf trees, many of which were still in full leaf, from Fort Collins south to Denver and east to Greeley and beyond. Broken limbs blocked streets, damaged homes and power lines and left many residents without electricity for several days. In addition, the snowstorm cost municipalities and homeowners several million dollars in repairs and clean-up costs.

Severe tree damage occurred in urban forests along the Front Range after an early season snowstorm struck in late October 2011.

These events serve as a reminder of the importance of weather and climate on the health and condition of Colorado's forests.

Climate and Forest Pests

Climatic anomalies, including prolonged drought, high winds and excessively mild or cold winter temperatures, can influence the abundance of damaging forest insects and diseases, and their resultant damage. For example, tree stress caused by the 1998-2002 drought triggered a major outbreak of the piñon ips bark beetle (*Ips confusus*) throughout much of the natural piñon pine range in the southwestern United States. This same drought also resulted in increased tree mortality from other bark beetles in Colorado, including the Douglas-fir beetle (*Dendroctonus pseudotsugae*) and fir engraver beetle (*Scolytus ventralis*). Moreover, this drought is believed to have incited sudden aspen decline in many of the state's aspen forests.

High winds, often associated with severe storms, can cause blowdown events in conifer forests and set the stage for bark beetle outbreaks. The development of spruce beetle outbreaks in high-elevation spruce forests, such as one following a blowdown in the Mount Zirkel Wilderness in 1997, is a good example. Windthrow in pine forests also can provide an abundance of host material suitable for outbreaks of ips engraver beetle.

Extremely cold winter temperatures can affect winter survival of bark beetles, such as mountain pine beetle and spruce beetle. Although these insects have mechanisms that allow them to survive beneath the bark of infested trees during sub-freezing conditions, excessive periods of extremely low temperatures (approximately 30 to 40 degrees below zero) can kill a high proportion of the bark beetles at all life stages (Gibson et al 2009). Studies in high-elevation forests in western Wyoming indicate that average winter low temperatures have increased steadily since approximately 1980, resulting in higher over-winter survival rates of mountain pine beetle.

Short-term changes in global climate, caused by the El Niño-Southern Oscillation (ENSO) and its counterpart, La Niña, also can affect forest health. ENSO refers to a warming of ocean surface waters in the tropical eastern Pacific Ocean off South America. This causes worldwide changes in normal weather patterns, including increased precipitation in the southern United States in winter and warm, dry winter conditions in the northern United States and Canada. The high winds that caused extensive blowdown in the Engelmann spruce forests of the Mount Zirkel Wilderness in 1997, which set the stage for a spruce beetle outbreak, were associated with an unusually strong ENSO event.

During 2010 and 2011, global climate was influenced by a La Niña event, recognized by a cooling of the same ocean surface waters off South America. La Niña typically has the opposite effect of ENSO events, as was the case when a La Niña event developed in June and July 2010. This resulted in the unusually dry conditions and high fire danger experienced along the foothills of the Rocky Mountains and on the Great Plains during the winter and spring of 2010-2011.

Blowdown in Engelmann spruce forests provides favorable host material for spruce bark beetles, which can lead to outbreaks in live trees.

Keeping Forests Healthy through Forest Management

Improving markets for forest products can help lawnowners meet wildfire mitigation objectives by offsetting the cost of treatments. [photo: CSFS archives]

As has been discussed throughout this report, Colorado's forests provide a wealth of social, economic and ecological benefits. Ensuring that our future forests continue to provide these benefits depends on sustainable forest management.

Forest management defines the goods, services and other benefits we hope to derive from the forest, and the management activities that are necessary to promote the output of those objectives. Forest management also improves forest health and resiliency, and is a useful tool to mitigate wildfire risk. Successful forest management requires an understanding of forest ecosystems and silvics – the science of how environmental factors affect tree growth and health. Through diverse forest management practices, we can satisfy our need for goods and services, while remaining good forest stewards.

An essential component to successful forest management is identifying the particular goods and services obtainable from each forest, and the stands that can best provide them sustainably over time. While some forests may be managed primarily for the production of lumber and other wood products, others are best suited for management practices that focus on wildlife habitat, recreation or water yields. Many forests can provide a variety of benefits with the right management and the application of forest ecology and silvics.

Silvics provides the scientific basis for forest management. It is the study of how climate, soils, available moisture, topography and other factors affect tree growth and health. This science examines the characteristics of individual tree species and their abilities to survive and grow under certain conditions. It also considers the role of fire, insects and diseases in the dynamic ecology of forests. Each tree species and forest type has a unique set of characteristics that defines where they can occur and how they

Tree thinning reduces fuel hazards, promotes forest health, improves wildlife habitat and supports local economies. [photo: Kathryn Hardgrave]

respond to disturbance, including fire, insects, diseases and forest management practices.

Applying forest management practices allows us to foster species and forest types that are best suited for each location and that can be sustained over time. This ensures that the individual characteristics of trees and forests are maximized to sustainably produce the desired goods and services. Forest management also can improve forest health by creating conditions more resilient to the recurrence of wildfire and damaging insect and disease outbreaks.

Reducing wood product imports from outside Colorado contributes to both local and statewide economies. [photo: Kathryn Hardgrave]

For example, ponderosa pine is a relatively long-lived tree that typically grows in uneven-aged stands. These trees produce a vigorous tap root that extends far underground, and have exceptionally thick bark. This combination of characteristics allows ponderosa pines to obtain moisture at deeper soil depths and resist damage from frequent, low-intensity fires. Therefore, in the central Rocky Mountains, ponderosa pine is best adapted to grow at relatively low elevations (6,500-8,500 feet) where conditions are dry and frequent, low-intensity fires occur naturally. A forest management approach in ponderosa pine might include stand thinning to reduce tree density. This allows the remaining trees to better use available soil and water resources, making them less susceptible to stress. Maintaining healthy tree densities in ponderosa pine forests also reduces their susceptibility to mountain pine beetle. Prescribed fire also can be used to manage fuels within stands and mitigate the impacts of future fire events.

Other tree species and forest types benefit from similar management practices applied to best suit specific needs. For example, lodgepole pine is a thin-barked tree with a shallow root system that usually grows in even-aged stands. It is best adapted to grow at higher elevations, where there is more moisture and natural fires are less frequent. Lodgepole pine responds very differently to forest thinning than ponderosa pine because of its shallow root system, which makes it susceptible to windthrow. Thinning and tree removal sometimes can be applied to lodgepole pine stands, but are best used at a different scale than thinning done in ponderosa pine stands.

Ultimately, forest management in Colorado can promote forest health and ensure that valuable goods and services

are produced from our forested landscape. Long-term forest management also will ensure that Colorado's forests will be resilient to insects and disease, wildfire and other agents of change. While promoting forest health and forest resiliency, forest management also can provide wood products to local markets, create jobs and bolster local economies. Forest managers and forest landowners have the ultimate responsibility to manage their forests in order to meet defined goals and objectives, while maintaining healthy forests. The Colorado State Forest Service can provide private forest landowners with the technical assistance needed to help meet their individual land-management objectives.

A strong forest products industry not only contributes to local economies, but can offset costs to landowners when reducing hazardous fuels. [photo: Kathryn Hardgrave]

Legislative Support for Colorado's Forests

For the past several years, the Colorado General Assembly has demonstrated a strong commitment to conserving and protecting Colorado's forests by passing numerous bills focused on forest health, fuels mitigation and public safety, including three bills in 2011. The level of legislative support over the past several years is evidence of the importance and value Coloradans place on our forests, and we look forward to continued support as we work together to promote healthier, more diverse forests that are resilient to insect and disease epidemics for the benefit of present and future generations.

Summary of 2011 Forestry Legislation

Bill Number	Bill Name	Bill Summary
SB11-110	County Open Burning Slash Permit Program	Requires counties with 44 percent forest cover to develop an open-burning permit system for unincorporated areas of the county by Jan. 1, 2012. Counties with an existing open-burning permit system are exempt. The bill also exempts prescribed burns that follow federal and state guidelines, and preserves the existing rights of agricultural producers to conduct burning on their properties.
SB11-238	Extend Wildfire Preparedness Funding	For two years, beginning on July 1, 2012, extends the annual $3.25 million transfer to the Wildfire Preparedness Fund of federal mineral lease revenues by the Department of Local Affairs. The funding is used by the Colorado State Forest Service for wildfire preparedness activities, including funding for firefighting resources, agreements and plans.
SB11-267	Forest Health Act of 2011	Promotes forest health efforts, detailing several initiatives for the management and use of biomass derived from forestland located in the state. Also creates the Colorado Forest Biomass Work Group to identify market-based models for forest management and woody biomass energy development.

Learning from the Past to Shape the Future of Colorado's Forests

Throughout this report, information was presented on the condition of Colorado's forests, based on data generated by the Forest Inventory and Analysis Program, ground surveys performed by CSFS field personnel, and the annual aerial survey of insect and disease activity performed by CSFS and USFS personnel. Forest conditions in Colorado have changed throughout history, and we can expect them to continue to change in the future. Climate, weather conditions, fire, insects and disease – as well as how we manage and use our forests – all contribute to their health and condition.

Over the last two decades, the rate of change our forests have experienced has been historically significant. Fire, insect and disease outbreaks, which have increased in size and intensity, have transformed our forests in a relatively short timeframe. Although the processes and conditions that precipitated these outbreaks occurred over a longer timeframe than the outbreaks themselves, they were not readily apparent to the casual observer. Forests mature over decades. The increase in age and density of trees, competition for resources and drought conditions further stressed Colorado's forests, contributing to the insect epidemics we have recently experienced.

Much of Colorado's forestland, including designated wilderness areas, is in protected status and is managed only by natural processes. On the state's remaining forestland, however, we now have the opportunity to take action that will shape our forests for the future. The cost of controlling wildfire, especially where people and infrastructure are at risk, is exceptionally high. An example is the cost to contain and control the 2002 Hayman Fire, which totaled $42,000,000. Additionally, the amount of funds expected to be spent on

watershed restoration and rehabilitation after the fire is $74,000,000 (Hayman Fire Case Study 2003). While we must direct resources to control fires when they occur, this practice limits our ability to use these resources in a more proactive manner to reduce the risk and severity of future wildfires. The objective is not to eliminate wildland fire and its important role in ecosystem function, but to reduce unwanted wildfire and its damaging effects.

[photo: Joy Jackson]

Forest management can fulfill an important role in how we help shape Colorado's future forests. Where lands allow for active management to occur, we can enhance forest resilience to fire, insects and diseases. This approach should ensure that at least a subset of managed forests will be resilient. Forest management also will continue to provide much-needed wood products and help diversify local employment. When we maintain a broad array of forest product markets, the economic value they provide assists us in meeting our desired future forest conditions in a cost-effective manner. In the United States, approximately 40 percent of solid wood products are imported from other countries. In Colorado, more than 90 percent of the wood products we consume are imported from other states and countries.

Managing the tracts of Colorado forest that allow for management under current regulations, especially on federal lands, will provide multiple benefits. Forest management provides employment, and businesses that use wood provide revenue that can offset the costs of forest management activities.

Conversely, if forests are left to rely only on natural processes, we can expect insects, diseases and fire to return in the future and have negative impacts on our forests. A balanced approach that recognizes the status of current protected lands, while encouraging remaining forestlands to be actively managed, is the best option for our future. This approach will provide diverse forests for tomorrow, and ensure that we continue to receive the wide range of benefits our forests provide.

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COLORADO
DEPARTMENT OF NATURAL RESOURCES
Division of Forestry
1313 Sherman Street, Room 718
Denver, Colorado 80203
(303) 866-3311
www.dnr.state.co.us

Colorado State FOREST SERVICE
Colorado State University
Foothills Campus
5060 Campus Delivery
Fort Collins, CO 80523-5060
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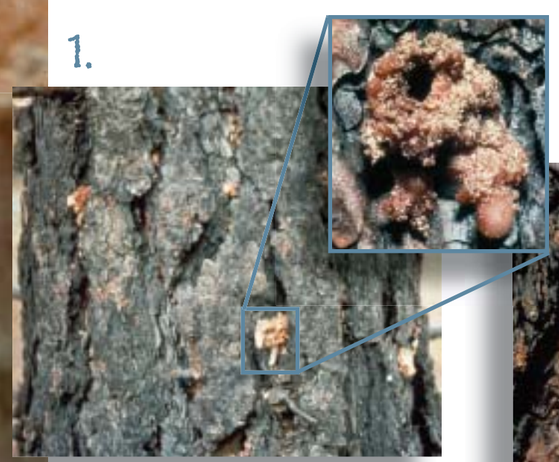
Mountain Pine Beetle



Description

Mountain pine beetles are one of the most significant insects of western pine forests. Outbreaks of this beetle can result in the loss of millions of trees.

Life Cycle

The mountain pine beetle completes one cycle of development from egg to adult per year. The most common homes the beetles seek are large ponderosa, lodgepole, and limber pines.

1. Every August, mountain pine beetles leave dead trees in which they developed to seek new homes for the next generation in living green pines.
2. Once the female beetle has found a suitable tree as a new home, she releases pheromones that attract both males and other females to the same tree. The beetles enter the tree by boring into the bark, creating pitch tubes.
3. Boring dust will appear in bark crevices and on the ground. Coordinated attacks of several hundred beetles are common.
4. Mating will occur under the bark, and each beetle couple will produce about 75 eggs. It takes seven to ten days for these eggs to hatch into larvae. The larvae tunnel away from the egg gallery, producing a characteristic pattern.
5. The beetles spend the winter under the bark. This is when you are likely to see evidence of woodpeckers feeding on the trunk.
6. The larvae continue to feed into spring and transform into pupae in June and July.

Damage

Adult beetles introduce bluestain fungi, which disables the tree's defenses and interrupts the flow of water. The combination of fungi and beetle feeding rapidly kills the tree.

Ten to twelve months after a successful attack, infested tree foliage turns yellowish to reddish. Soon after, the beetles are ready to exit and search for a new home.

Large numbers of dead trees create safety and fire hazards.

Management

Timing means everything! Infested trees must be treated by an approved method before the beetles exit to attack new trees.

Natural: Except when woodpeckers and extreme cold eliminate the beetles, trees must be cut, then logs should be hauled to 'safe sites' a mile or more from susceptible tree hosts.

Chemical: Preventive spraying before mid-July is one method of keeping uninfected but susceptible pines protected.

Solar: Solar treatments that raise the underbark temperature to lethal levels also will reduce beetle populations. This can be done with or without plastic and requires six to eight weeks of warm weather.

A thinned, healthy forest will help prevent outbreaks of the mountain pine beetle, improve mountain views, and reduce fire hazard.

Colorado State Forest Service

For more information about the management of mountain pine beetle, contact your nearest office of the Colorado State Forest Service or USDA Forest Service.

Forest Service U.S. Department of Agriculture

TREES & SHRUBS

Mountain Pine Beetle no. 5.528

by D.A. Leatherman, I. Aguayo, and T.M. Mehall[1]

Quick Facts...

Mountain pine beetles (MPB) are the most important insect pest of Colorado's pine forests. MPB often kill large numbers of trees annually during outbreaks.

Trees that are not growing vigorously due to old age, crowding, poor growing conditions, drought, fire or mechanical damage, root disease and other causes are most likely to be attacked.

For a long-term remedy, thin susceptible stands. Leave well-spaced, healthy trees.

For short-term controls, spray, cover, burn or peel attacked trees to kill the beetles. Preventive sprays can protect green, unattacked trees.

Mountain pine beetle (MPB), *Dendroctonus ponderosae*, is native to the forests of western North America. Periodic outbreaks of the insect, previously called the Black Hills beetle or Rocky Mountain pine beetle, can result in losses of millions of trees. Outbreaks develop irrespective of property lines, being equally evident in wilderness areas, mountain subdivisions and back yards. Even windbreak or landscape pines many miles from the mountains can succumb to beetles imported in infested firewood.

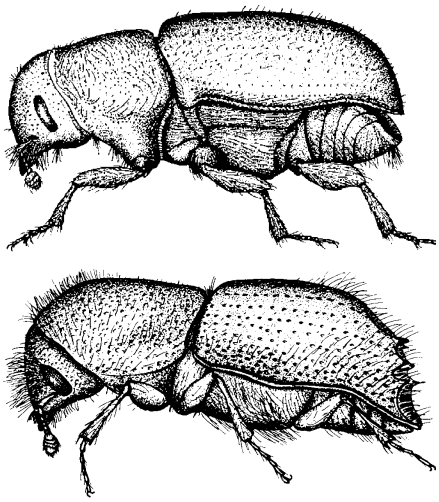


Figure 1: Adult *Dendroctonus* (top) versus *Ips* (bottom). Note gradually curved wing of *Dendroctonus*. Actual size of *Dendroctonus* from 1/8 to 1/3 inch, *Ips* 1/3 to 1/4 inch.

Mountain pine beetles develop in pines, particularly ponderosa, lodgepole, Scotch and limber pine. Bristlecone and pinyon pine are less commonly attacked. During early stages of an outbreak, attacks are limited largely to trees under stress from injury, poor site conditions, fire damage, overcrowding, root disease or old age. However, as beetle populations increase, MPB attacks may involve most large trees in the outbreak area.

A related insect, the Douglas-fir beetle (*D. pseudotsugae*), occasionally damages Douglas-fir. Most often, outbreaks are associated with previous injury by fire or western spruce budworm. (See fact sheet 5.543, *Western Spruce Budworms*). Spruce beetle (*D. rufipennis*) is a pest of Engelmann and Colorado blue spruce in Colorado. Injured pines also can be attacked by the red turpentine beetle (*D. valens*).

Mountain pine beetles and related bark beetles in the genus *Dendroctonus* can be distinguished from other large bark beetles in pines by the shape of the hind wing cover (Figure 1, top). In side view, it is gradually curved. The wing cover of *Ips* or engraver beetles, another common group of bark beetles attacking conifers, is sharply spined (Figure 1, bottom).

Signs and Symptoms of MPB Attack

- Popcorn-shaped masses of resin, called "pitch tubes," on the trunk where beetle tunneling begins. Pitch tubes may be brown, pink or white (Figures 2 and 6).
- Boring dust in bark crevices and on the ground immediately adjacent to the tree base.

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Figure 2: "Pitch tubes" indicating trunk attacks by MPB. Success of the attacks is confirmed by looking under the bark with a hatchet for beetles, their tunnels and/or bluestaining.

- Evidence of woodpecker feeding on trunk. Patches of bark are removed and bark flakes lie on the ground or snow below tree.
- Foliage turning yellowish to reddish throughout the entire tree crown. This usually occurs eight to 10 months after a successful MPB attack.
- Presence of live MPB (eggs, larvae, pupae and/or adults) as well as galleries under bark. This is the most certain indicator of infestation. A hatchet for removal of bark is needed to check trees correctly (Figures 3, 5 and 8).
- Bluestained sapwood (Figure 9). Check at more than one point around the tree's circumference.

Life History and Habits

Figure 3: Top view of adult MPB (actual size, 1/8 to 1/3 inch).

Mountain pine beetle has a one-year life cycle in Colorado. In late summer, adults leave the dead, yellow- to red-needled trees in which they developed. In general, females seek out large diameter, living, green trees that they attack by tunneling under the bark. However, under epidemic or outbreak conditions, small diameter trees may also be infested. Coordinated mass attacks by many beetles are common. If successful, each beetle pair mates, forms a vertical tunnel (egg gallery) under the bark and produces about 75 eggs. Following egg hatch, larvae (grubs) tunnel away from the egg gallery, producing a characteristic feeding pattern.

Figure 4: Mountain area infested by MPB, showing three years of mortality. Old, dead trees are gray; newly killed trees are straw yellow or orange. Some trees may also be infested but do not turn color until nine months or so under attack.

MPB larvae spend the winter under the bark. Larvae are able to survive the winter by metabolizing an alcohol called glycerol that acts as an antifreeze. They continue to feed in the spring and transform into pupae in June and July. Emergence of new adults can begin in mid-June and continue through September. However, the great majority of beetles exit trees during late July (lodgepole pine) and mid-August (ponderosa pine).

A key part of this cycle is the ability of MPB (and other bark beetles) to transmit bluestain fungi. Spores of these fungi contaminate the bodies of adult beetles and are introduced into the tree during attack. Fungi grow within the tree and assist the beetle in killing the tree. The fungi give a blue-gray appearance to the sapwood.

Figure 5: Larva of MPB (actual size, 1/8 to 1/4 inch). They are found under the bark in tunnels.

Figure 6: Not all pitch tubes indicate successful attacks. Note the beetle trapped in this large pitch tube. If the majority of tubes look like this, the tree may have survived the current year's attack.

Infested Trees

- Once MPB infests a tree, nothing practical can be done to save that tree.
- Under epidemic or outbreak conditions, enough beetles can emerge from an infested tree to kill at least two, and possibly more, trees the following year.
- *Ips* and related beetles that emerge early in summer often are mistaken for mountain

Figure 7: Checking beneath the bark for MPB. This attack was successful (note tunnels and stain).

pine beetle, leading to early reports that "MPB is flying." Be sure to properly identify the beetles you find associated with your trees.

- Trees from which MPB have already emerged (look for numerous round, pitch-free exit holes in bark) do not need to be treated.
- The direction and spread rate of a beetle infestation is impossible to predict. However, attacked trees usually are adjacent to or near previously killed trees.

Figure 8: Characteristic tunnels (galleries) of mountain pine beetle made by the adults and larvae. The underbark area looks like this in late spring. Bluestained wood is caused by fungi the beetles introduce.

Control

Natural controls of mountain pine beetle include woodpeckers and insects such as clerid beetles that feed on adults and larvae under the bark. However, during outbreaks these natural controls often fail to prevent additional attacks.

Extreme cold temperatures also can reduce MPB populations. For winter mortality to be a significant factor, a severe freeze is necessary while the insect is in its most vulnerable stage; i.e., in the fall before the larvae have metabolized glycerols, or in late spring when the insect is molting into the pupal stage. For freezing temperatures to affect a large number of larvae during the middle of winter, temperatures of at least 30 degrees below zero (Fahrenheit) must be sustained for at least five days.

Figure 9: Cut tree killed by MPB, showing the characteristic blue-staining pattern.

Logs infested with MPB can be treated in various ways to kill developing beetles before they emerge as adults in summer.

One very effective way to kill larvae developing under the bark (though very labor intensive) is by peeling away the bark, either by hand or mechanically; this exposes the larvae to unfavorable conditions—the larvae will dehydrate, starve and eventually die. Logs my also be burned or scorched in a pile—preferably when there is snow on the ground (contact your local forester for assistance). They can also be buried under at least eight inches of soil, or chipped. Following beetle emergence, wood can be used without threat to other trees.

Figure 10: Large, uninfested pine being preventively sprayed. This protects high-value trees and should be done annually between April 1 and July 1.

Chemical control options for MPB larvae have been greatly limited in recent years. At present, there are no labeled pesticides for use on MPB.

Solar treatments may be appropriate in some areas of Colorado to reduce beetle populations in infested trees. For the treatment to be effective, the temperature under the bark much reach 110 degrees Fahrenheit or more. Such treatments can be performed with or without plastic. This method is also labor intensive; contact your local forester for more details on solar treatments.

Figure 11: The appearance of a forest thinned to help prevent MPB. This can also improve mountain views and reduce fire hazard.

Prevention

An important method of prevention involves forest management. In general, MPB prefers forests that are old and dense. Managing the forest by

creating diversity in age and structure with result in a healthy forest that will be more resilient and, thus, less vulnerable to MPB. Most mature Colorado forests have about twice as many trees per acre as those forests which are more resistent to MPB. Contact your local forester for more information on forest management practices.

Certain formulations of carbaryl (Sevin and others) permethrin (Astro, Dragnet and others), and bifenthrin (Onyx) are registered for use to prevent attacks on individual trees. These sprays are applied to living green trees in early summer to kill or deter attacking beetles. This preventive spray is generally quite effective through one MPB flight (one year). During epidemic conditions, the pressure from beetle populations may result in less satisfactory results due to several factors:

Always carefully read and follow all label precautions before applying insecticides for MPB prevention.

- Misidentification of healthy trees: Under dry conditions, trees may not produce pitch tubes when infested, therefore healthy trees are not as obvious. Time may need to be spent looking for sawdust around a tree's circumference and at the base of the tree.
- Timing of application: Trees sprayed after June may already have been attacked.
- Improper coverage: Spray may not have been applied high enough (up to where the trunk tapers to less that six inches), or spray coverage of the tree did not begin at ground level, or was not applied to the entire circumference of the tree (thus creating "windows" for beetle attack).
- Improper dosage/mixing of chemical: Low dosage—effective dosages for bark beetles are higher than the percent used for other insects. Mixture—the carbaryl and water were not fully mixed.
- Environmental conditions: Significant rain or moisture within two hours of application may wash off the insecticide. Very high temperatures may break down the chemical (this can occur when treated trees are near forest fires).
- Chemical shelf life/storage: Manufacturers guarantee stable chemical properties for at least two years after manufacturing date, if stored properly. Chemical properties of carbaryl may be altered if stored at very high or very low temperatures.
- Improper volume/formulation: Not enough spray is used to cover the bark area susceptible to beetle attack; lodgepole pine has "flaky" bark which may require more spray. The label on the chemical does not indicate bark beetle prevention (if using Sevin, SL or XLR is recommended).

Always carefully read and follow all label precautions before applying insecticides for MPB prevention.

Related Fact Sheets

5.543, *Western Spruce Budworms*

5.558, *Ips Beetles*

Contact the Colorado State Forest Service for additional information related to mountain pine beetles.

Colorado State Forest Service

This fact sheet was produced in cooperation with the Colorado State Forest Service.

[1]*D.A. Leatherman, Colorado State Forest Service entomologist (retired); I. Aguayo, Colorado State Forest Service entomologist; and T.M. Mehall, Colorado State Forest Service forester.*

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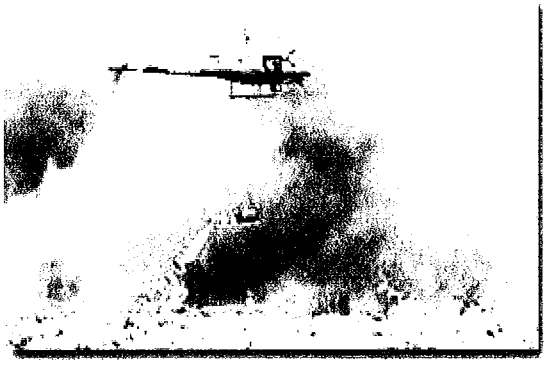
LOWER NORTH FORK PRESCRIBED BURN PLAN

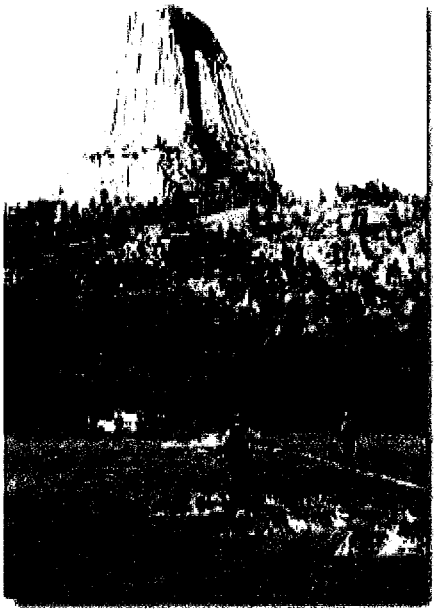
These documents have previously been released by the State

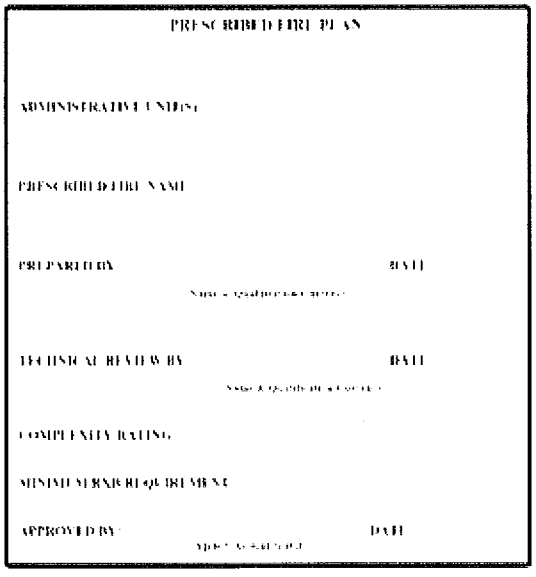
NWCG PRESCRIBED FIRE IMPLEMENTATION GUIDE

Interagency Prescribed Fire

Planning and Implementation Procedures Guide







PRESCRIBED FIRE PLAN

ADMINISTRATIVE UNIT(S)

PRESCRIBED FIRE NAME

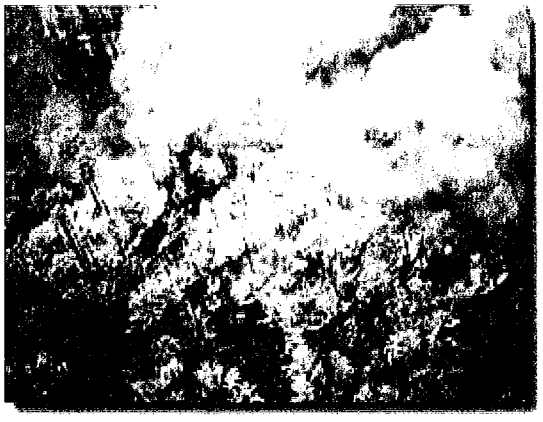
PREPARED BY DATE

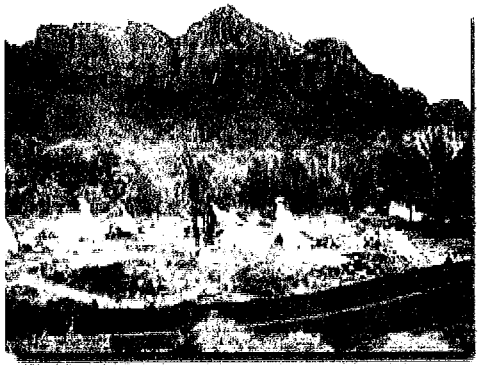
TECHNICAL REVIEW BY DATE

COMPLEXITY RATING

MINIMUM SERVICE REQUIREMENT

APPROVED BY DATE





July 2008

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Foreword

Interagency Prescribed Fire Planning and Implementation Procedures Guide (2008 Guide) provides standardized procedures, specifically associated with the planning and implementation of prescribed fire. These procedures meet all policy requirements described in the 2003 ***Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy.*** The 2008 Guide provides unified direction and guidance for prescribed fire planning and implementation for the Department of the Interior's Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), the National Park Service (NPS), the United States Fish and Wildlife Service (USFWS) and the United States Department of Agriculture Forest Service (USDA FS) as well as National Wildfire Coordinating Group (NWCG) partners the National Association of State Foresters (NASF) and the United States Fire Administration (USFA).

Prior to implementing Prescribed Fire under the standards in the 2008 Guide, local units must have ensured compliance with National Environmental Policy Act (NEPA), National Historical Preservation Act (NHPA) and Endangered Species Act (ESA) requirements.

This 2008 Guide meets requirements of Interagency Fire Directorate task to develop common language and unified direction or guidance for agency/bureau manuals, directive handbooks, and guidelines to complete final implementation of this policy.

Brian McManus, Fire Director (*NWCG Chair*)
Wildland Fire Management
U.S. Fish and Wildlife Service

Dan Smith (*NWCG Vice Chair*)
National Association of State Foresters

Lyle Carlile, Fire Director
Bureau of Indian Affairs

Timothy Murphy, Deputy Director
Office of Fire and Aviation
Bureau Land Management

Tom Nichols, Acting Division Chief
Division of Fire and Aviation Management
National Park Service

Hugh Wood
U.S. Fire Administration

Karyn Wood, Deputy Director
Fire and Aviation Management
U.S. Forest Service

Executive Summary

Fire is an essential ecological process in many fire dependent ecosystems. In large areas of the country, fire exclusion from these ecosystems has led to unhealthy forest, woodland and rangeland conditions. These areas are at risk of intense, severe wildfires that threaten communities and cause significant damage to key ecological components.

As one component of fire management, prescribed fire is used to alter, maintain, or restore vegetative communities; achieve desired resource conditions; and to protect life, property, and values that would be degraded and/or destroyed by wildfire.

Federal Prescribed Fire Programs are guided by the principles of the 1995 Federal Wildland Fire Management Policy and Program Review and the 2001 update. Collectively these principles establish that wildfire suppression, wildland fire use, and prescribed fire programs be implemented equally, consistently and concurrently, as a means to avoid fire risks. The policy emphasizes firefighter safety as a consideration in planning and a priority in operations (Wildland Fire Management Policy, June, 2003).

This guide supports the Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy. It provides unified direction and guidance for prescribed fire planning and implementation for the Department of the Interior's Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), the National Park Service (NPS), the United States Fish and Wildlife Service (USFWS) and the United States Department of Agriculture Forest Service (USDA FS).

This guide partially replaces the original Wildland and Prescribed Fire Management Policy Implementation Procedures and Reference Guide (USDI/ USDA 1998)[1] which established consistent agreement between agencies regarding federal policy direction related to prescribed fire planning and implementation.

[1] Other documents that replace this 1998 document are the *Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy,* June 20, 2003 and *Wildland Fire Use Implementation Procedures Reference Guide, May 2005*

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Introduction

Purpose

The purpose of this guide is to provide consistent interagency policy, establish common terms and definitions and identify planning and implementation processes for prescribed fire.

The guide describes what is **minimally** acceptable for prescribed fire planning and implementation. Agencies may choose to provide more restrictive standards and policy direction, but must adhere to these **minimums**.

Scope

This guide provides policy and direction to implement existing federal policy and has been developed with tribal, state, county, and local cooperators in mind. While some of these guidelines will not fit all non-federal cooperators, the intent is to include everyone by establishing a planning and implementation guide that might result in that outcome.

Prescribed Fire Program Goals

Interagency Prescribed Fire Program goals are to:

- Provide for firefighter and public safety as the first priority.
- Ensure that risk management is incorporated into all prescribed fire planning and implementation.
- Use prescribed fire in a safe, carefully planned, and cost-efficient manner.
- Reduce wildfire risk to communities, municipal watersheds and other values and to benefit, protect, maintain, sustain, and enhance natural and cultural resources.
- Utilize prescribed fire to restore natural ecological processes and functions, and to achieve land management objectives.

Authorities

All use of prescribed fire will be supported by a Land/Resource Management Plan (L/RMP) and/or Fire Management Plans (FMP). Prescribed fire projects can only be implemented through an approved Prescribed Fire Plan. Specific authorities exist for each agency to utilize prescribed fire (See Appendix A). All project decisions to use prescribed fire are subject to the agency's analysis, documentation, and disclosure requirements for complying with the National Environmental Policy Act (NEPA).

During prescribed fire planning and operations, all federal agencies will accept each other's standards for qualifications. The minimum qualifications standard is National Wildland Fire Coordinating Group (NWCG) Wildland and Prescribed Fire Qualifications System Guide, 2000 (PMS 310-1). State, local cooperators and contractors working on federal agency prescribed fires must meet the NWCG PMS 310-1 standards unless local agreements or contracts specify otherwise.

The main reference glossary for this guide is the NWCG glossary, which is updated periodically: http://www.nwcg.gov/.

This guide is not intended to address interagency business rules. Reference individual agency's business rules for direction.

Prescribed Fire Planning Process

Common planning documents to ensure quality prescribed fire plans include:

Land/Resource Management Plan (L/RMP)

Overall direction is provided to the Wildland Fire Management Program by Land/Resource Management Plans (L/RMP). These plans serve as the document to initiate, analyze, and provide the basis for using prescribed fire to meet resource management objectives.

Fire Management Plan (FMP)

All burnable acres will be covered by a Fire Management Plan (FMP). The FMP is the cornerstone plan for managing a Wildland Fire Management Program and should flow directly from the L/RMP. FMPs may be developed for a Fire Planning Unit (FPU) that crosses jurisdictional boundaries. Where the Wildland Fire Management Program crosses jurisdictional boundaries, or where

program coordination is essential, the FMP will require interagency coordination. Most FMPs are anticipated to fall into this category.

National Environmental Policy Act (NEPA)

Resource and prescribed fire objectives for specific prescribed fire projects are derived from the NEPA analysis. **The entire prescribed fire project area must be analyzed under NEPA.** NEPA documents that identify and analyze the effects of using or not using prescribed fire treatment projects may include Environmental Impact Statements (EIS), Environmental Assessments (EA), and Categorical Exclusion (CE).

Other authorities that may be utilized to guide analysis and determination of NEPA compliance are Healthy Forest Restoration Act (HFRA), Healthy Forest Initiative (HFI), and the Tribal Forest Protection Act (TFPA).

Prescribed fire planning and related NEPA analysis should always occur at the largest possible spatial and temporal scales.

Implementation Organization and Qualifications

During prescribed fire planning and operations, all federal agencies will accept each other's standards for qualifications. The minimum qualifications standard is National Wildland Fire Coordinating Group (NWCG) Wildland and Prescribed Fire Qualifications System Guide, (PMS 310-1). State, local cooperators and contractors working on federal agency prescribed fires must meet the NWCG PMS 310-1 standards unless local agreements specify otherwise. No less than the organization described in the approved Prescribed Fire Plan may be used for implementation. The complexity of each prescribed fire or phase of fire(s) determines the organization(s) needed to safely achieve the objectives specified in the Prescribed Fire Plan.

Minimum Supervisory Qualifications determined by prescribed fire complexity:

Table 1. Qualifications requirements related to Prescribed Fire Complexity.

	Complexity		
Position	**High**	**Moderate-Low**	**Low**
RXM1	Optional	Optional	Optional
RXM2	Not Allowed	Optional	Optional
RXB1	Required	Optional	Optional
RXB2	Not Allowed	Required	Optional
RXB3	Not Allowed	Not Allowed	Required
FIRB	Optional	Optional	Optional

Holding Specialist: Holding functions will be managed by personnel qualified at the appropriate ICS wildland fire operations position as required by complexity, assigned resources and operational span of control. For some projects, there may be no holding requirements or the holding duties are assumed by the Burn Boss.

High, Moderate, and Low complexity prescribed fires are determined through the required NWCG Prescribed Fire Complexity Rating System Guide.

Prescribed Fire Burn Boss Type 3 (RXB3):

An RXB3 will only be allowed to implement low complexity prescribed fires where the final complexity is rated low.

The requirements for Prescribed Fire Burn Boss Type 3 are:

Table 2: Requirements for Prescribed Fire Burn Boss Type 3

Training:	Required: S-290 Intermediate Wildland Fire Behavior Suggested: S-234 Ignition Operations
Prerequisite Experience:	Incident Commander, Type 5 **OR** Advanced Firefighter/Squad Boss **AND** Satisfactory position performance as a Prescribed Fire Burn Boss Type 3
Physical Fitness:	Moderate
Other Position Assignments that will Maintain Currency:	Prescribed Fire Burn Boss Type 2 Prescribed Fire Burn Boss Type 1 Fire Use Manager Type 1 Fire Use Manager Type 2 Prescribed Fire Manager Type 1 Prescribed Fire Manager Type 2

Responsibilities

Prior to prescribed fire implementation, thorough planning and review processes must be conducted. All prescribed fire actions must be developed from resource/fire management objectives carried forward from FMP's and/or L/RMP's. A specific implementation plan for each prescribed fire must be completed, reviewed, and approved before ignition can begin.

The Agency Administrator has final approval authority for all Prescribed Fire Plans, unless special circumstances warrant higher review and concurrence (such as may occur during higher Preparedness Levels or for extremely large, complex projects). Although the Agency Administrator has final approval authority for the Prescribed Fire Plan and the Agency Administrator "GO/NO-GO" checklist, the Prescribed Fire Burn Boss has the responsibility to make the on-site tactical "GO/NO-GO" decision. The Prescribed Fire Burn Boss ensures that all prescription, staffing, equipment, and other plan specifications are met before, during, and after the prescribed fire.

Every Prescribed Fire Plan must receive a technical review. The Technical Reviewer and Prescribed Fire Plan Preparer must be qualified or have been previously qualified as a Prescribed Fire Burn Boss at an experience level equal to or higher than the complexity being reviewed. Either **the Prescribed Fire Plan Preparer or Technical Reviewer must be currently qualified, less physical fitness requirement.**

Only a RXB1 can review plans at high complexity. An RXB2 can review plans of moderate to low complexity. An RXB3 is allowed to function as a Prescribed Fire Plan Preparer for a low complexity plan, but not a Technical Reviewer.

Agency or individual unit policy may dictate additional reviews. Interagency Prescribed Fire Plans require approval from all appropriate Agency Administrators and a technical review. Listed below are the prescribed fire and implementation position roles and responsibilities:

Agency Administrator

For the purposes of this document, the Agency Administrator is defined as the Line Officer (or designee) of the agency or jurisdiction that has responsibility for the prescribed fire. These usually include the: NPS Park Superintendent, BIA Agency Superintendent, USFS Forest Supervisor/District Ranger, BLM District/Field Office Manager, FWS Project Leader and/or Refuge Manager, State Forest Officer, and/or Fire Chief.

The Agency Administrator is responsible to:

1. Approve Prescribed Fire Plans. When approving a plan, understand the risks associated with it. Ensure that the plan has been reviewed and recommended for approval by the Technical Reviewer who was not the primary preparer of the plan.
2. Ensure that only trained and qualified personnel participate in the implementation portion of the prescribed fire.
3. Ensure that projects are monitored, evaluated, and documented in the project file.
4. Sign, date, and provide an expiration date for the approval to burn on the Agency Administrator GO/NO-GO Checklist (Reference Burn Plan Template, Appendix B).
5. Understand and approve the Complexity Analysis (PMS 424).
6. Ensure that all prescribed fires are conducted in accordance with the approved implementation plan and established standards and guidelines.
7. Ensure that periodic reviews and inspections of the Prescribed Fire Program are completed.
8. Determine if and when the Agency Administrator is to be notified that contingency actions are being taken.
9. Report all wildfires resulting from prescribed fires through the chain of command.

10. Declare a prescribed fire a wildfire (if necessary and if responsibility is assigned in the plan).
11. Ensure that prescribed fires declared as wildfires are reviewed according to established guidelines.
12. Ensure that prescribed fires which receive a National Ambient Air Quality Standards (NAAQS) Notice of Violation (NOV) are reviewed according to established guidelines

Technical Reviewer

The Technical Reviewer is responsible for reviewing each Prescribed Fire Plan element for content as well as evaluating the risk and Complexity Analysis to ensure that the stated goals and objectives can be safely and successfully achieved when properly implemented. The Technical Reviewer shall be qualified or previously qualified as a Burn Boss at or above the level of project complexity. At a minimum, NWCG qualifications will be accepted. The Technical Reviewer should have local knowledge of the area, experience burning in similar fuel types, and/or conduct an on-site review. **The Technical Reviewer must be someone other than the primary preparer of the plan.** An off-unit technical review is encouraged to provide an additional independent perspective. It is acceptable for other specialists to review certain portions of the plan however; a primary Technical Reviewer must be designated as technical review signatory. For example, a fire behavior analyst may review the fire behavior calculations; the aviation manager may review the air operations plan; and/or a resource specialist may review impacts to their resource of interests. It is recommended that at least once every year, each unit should send a moderate or high complexity Prescribed Fire Plan off-unit for technical review.

The Technical Reviewer is responsible to:

1. Ensure that Prescribed Fire Plans meet agency policy and direction.
2. Ensure that the Complexity Analysis accurately represents the project, so the Agency Administrator understands the identified risks and the mitigating measures enacted. This may require on-site review in Wildland Urban Interface (WUI) or high complexity situations by the Technical Reviewer.
3. Check the prescription parameters against the fuel types to ensure that the project as planned has a reasonable chance of meeting the resource management objectives.
4. Ensure that the fire behavior calculations and/or prescription parameters are appropriate and within the acceptable range.
5. Ensure that the ignition, holding and contingency plans are consistent with the predicted fire behavior.
6. Complete and sign the Technical Review Checklist (See Burn Plan Template, Appendix B) and the Prescribed Fire Plan signature page.

Prescribed Fire Plan Preparer

For the purpose of this document, the Prescribed Fire Plan Preparer is defined as the individual responsible for the preparation of the Prescribed Fire Plan. Several people may be involved in the preparation of the Prescribed Fire Plan, but the Prescribed Fire Plan Preparer is responsible for the final plan content. The primary preparer of the Prescribed Fire Plan will sign the signature page.

The preparer is responsible to:

1. Prepare the Prescribed Fire Plan in accordance with this guide's policy and direction.
2. Coordinate with the resource management and/or technical specialists to ensure that the plan meets management and operational objectives.
3. Interact with the Technical Reviewer to ensure that all plan elements are adequately addressed.
4. Complete and sign the Complexity Analysis.

Prescribed Fire Burn Boss (RXB1/RXB2/RXB3)

The Prescribed Fire Burn Boss is responsible to the Agency Administrator, Prescribed Fire Manager, or FMO/local fire management

organization for implementing the Prescribed Fire Plan.

The Prescribed Fire Burn Boss is responsible to:

1. Review the Prescribed Fire Plan prior to implementation and ensure all required elements and objectives are addressed.
2. Inspect the burn unit to validate Prescribed Fire Plan elements including areas of special concern as well ensuring that holding/contingency plans adequately address expected fire behavior outside the unit(s).
3. Obtain current weather and smoke management forecasts, updates, and special advisories from a meteorologist.
4. Maintain communication with the Agency Administrator, Prescribed Fire Manager, or FMO/local fire management organization.
5. Ensure that the Agency Administrator GO/NO-GO Checklist is valid (See Burn Plan Template, Appendix B)
6. Take to the field those portions of the Prescribed Fire Plan necessary for completing the briefing and safe project implementation.
7. Complete and sign the Prescribed Fire GO/NO-GO Checklist (See Burn Plan Template, Appendix B).
8. Ensure availability of any contingency resources and management of those resources if deployed.
9. Ensure that all operations are conducted in a safe manner and in accordance with the approved plan and established standards and guidelines.
10. Verify qualifications of all assigned personnel. Conduct the personnel/safety briefing to ensure a safe operation.
11. Conduct the test fire and document the results.
12. Supervise assigned personnel and direct the ignition, holding and monitoring operations. The Prescribed Fire Burn Boss will be responsible for implementation including mop-up and patrol unless otherwise assigned to other qualified personnel.
13. Declare the prescribed fire out unless the responsibility for it is formally passed to another Prescribed Fire Burn Boss, Prescribed Fire Manager or the local fire management organization.
14. Determine when the prescribed fire is not within prescription parameters (both short and long term) or is not meeting objectives.
15. Declare a prescribed fire a wildfire (if necessary and if responsibility is assigned in the plan).
16. Manage the incident or oversee the transition to another Incident Commander if an escape occurs.
17. Ensure that reports are completed.
18. Coordinate with adjacent landowners, cooperators and permittees as designated in the Prescribed Fire Plan.

Fire Management Officer (FMO)/ Fire Program Manager

The Fire Management Officer (FMO)/Fire Program Manager is responsible to the Agency Administrator for planning, implementing and monitoring of the Prescribed Fire Program in accordance with policy and direction.

The FMO/Fire Program Manager is responsible to:

1. Ensure compliance with National, Regional, tribal and local fire policy and direction, as well as applicable state and local laws.
2. Ensure that Preparedness Level Restrictions are followed. At National Preparedness Levels Four and Five, prescribed fire implementation is restricted. See the National Interagency Mobilization Guide for details.
3. Ensure that both the Prescribed Fire Plan Preparer and the Technical Reviewer are qualified or qualified less currency at the level of complexity or higher.
4. Ensure that trained and qualified personnel are available to participate in the Prescribed Fire Program.
5. Assign the Prescribed Fire Burn Boss.
6. Ensure a Prescribed Fire Plan with written approval exists for each prescribed fire project.

7. Review the Prescribed Fire Plan to assess the impact of the project on the unit's workload; include the project in the unit's Annual Work Plan; assess the unit's ability to implement the project; and assess the need for additional implementation resources.
8. Ensure that all prescribed fires are conducted in accordance with the approved Prescribed Fire Plan and established standards and guidelines.
9. Declare a prescribed fire a wildfire (if necessary and if responsibility is assigned in the plan).
10. Act as liaison/coordinator to the Agency Administrator, Prescribed Fire Manager and/or Prescribed Fire Burn Boss, local dispatch office, other units, other agencies, air quality authorities, news media, transportation agencies, and safety officials.
11. Ensure that projects are reported through the local office and comply with national reporting guidelines.
12. Ensure that fuels management prescribed fire projects and interagency support actions are reported through the proper reporting systems.
13. Ensure that periodic reviews and inspections of the Prescribed Fire Program are completed.
14. Update Agency Administrator on the progress of the prescribed fire (as necessary).
15. Ensure that projects are monitored, evaluated and documented as a part of the project file.

Prescribed Fire Manager (RXM1/RXM2)

The Prescribed Fire Manager is responsible for implementing and coordinating assigned prescribed fire activities. A Prescribed Fire Manager may be assigned during periods when multiple simultaneous prescribed fires are being conducted; when multiple prescribed fires will be conducted within a short time frame; or where there is complex interagency involvement.

The Prescribed Fire Manager is responsible to:

1. Review Prescribed Fire Plans prior to implementation.
2. Monitor all prescribed fire operations.
3. Ensure that all operations are conducted in a safe manner and in accordance with the approved plan(s) and established standards and guidelines.
4. Act as coordinator/liaison between the burn organization(s) and other offices, agencies, air quality authorities, news media, transportation agencies, safety officials, and interested public.
5. Declare a prescribed fire a wildfire (if necessary and if responsibility is assigned in the plan).
6. Obtain and interpret long-term weather information.
7. Brief the Burn Bosses and direct operational assignments according to policies, priorities and standards.
8. Set priorities for allocation of resources.
9. Ensure the completion of all required documentation including the evaluation and documentation of accomplishments, fire behavior and fire effects, operation procedures, and cost summaries.

Firing Boss (FIRB)

The Firing Boss reports to the Prescribed Fire Burn Boss and is responsible for supervising and directing ground and/or aerial ignition operations according to established standards in the Prescribed Fire Plan.

The Firing Boss is responsible to:

1. Review the Prescribed Fire Plan and the burn unit prior to implementation.
2. Brief personnel on project objectives and ignition operations.
3. Complete the test fire according to the ignition plan at the direction of the Prescribed Fire Burn Boss.
4. Conduct ignition operations in a safe manner according to the ignition plan.
5. Identify the impacts of ignition on the control and desired fire effects.
6. Coordinate ignition operations with the Holding Specialist.

Firing Boss is not a mandatory position for any prescribed fire. Ignition operations may be managed by personnel qualified at the appropriate Incident Command System (ICS) wildland fire operations standard and as required by the prescribed fire complexity, assigned resources, and operational span of control.

Holding Specialist

The supervisory position in charge of the holding forces reports to the Prescribed Fire Burn Boss. There is no specific NWCG approved prescribed fire position for this function. This position is assigned by name and title using PMS 310-1 mnemonics. Holding functions will be managed by personnel qualified at the appropriate Incident Command System (ICS) wildland fire operations standard and as required by the prescribed fire complexity, assigned resources, and operational span of control.

The Holding Specialist is responsible to:

1. Review the Prescribed Fire Plan and the burn unit prior to implementation.
2. Brief holding personnel on project objectives and holding operations.
3. Conduct holding operations in a safe manner according to the holding plan.
4. Coordinate holding operations with the Firing Boss.
5. Confine the fire to a predetermined area, mop up, and patrol.
6. Maintain communication with Burn Boss on holding progress and/or problems.

For some prescribed fires, there may be no holding requirements or the holding duties are assumed by the Prescribed Fire Burn Boss.

Fire Effects Monitor (FEMO)

The Fire Effects Monitor (FEMO) is responsible for collecting the onsite weather, fire behavior, and fire effects information needed to assess whether the fire is achieving established resource management objectives.

The FEMO is responsible to:

1. Review the monitoring plan prior to implementation.
2. Monitor, obtain, and record weather data.
3. Monitor and record fire behavior data throughout the burn operations.
4. Recon the burn unit/area assigned.
5. Plot the burn area and perimeter on a map.
6. Monitor and record smoke management information.
7. Monitor first order fire effects.
8. Provide monitoring summary of the fire.
9. Provide fire behavior and weather information to burn personnel as appropriate.

Helitorch Manager (HTMG)

The Helitorch Manager is responsible to manage the helitorch operation, supervise the mixing operation, and provide technical assistance to the Prescribed Fire Burn Boss/Firing Boss (FIRB). The HTMG may also serve as Helicopter Manager and Helitorch Manager or Helicopter Parking Tender (but not both).

Plastic Sphere Dispenser Operator (PLDO)

The Plastic Sphere Dispenser Operator (PLDO) is responsible for the preparation, operation, maintenance, and care of the dispenser. The PLDO reports to the Firing Boss (FIRB).

Helitorch Mixmaster (HTMM)

The Helitorch Mixmaster (HTMM) is responsible for supervising the mixing/filling operations. The HTMM may also serve as Helitorch Manager or Helicopter Manager.

Resource Specialist or Resource Advisor (READ)

The Resource Specialist/READ is responsible for ensuring the prescribed fire project is planned and implemented in a manner supporting the unit's resource management goals and objectives. The Resource Specialist/READ is responsible to the Agency Administrator.

The Resource Specialist/READ is responsible to:

1. Ensure resource management representation in the preparation of the Prescribed Fire Plan.
2. Ensure a review of Prescribed Fire Plans is conducted before each plan is submitted for approval.
3. Evaluate the prescribed fire project in terms of meeting objectives.
4. Provide resource information and direction to the Prescribed Fire Burn Boss.
5. Present information at briefings on resources, priorities, and issues of concern.
6. Coordinate with adjacent landowners, cooperators and permittees as designated in Prescribed Fire plan or by Burn Boss.

Amendments

There may be a need to make amendments to the Prescribed Fire Plan. These are changes to the Prescribed Fire Plan that require Agency Administrator signature. When changes are necessary, plans must be amended to identify the affected sections; the reason for the change(s); and have the changes clearly identified. For amendments, the need for additional technical review will be determined and justified by the agency administrator.

Common reasons for amending the Prescribed Fire Plan may include:

- Changes to objectives.
- Changes to complexity.
- Changes to fire behavior prescription parameters.
- Changes to project area boundaries resulting in either an increase or decrease in area.
- Reduction in resource capabilities identified as required in the plan.
- Major changes to ignition methods including ground ignition to aerial ignition; aerial ignition to hand ignition; hand drip torch ignition to use of terra torch ignition (includes ATV mounted ignition devices); and/or hand ignition from roadways to hand ignition from boats or other watercraft.

To avoid having to amend the Prescribed Fire Plan, flexibility should be built into the plan that will allow for a range of adjustments during the prescribed fire. When building flexibility, the range of identified options must remain within the scope of the Complexity Analysis.

Examples of flexibility that can be built into a prescribed fire plan:

- The Prescribed Fire Plan may state that on burn day and subsequent days of the prescribed fire, a mix of the number and kinds of hand crews and engines may be modified as long as stated production capabilities are not compromised.
- As the prescribed fire progresses from ignition to holding to mop up and patrol, specified capabilities and/or types of resources may be adjusted. If these flexibilities are built into the Prescribed Fire Plan, there must be a clear statement as to the work capability requirements of the resources at the various stages of the prescribed fire.
- Minor changes in burn unit boundaries to facilitate holding and/or ignition, as long as the area in question has been in the NEPA document, requires no change in holding or ignition resources and is within the project boundaries.
- Additional resources may be assigned to the project without amending the burn plan if the addition of these resources does not change the complexity of the burn or require additional supervisory positions. These changes must be documented in the daily briefing.

Safety

The Federal Wildland Fire Policy states that firefighter and public safety is first priority. Prescribed Fire Plans and activities must reflect this commitment. Every person involved in a prescribed fire is responsible for identifying safety issues and concerns. It is the responsibility of each individual participating in prescribed fire activities to notify immediate supervisor of any possible misunderstanding of assigned tasks or safety concerns related to the assignment.

NWCG established Work/Rest Guidelines and span of control apply equally to wildland and prescribed fire operations. The management of crew, overhead, and support personnel rest to assure safe, productive fire operations is the responsibility of all supervisory fire management personnel (refer to *NWCG Interagency Incident Business Management Handbook*, PMS 902, NFES 3139).

Exposure to smoke during prescribed fire operations can be a significant safety concern. Research has shown that exposure to smoke on prescribed fires, especially in holding and ignition positions, often exceeds that on wildfire. At a minimum, smoke exposure must be addressed in a job hazard analysis or its equivalent and smoke management element. Public safety impacts from smoke should be addressed in the Smoke Management and Air Quality Element as well as the Public, Personnel Safety, Medical Element.

Transportation and use of any product containing chemicals (drip torch fuel, aviation gas, sphere dispensers, fusees, fuel thickener, etc.) must be in compliance with the Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard (29 CFR 1910.1200) and Department of Transportation Regulations (49 CFR Part 171), and agency specific guidance. Material Safety Data Sheets (MSDS) for hazardous materials used on projects should be consulted in developing the job hazard analysis.

The SAFENET form and process is designed for reporting and correcting unsafe situations and is applicable to prescribed fire applications.

The risk management process identified in the NWCG Incident Response Pocket Guide (IRPG, PMS 410-1) helps ensure that critical factors and risks associated with prescribed fire operations are considered during decision making. This process should be applied to all prescribed fire planning and operations.

Consider using a Safety Officer on high complexity prescribed fires and others where the complexity analysis shows the need or indicates a higher than normal hazard.

A qualified Safety Officer is defined as a currently qualified Safety Officer, at any Type level (Types 1, 2 or 3), as defined by the NWCG, *Wildland and Prescribed Fire Qualification System Guide* (PMS 310-1).

Prescribed Fire Plan

The Prescribed Fire Plan is the site-specific implementation document. It is a legal document that provides the Agency Administrator the information needed to approve the plan and the Prescribed Fire Burn Boss with all the information needed to implement the prescribed fire. Prescribed fire projects must be implemented in compliance with the written plan.

Prescribed Fire Plans will vary in their degree of detail. The size and complexity of the prescribed fire project will determine the level of detail required. The Prescribed Fire Plan Template (Appendix B) must be utilized. Each element must be addressed and then assembled in the sequence identified in the template. Should an element not apply to a specific prescribed fire plan, not applicable (N/A) may be utilized. Programmatic plans for multiple units under like conditions may be appropriate. Additional information may be added as appendices.

If an interagency mixed ownership Prescribed Fire Plan is being prepared, the development of all appropriate elements within the plan will be conducted in an interagency setting. For cooperative burns implemented by non-federal entities involving federal and non-federal lands, where only a small amount of federal lands will be treated, the local agency administrator has discretion to use either a federal or non-federal Prescribed Fire Plan. Interagency agreements and Memorandums of Understanding (MOU) and/or private land owner agreements are required to implement prescribed fire on multiple ownerships.

Listed below are the planning explanations of each individual element required as part of a complete Prescribed Fire Plan and implementation policy related to the element.

Element 1. Signature Page

The following information must be included on the signature page:

1. Administrative unit name.
2. Prescribed Fire Unit (burn unit)/Project name.
3. At a minimum, three dated signatures are required: a Prescribed Fire Plan Preparer, a Technical Reviewer, and an Agency Administrator. Additional signatures may be included as required by the individual unit.
4. Final determined complexity rating(s).
5. If the plan needs to be amended, the signed and dated amendments must be attached to the Prescribed Fire Plan (see Amendments, page 17).

Element 2. GO/NO-GO Checklists

Agency Administrator GO/NO-GO Checklist

The Agency Administrator Pre-Ignition Checklist (Burn Plan Template, Appendix B) is required to be completed. The Agency Administrator's Pre-Ignition Checklist and Approval evaluates whether compliance requirements, Prescribed Fire Plan's elements, and internal and external notification(s) have been completed and expresses the Agency Administrator's intent to implement the Prescribed Fire Plan. The checklist establishes the expiration date for the implementation of the Prescribed Fire Plan. If ignition of the prescribed fire is not initiated prior to expiration date determined by the Agency Administrator, a new approval is required. An 'acting' Agency Administrator may sign the Agency Administrator GO/NO-GO checklist if authority to do so has been delegated. If the Prescribed Fire Plan is amended, a review and re-validation of the Agency Administrator GO/NO-GO Checklist would be required and included in the Project File.

Prescribed Fire GO/NO-GO Checklist

Prior to all ignition operations, the assigned Prescribed Fire Burn Boss will complete and sign the Prescribed Fire GO/NO-GO Checklist (Burn Plan Template, Appendix B). This checklist is a minimum standard and agencies may elect to add questions and/or approval signatures. For each day of active ignition on a prescribed fire, a separate daily GO/NO-GO Checklist is required.

Element 3. Complexity Analysis

Risk management is a foundation for all prescribed fire activities. Risks and uncertainties relating to prescribed fire activities must be understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity. At a minimum, those risks from the Complexity Analysis that are rated high and cannot be mitigated will be identified with a discussion of the risks associated in the Summary Complexity Rating Rationale. This discussion will also be included in the Complexity Analysis Summary page (Appendix C of Prescribed Fire Plan Template).

The Prescribed Fire Complexity Rating must be completed utilizing the Prescribed Fire Complexity Rating System Guide.

The purpose of the complexity rating process is to provide:

- Assignment of a complexity rating of high, moderate, or low to the prescribed fire.
- Management and implementation personnel a relative ranking as to the overall complexity of a specific prescribed fire project.
- A process that can be used to identify Prescribed Fire Plan elements or characteristics that may pose special problems or concerns.
- A process that identifies mitigation activities needed to reduce the risk/hazard to the implementation personnel and public as well as mitigating potential resource damage.

A preliminary rating will be completed early in the Prescribed Fire Plan development stage. This will identify potential concerns that may be mitigated during the plan preparation process. Once the Prescribed Fire Plan is near completion, the final complexity rating is made. The final complexity rating will be used as a basis for determining prescribed fire organization, Prescribed Fire Burn Boss level, and mitigation measures.

The Summary Complexity Rating Rationale will clearly justify the summary rating for prescribed fire organization and Prescribed Fire Burn Boss level. It must also identify those risks from the Complexity Analysis that are rated high and cannot be mitigated and will provide a discussion of the risks associated. The Complexity Analysis must be signed by the Prescribed Fire Plan Preparer and the Agency Administrator and attached as an appendix to the Prescribed Fire Plan. The Complexity Analysis Summary will be attached to the Prescribed Fire Plan following the GO/NO-GO Checklists.

Separate prescriptions and/or burn organizations for different stages of implementation may result in multiple Complexity Analyses and ratings. For example, a plan may have separate prescriptions for spring and fall burning which may require different organizations and constitute the need for additional complexity analyses.

If a prescribed fire complexity changes which results in different Prescribed Fire Burn Boss qualifications, a separate complexity analysis is required. For example, for certain prescribed fires conducted over time, progressive or sequential actions may reduce complexity, organization and Prescribed Fire Burn Boss qualifications. (e.g. a large scale, high complexity prescribed fire has been black-lined, portions burned and operations suspended for a period of time then resumed to continue or finish the prescribed fire). In this case, a separate Complexity Analysis will be developed to reflect the reduced complexity rating and will be included in the appendix of the Prescribed Fire Plan.

Element 4. Description of the Prescribed Fire Area

A. Physical Description

This section of the plan will describe the physical features of the prescribed fire area.

- Location: Narrative description of the location of the prescribed fire project including a legal description, UTM and/or latitude/longitude (decimal degrees; NAD83 preferred), county, and state.

- Size: Area, in acres, of the prescribed fire project with a breakdown by prescribed fire unit and/or ownership if applicable.
- Topography: Identify the upper and lower range of elevation, slope(s) –maximum/minimum and average, and aspect(s) of the prescribed fire project.
- Project Boundary: **The project boundary defines that area where fire will be ignited and may be allowed to burn.** Describe the physical, natural and/or human made boundaries (including multiple units) of the prescribed fire project. This will be done through maps and may include narratives. The entire prescribed fire project area must be analyzed under NEPA.

B. Vegetation/Fuels Description

This is a description of current vegetation and fuels in the project area Identify any reference material used.

- Describe the structure and composition of the vegetation type(s) and fuel characteristics. This description may include natural or activity fuels, total fuel load (both live and dead) in tons/acre, dead fuel load by time-lag size classes, live fuel load (woody/herbaceous), fuel bed depth, and vertical and horizontal arrangement within the project boundary.
- Describe the percent of the unit composed of each vegetative type and the corresponding fuel model(s).
- Identify conditions (fuels, slope, and aspect) in and adjacent to boundaries that may be a potential threat for escaped fire.

C. Description of Unique Features and Resources:

List and discuss special features, hazards, regulations, issues, constraints, etc. Examples may include: fences to protect, power poles, historical/cultural sites, threatened and endangered species or habitat, etc.

D. Maps:

Maps will be developed and included in the Prescribed Fire Plan. At a minimum, the plan will include a vicinity and project map. The number of maps, map size and scale, legend and level of detail should be appropriate for the complexity of the project. All maps will include the standard mapping elements: title, name of preparer(s), date, north arrow, scale, and legend.

- Vicinity Map: Map scale will be such that the burn units can be located on the ground and in sufficient detail to guide implementation.
- Project Map(s): The project map(s) identify features in sufficient detail to guide and assist in operational implementation of the prescribed fire.

Element 5. Objectives

Describe in clear, concise statements the specific measurable resource and fire objectives for this prescribed fire. Objectives will be measurable and quantifiable so prescription elements can be developed to meet those objectives and the success of the project can be determined following implementation.

Element 6. Funding

Identify the funding source(s) and estimated cost(s) of the prescribed fire. Itemize by phase if desired.

Element 7. Prescription

Prescription is defined as the measurable criteria that define a range of conditions during which a prescribed fire may be ignited and held as a prescribed fire.

Parameters are quantitative variables expressed as a range that result in acceptable fire behavior and smoke management. The plan prescription will describe a range of low to high limits for the environmental (weather, topography, fuels, etc.) and fire behavior (flame lengths, rate of spread, spotting distance, etc.) parameters required to meet Prescribed Fire Plan objectives while meeting smoke management and control objectives.

In many cases, burning under the extremes of all prescriptive parameters would not meet or possibly exceed the desired prescribed fire behavior characteristics and are therefore out of prescription. Empirical evidence (historical evidence or researched data) and judgment may be utilized to identify or calibrate prescriptions. Weaknesses in modeling can be overridden, but must be justified with empirical evidence and/or verified actual fire behavior.

Separate prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (black lining, aerial ignition, etc). Separate prescriptions may result in multiple complexity ratings and burn organizations. For example, a separate prescription is needed for black-lining operations if conditions will be significantly different from the primary prescription or if the holding resources differ from those identified for ignition and holding phases. Separate prescriptions may result in the need to identify multiple levels of management, organizational structures, implementation measures, and pre-burn considerations.

If the prescription limits are exceeded, the Prescribed Fire Burn Boss must evaluate fire controllability and whether fire effects will meet objectives. The Prescribed Fire Burn Boss must take action to ensure objectives are being met, or take appropriate actions to maintain control of or secure the fire.

Holding and contingency plans must be developed with the consideration of the predicted fire behavior outside the project boundary(s). Fire behavior characteristics for fuel models within the maximum spotting distance and/or adjacent to the project boundaries must be considered and modeled. These predictions must be modeled using fire behavior model runs or empirical evidence of the hottest, driest, and windiest prescription limits identified in the Prescribed Fire Plan, along with the most extreme environmental conditions (slope, aspect) identified.

A short fire behavior narrative that summarizes the fire behavior identified in the prescription and discusses how it will achieve the desired treatment objectives may be included.

When used, fire behavior calculations must be developed using an appropriate fire behavior modeling program. Include modeling and/or empirical evidence documentation as an appendix or in the fire behavior narrative.

Element 8. Scheduling

Identify the general ignition time frame(s) (i.e. time of day, duration of ignition) or season(s) and note any dates when the project may not be conducted. For prescribed fires with multiple ignitions or burn days, estimate project duration.

At National Preparedness Levels Four and Five, see National Interagency Mobilization Guide for details.

Element 9. Pre-burn Considerations & Weather

Describe on and off-site actions to be conducted and considerations to be addressed prior to implementation. Examples include clearances; mitigation actions generated by the initial complexity analysis; line to be built; preparation of critical holding points; snags to be felled or protected; equipment to be pre-positioned; special features to be protected; warning signs to be placed; weather recording; fuels condition sampling; monitoring needs; responsibility; and timeframes.

Describe any fuel sampling and weather data that may need to be obtained (See Element 14: Test Fire). This data should be taken at the project site. If this is not possible, use the closest representative site.

The plan will include a list of organizations (including media) and individuals that are to be notified prior to ignition, with information necessary to make the contacts. Reasonable efforts will be made to notify adjacent land owners (or their agents) and other potentially

impacted publics. Attempts and/or actual notifications will be documented with date and method and placed in the Project File.

Identify in the burn plan the method and frequency for obtaining weather and smoke management forecast(s). Spot weather or local area forecasts are required prior to ignition, on all ignition days and any days the fire is actively spreading. A copy of the forecast will be included in the Project File. The Prescribed Fire Burn Boss or other person in charge of mop-up and patrol will also obtain and review the spot weather or area forecast to determine if mop up and patrol resources are adequate.

Element 10. Briefing

All assigned personnel must be briefed at the beginning of each operational period to ensure personnel safety considerations (including the job hazard analysis or other agency-specific risk analysis) and prescribed fire objectives and operations are clearly defined and understood. Briefing checklists are required to be included in the Prescribed Fire Plan and will include the following elements:

- Burn Organization and Assignments
- Burn Objectives and Prescription
- Description of the Prescribed Fire Area
- Expected Weather & Fire Behavior
- Communications
- Ignition Plan
- Holding Plan
- Contingency Plan and Assignments
- Wildfire Conversion
- Safety and Medical Plan
- If aerial ignition devices will be used, include an Aerial Ignition briefing.

The briefing checklist should list briefing topics only, not re-state what is listed in the Prescribed Fire Plan for that element.

The Prescribed Fire Burn Boss will ensure that any new personnel arriving to the prescribed fire receives a briefing prior to assignment.

An Incident Action Plan (IAP) is optional, it is recommended for large multi-day or high complexity prescribed fires.

Element 11. Organization & Equipment

The complexity of each prescribed fire determines the organization capabilities needed to safely achieve the objectives specified in the Prescribed Fire Plan. Specify the minimum required implementation organization to meet the capabilities (line production rates, etc.) by position, equipment, and the supplies needed for all phases of the prescribed fire until declared out. At a minimum, a Prescribed Fire Burn Boss will be assigned to every prescribed fire. Positions that may not be filled as collateral duty will be identified in the organization chart of the Prescribed Fire Plan.

Standard ICS fire management principles for span of control and length of assignments will be adhered to when developing burn implementation organization(s) and used in managing prescribed fires. On prescribed fires with large organizations, use the ICS organization and staffing commensurate with the level of complexity. Consider the use of a Prescribed Fire Manager in conducting multiple prescribed fires.

Before implementation (all phases) of the prescribed fire, documentation in the form of an organization chart must be completed. Any changes to the organization during implementation must be documented. Any changes that reduce capability or increase complexity will require an amendment. Different organizations may be identified for different phases of implementation (i.e. holding v. mop-up and patrol, different ignition operations, different prescriptions).

Multiple prescriptions for one Prescribed Fire Plan are permissible (Element 7). Multiple prescriptions may require identifying and developing multiple organizations.

The Prescribed Fire Burn Boss is responsible for implementation including mop-up and patrol until the responsibility is formally passed to a Prescribed Fire Burn Boss, Prescribed Fire Manager or the local fire management organization.

Element 12. Communication

Develop communications plan specific to the project's implementation to address safety and tactical resource management needs. Identify and assign command, tactical, and air operations frequencies as needed. Also include any required telephone numbers.

Element 13. Public & Personnel Safety, Medical

Describe provisions to be made for public and personnel safety. All personnel who are within the active burn area are required to wear personal protective equipment. Identify and analyze the safety hazards unique to the individual prescribed fire project and specify personnel safety and emergency procedures. Include safety hazards (including smoke exposure and impacts) and measures taken to reduce those hazards. Specify emergency medical procedures, evacuation methods, and emergency facilities to be used. A job hazard analysis or other agency-specific risk analysis is required for each prescribed fire.

Element 14. Test Fire

Provisions for a test fire are required and results must be recorded. The test fire must be ignited in a representative location and in an area that can be easily controlled. The purpose of the test fire is to verify that the prescribed fire behavior characteristics will meet management objectives and to verify predicted smoke dispersion. In many applications, analysis of the initial ignitions may provide adequate test fire results. On multiple-day projects, evaluation of current active fire behavior, in lieu of a test fire, may provide a comparative basis for continuing and must be documented. If in doubt however, initiate a separate test fire and evaluate results.

Prior to ignition of both the test fire and ignition operations, compare the Prescribed Fire Plan prescription elements, both individually and collectively, against local area or spot weather forecasts, other predicted conditions, and the actual conditions onsite (See element 9: Pre-Burn Considerations) to ensure that predicted fire behavior will take place and/or weather parameters will not change to the point of the burn going out of prescription.

Element 15. Ignition Plan

Describe planned ignition operations. Examples could include firing methods, devices, techniques, sequences, patterns, and ignition staffing for single or multiple unit operations. Maps showing proposed firing patterns may be included. If aerial ignition is planned, cover aviation operations, organization, and safety within the Prescribed Fire Plan, Aerial Ignition Plan, or in an agency specific Aviation Operating Plan (Refer to the Interagency Helicopter Operations Guide, {NFES #1885} and the Interagency Aerial Ignition Guide {NFES #1080}for more detailed information on this topic). Multiple prescriptions and ignition operations (blackline, primary, aerial, etc.) may require identifying and developing multiple ignition organizations.

Element 16. Holding Plan

Describe general procedures to be used for operations to maintain the fire within the project area and meet project objectives until the fire is declared out. This may include mop-up and/or patrol procedures. Describe critical holding points (if any) and mitigation actions. Critical holding points will be identified on the project map. Describe minimum capabilities needed for all phases of implementation (see Element 11: Organization and Equipment). If used, attach or reference modeling outputs or worksheets (i.e. Fireline Handbook production rates, BEHAVE, etc.) and/or documented empirical evidence to justify minimum holding resources required.

Different organizations may be identified for different phases of implementation (i.e. holding v. mop-up and patrol, different ignition operations, different prescriptions). Multiple prescriptions may require identifying multiple complexity ratings and developing multiple holding organizations.

If onsite resources are insufficient to meet the prescribed fire plan objectives, then the Burn Boss should implement the Contingency Plan or Wildfire Conversion.

Element 17. Contingency Plan

"...If the objectives are not being met the Contingency Plan, a required component of the Prescribed Fire Burn Plan, is implemented. If the Contingency Plan is successful at bringing the project back within the scope of the Prescribed Fire Burn Plan the project continues. If contingency objectives are not met the prescribed fire is converted to a wildfire and Extended Attack is undertaken."

Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy, June 20, 2003, page 12.

The contingency plan is the portion of the Prescribed Fire Plan that considers possible but unlikely events and the actions needed to mitigate those events.

Contingency planning is the determination of initial actions and additional resources needed if the prescribed fire is not meeting, exceeds, or threatens to exceed:

- Project or unit boundary
- Objectives
- Prescription parameters
- Minimum implementation organization
- Smoke management objectives
- Other Prescribed Fire Plan elements

Contingency resources are those resources or capabilities required to meet contingency actions. These resources may be on or off site as required by the Prescribed Fire Plan. For purposes of this element, the terms *capabilities* and *resources* are interchangeable.

The contingency plan will establish trigger points or limits that indicate when additional actions and/or resources are needed. If additional resources will not be needed to implement the contingency plan, document the rationale in this section.

Contingency planning may include the additional resources required, and the maximum acceptable response time for those resources. Resource needs should be based on fire behavior outputs tied to the hottest, driest, windiest fire behavior scenario as identified in Element 7: Prescription. Separate contingency plans may be necessary and appropriate to address seasonal differences, types of ignitions or phases of the burn implementation as described in the prescriptions and ignition and holding plans developed for the burn.

Verify and document availability of identified contingency resources and response time throughout each phase of the burn. If contingency resources availability falls below plan levels, actions must be taken to secure operations until identified resources are replaced.

The same contingency resource can be identified for multiple prescribed fire projects. When specific contingency resources are identified for more than one prescribed fire, the local fire management organization(s) must evaluate and document adequacy of all contingency resources within the area. This evaluation must consider:

- Local, current, and predicted fire danger
- Local and regional wildland fire activities.

Once a contingency resource is committed to a specific wildland fire action (wildfire, wildland fire use or prescribed fire), it can no longer be considered a contingency resource for another prescribed fire project and a suitable replacement contingency resource must be identified or the ignition secured.

The Agency Administrator will determine if and when they are to be notified that contingency actions are being taken.

If the contingency actions are successful at bringing the project back within the scope of the Prescribed Fire Plan, the project may continue. If contingency actions are not successful by the end of the next burning period, then the prescribed fire will be converted to a wildfire.

Element 18. Wildfire Conversion

The Prescribed Fire Plan will specify who has the authority to declare a wildfire. A prescribed fire must be declared a wildfire by those identified in the plan when that person(s) determines that the contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period. A prescribed fire must be declared a wildfire when

the fire has spread outside the project boundary, or is likely to do so, and cannot be contained by the end of the next burning period. A prescribed fire can be converted to a wildfire for reasons other than an escape.

Describe the actions to be taken when a prescribed fire is declared a wildfire. Description will include:

- Wildfire declaration (by whom)
- IC assignment
- Notifications

A prescribed fire declared a wildfire cannot be returned to prescribed fire status.

Element 19. Smoke Management & Air Quality

Describe how the project will comply with local community, County, State, Tribal, and Federal air quality regulations. Identify what permits, if any, need to be obtained. Identify smoke sensitive receptors including population centers, recreation areas, hospitals, airports, transportation corridors, schools, non-attainment areas, Class I areas, and restricted areas that may be impacted. Include modeling outputs and mitigation strategies and techniques to reduce the impacts of smoke production, if required by State Implementation Plans (SIPs) and/or State or local regulations. Reference the Smoke Management Guide for Prescribed and Wildland Fire for other smoke management planning suggestions and smoke management techniques for reducing or redistributing emissions.

Special considerations must be taken to address smoke when the project is in a non-attainment area for a National Ambient Air Quality Standards including insuring compliance with SIP/TIP provisions and addressing Conformity. Projects which will potentially impact Class I areas should address any efforts to minimize smoke impacts on visibility. Comply with all local, State, Tribal and Federal pre-burn and post-burn data reporting requirements.

If a Notice of Violation (NOV) is issued by an air quality regulatory agency for a prescribed fire, a formal review of the incident must be conducted, following the guidance provided under the 'Reviews' chapter. If an air quality regulatory agency notifies a land management agency that their prescribed fire may have contributed to an exceedance of a NAAQS then a review is highly recommended. Use of *Guidance for After Action Review of Smoke Impacts*, available at http://www.nifc.gov/smoke or other review approaches are recommended to the extent feasible in order meet information needs stipulated by the Final Rule on the Treatment of Data Influenced by Exceptional Events (40 CFR Parts 50 1nd 51).

Element 20. Monitoring

Prescribed fire monitoring is defined as the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective. Describe the monitoring that will be required to ensure that Prescribed Fire Plan objectives are met. For the prescribed fire, at a minimum specify the weather (forecast and observed), fire behavior and fuels information and smoke dispersal monitoring required during all phases of the project and the procedures for acquiring it, including who and when.

Element 21. Post-burn Activities

Describe the post-burn activities that must be completed. This may include post-burn report, safety mitigation measures, and rehabilitation needs including those as a result of pre-burn activities undertaken.

Appendices

Include all the required appendices.

A. Maps

B. Technical Review Checklist

C. Complexity Analysis

D. A job hazard analysis or other agency specific risk analysis (may be included here or in Project File)

E. Fire Behavior Modeling Documentation or Empirical Documentation

Project File

All prescribed fire Project Files will contain the following information. Agencies and/or administrative units may require additional information.

1. Prescribed Fire Plan (and amendments)
2. Monitoring data including weather, fire behavior, fire effects and smoke dispersal observations
3. Weather forecasts
4. Notifications
5. Documented prescribed fire organization(s)
6. Any written agreements related to implementation
7. Multiple day GO/NO-GO checklist(s), if applicable
8. Re-validation of the agency administrator GO/NO-GO checklist (if applicable)

Depending on the scope and complexity of the prescribed fire, optional information and/or further documentation that may be included in the Project File include:

1. After Action Review (see Chapter 8)
2. Incident Action Plans, Unit Logs
3. Press releases, etc
4. Implementation costs
5. Actual ignition patterns and sequences used
6. Appropriate smoke management information
7. Agency individual fire occurrence form
8. Detailed Post Burn Report
9. NEPA documentation
10. Permits
11. Reference documents that helped in development of the plan.

Reviews

After Action Review (AAR)

Each operational shift on a prescribed fire should have an informal After Action Review (AAR). Certain events or a culmination of events that may affect future prescribed fire implementation and/or policy should be submitted via the Roll-up documentation (Found at http://www.wildfirelessons.net). The questions to answer in conducting an AAR are:

1. What did we set out to do (what was planned)?
2. What actually happened?
3. Why did it happen that way?
4. What should be sustained? What can be improved?

Declared Wildfire Reviews

The Agency Administrator will be notified of a declared wildfire. The Agency Administrator is required to make the proper notifications. All prescribed fires declared a wildfire will have a review initiated by the appropriate level Agency Administrator. The level and scope of the review will be determined by agency policy.

The goal of the declared wildfire review process is to guide future program actions by minimizing future resource damage and/or preventing future escapes from occurring by gathering knowledge and insight for incorporation into future resource management and prescribed fire planning. The objectives of the review are to:

- Determine if the Prescribed Fire Plan was adequate for the project and complied with policy and guidance related to prescribe fire planning and implementation.
- Determine if the prescription, actions, and procedures set forth in the Prescribed Fire Plan were followed.
- Describe and document factual information pertaining to the review.
- Determine if overall policy, guidance, and procedures relating to prescribed fire operations are adequate.
- Determine the level of awareness and the understanding of the personnel involved, in regard to procedures and guidance.

At a minimum, the declared wildfire review report will include the following elements:

1. An analysis of seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.
2. An analysis of the actions taken leading up to the wildfire declaration for consistency with the Prescribed Fire Plan.
3. An analysis of the Prescribed Fire Plan for consistency with policy.
4. An analysis of the prescribed fire prescription and associated environmental parameters.
5. A review of the approving line officer's qualifications, experience, and involvement.
6. A review of the qualifications and experience of key personnel involved.
7. A summary of causal agents contributing to the wildfire declaration.

Document the incident, including all actions prior to and after the declaration. Set up a file that includes all pertinent information, i.e., the Prescribed Fire Plan; a chronology of events including the prescribed fire report; unit logs and individual statements; weather forecasts including any spot forecasts; weather information taken on site and Remote Automated Weather Station (RAWS) and National Fire Danger Rating System (NFDRS) data for the day of the escape from the nearest station(s); photos; and all other pertinent information.

An independent review team is recommended for conducting declared wildfire reviews. The number of individuals assigned to the team and their functional expertise should be commensurate with the scope and focus of the review. Interagency participation is highly recommended for all declared wildfire reviews.

Air Quality Notice of Violation (NOV) Reviews

This review would follow direction in "Declared Wildfire Reviews" that support understanding of the planning, the decisions made, and actions taken that contributed to the NOV. In addition, the elements below which are unique to smoke incidents affecting air quality must be addressed.

The review may also utilize the *Guidance for After-Action-Review of Smoke Impacts* found at the http://www.nifc.gov/smoke website. At a minimum the NOV review will include:

- An analysis of the smoke sensitive receptors identified in the prescribed fire plan, estimated smoke effects including modeling and any smoke monitoring observations and effects related to the burn project.
- An analysis of predicted vs. actual ambient air quality using best on-site fuels information available (e.g. fuel conditions, fire behavior, fuel consumption), emissions production (quantity and duration) and weather.
- If needed to determine causes of impacts, a comparison between pre-burn smoke dispersion modeling and post-burn modeling using best on-site information available.
- Assess the smoke management training of personnel, policies for smoke management, and performance of the smoke management elements of the Prescribed Fire Plan for the prescribed fire under review.
- Assess the smoke management practices used for the prescribed fire and the role of cumulative smoke impacts from other burning activities for how they affected the issuance of the NOV.

References

NWCG Glossary of Wildland Fire Terminology PMS 205

Additional definitions found in the NWCG glossary of Project Management Terms (http://www.nwcg.gov/teams/pmo/products/glossaries.htm)

National Fire & Aviation Executive Board, Federal Fire Policy Directives Task Group – Common Policy Language, November 19, 2004

Interagency Strategy for the Implementation of Federal Wildland Fire Management policy, September 7, 2004

Smoke Management Guide for Prescribed and Wildland Fire 2001 Edition, December 2001

Restoring Fire Adapted Ecosystems on federal Lands - A Cohesive Fuel Treatment Strategy for Protecting People and Sustaining Natural resources. August 2, 2002

10-Year Comprehensive Strategy Implementation Plan, May 2002

Prescribed Fire Complexity Rating System Guide PMS 424, January 2002

Review and Update of the 1995 Federal Wildland Fire Management Policy, January 2001.

Cerro Grande Prescribed Fire Investigative Report - National Park Service, May 18, 2000

Sawtooth Mountain Prescribed Fire Burnover Fatality - Bureau of Indian Affairs Fort Apache Agency, Arizona May 14, 2003

Lowden Ranch Prescribed Fire Review Final Report - Bureau of Land Management, July 22, 1999

Wildland and Prescribed Fire Qualifications System Guide PMS 310-1 January 2002

Appendix A: Laws and Authorities

Organic Administration Act of June 4, 1897 (16 U. S. C. 551

Weeks Law, Act of March 1, 1911 (16 U. S. C. 563)

National Park Service Act of 1916 as amended (67 Stat. 495; 16 U.S.C. 1 et seq.)

Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C. 594)

Clark-McNary Act of 1928 (45 Stat. 221; 16 U. S. C. 487)

McSweeney-McNary Act of 1928 (45 Stat. 221; 16 U.S.C. 487)

Economy Act of June 30, 1932 (47 Stat. 417; 31 U.S.C. 1535)

Taylor Grazing Act of June 28, 1934 (48 Stat. 1269; 43 U.S.C. 315)

Oregon and California Act of August 28, 1937 (50 Stat. 875; 43 U.S.C. 1181e)

Bankhead-Jones Farm Tenant Act of July 22, 1937 (7 U. S. C. 1010 - 1011)

Federal Property and Administrative Service Act of 1949 (40 U.S.C. 471; et seq.)

Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 U.S.C. 1856a)

Clean Air Act of July 14, 1955, as amended (42 U. S. C. 7401 et seq.)

Multiple-Use Sustained Yield Act of 1960 (16 U. S. C. 528)

Wilderness Act of 1964 (16 U. S. C. 1131 - 1132)

National Wildlife Refuge System Administration Act of 1966 as amended (80 Stat. 927; 16 U.S.C. 668dd through 668ee)

National Environmental Policy Act of 1969 (42 U. S. C. 4321)

Alaska Native Claims Settlement Act of 1971 (85 Stat. 688; 43 U.S.C. 1601)

Endangered Species Act of 1973 (16 U. S. C. 1531 - 1544)

Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121)

Federal Fire Prevention and Control Act of 1974 (88 Stat. 1535; 15 U.S.C. 2201)

National Forest Management Act of 1976 (16 U. S. C. 1600 et seq.)

Federal Land Policy and Management Act of 1976 (90 Stat. 2743)

Federal Grant and Cooperative Agreement Act of 1977 (P.L. 950224, as amended by P.L. 97-258, September 13, 1982 (96 Stat. 1003; 31 U.S.C. 6301 thru 6308)

Alaska National Interest Lands Conservation Act of 1980 (94 Stat. 2371)

Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837)

Wildfire Suppression Assistance Act of 1989 (P.L. 100-428, as amended by P.L. 101-11, April 7, 1989), 42 U. S. C. 1856

Indian Self-Determination and Education Assistance Act (PL 93-638) as amended

National Indian Forest Resources Management Act (P. L. 101-630 November 28, 1990)

Tribal Self-Governance Act of 1994 (P.L. 103-413)

Department of the Interior and Related Agencies Appropriations Act, Fiscal Year 1995 (P.L. 103-332)

National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57)

Federal Financial Assistance Management Act of 1999 (P.L. 106-107)

Healthy Forest Restoration Act of 2003 (P.L. 108-18, 117 Stat. 1887)

Tribal Forest Protection Act of 2004 (P.L. 108-287)

Department of the Interior, Departmental Manual; Part 620: Wildland Fire Management; Chapter 4: Fuels Management and Wildland-Urban Interface Community Assistance

Department of Agriculture, US Forest Service Manual; FSM 5100: Fire Management; Chapter 5140: Fire Use

National Historic Preservation Act (1966 as amended)

Appendix B: Prescribed Fire Plan Template

A standardized, reproducible template form for the Prescribed Fire Plan development process is included in this appendix. A standardized format is provided for the Prescribed Fire Plan in PDF. An electronic version editable in Word is also available. Users should prepare the plan using the electronic version.

PRESCRIBED FIRE PLAN

ADMINISTRATIVE UNIT(S): _____

PRESCRIBED FIRE NAME: _____

PREPARED BY: _____ **DATE:** _____

Name & Qualification/Currency

TECHNICAL REVIEW BY: _____ **DATE:** _____

Name & Qualification/Currency

COMPLEXITY RATING: _____

MINIMUM RXB REQUIREMENT: _____

APPROVED BY: _____ **DATE:** _____

Agency Administrator

ELEMENT 2: AGENCY ADMINISTRATOR GO/NO-GO PRE-IGNITION APPROVAL CHECKLIST

Instructions: The Agency Administrator's GO/NO-GO Pre-Ignition Approval is the intermediate planning review process (i.e. between the Prescribed Fire Complexity Rating System Guide and Go/No-Go Checklist) that should be completed before a prescribed fire can be implemented. The Agency Administrator's Go/No-Go Pre-Ignition Approval evaluates whether compliance requirements, Prescribed Fire Plan elements, and internal and external notifications have been or will be completed and expresses the Agency Administrator's intent to implement the Prescribed Fire Plan. If ignition of the prescribed fire is not initiated prior to expiration date determined by the Agency Administrator, a new approval will be required.

YES	NO	KEY ELEMENT QUESTIONS
		Is the Prescribed Fire Plan up to date? *Hints: amendments, seasonality.*
		Will all compliance requirements be completed? *Hints: cultural, threatened and endangered species, smoke management, NEPA.*
		Is risk management in place and the residual risk acceptable? *Hints: Prescribed Fire Complexity Rating Guide completed with rational and mitigation measures identified and documented?*
		Will all elements of the Prescribed Fire Plan be met? *Hints: Preparation work, mitigation, weather, organization, prescription, contingency resources*
		Will all internal and external notifications and media releases be completed? *Hints: Preparedness level restrictions*
		Will key agency staff be fully briefed and understand prescribed fire implementation?
		Are there any other extenuating circumstances that would preclude the successful implementation of the plan?
		Have you determined if and when you are to be notified that contingency actions are being taken? Will this be communicated to the Burn Boss?
		Other:

Recommended by: _____ Date: _____
FMO/Prescribed Fire Burn Boss

Approved by: _____ Date: _____
Agency Administrator

Approval expires (date): _____

ELEMENT 2: PRESCRIBED FIRE GO/NO-GO CHECKLIST

	YES	NO
A. Has the burn unit experienced unusual drought conditions or does it contain above normal fuel loadings which were not considered in the prescription development? If NO proceed with checklist below, if YES go to item B.		
B. Has the prescribed fire plan been reviewed and an amendment and technical review been completed; or has it been determined that no amendment is necessary? If YES to any, proceed with checklist below, if NO, STOP.		

YES	NO	QUESTIONS
		Are ALL pre-burn prescription parameters met?
		Are ALL smoke management specifications met?
		Has ALL required current and projected fire weather forecast been obtained and are they favorable?
		Are ALL planned operations personnel and equipment on-site, available, and operational?
		Has the availability of ALL contingency resources been checked and are they available?
		Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?
		Have all the pre-burn considerations identified in the Prescribed Fire Plan been completed or addressed?
		Have ALL the required notifications been made?
		Are ALL permits and clearances obtained?
		In your opinion, can the burn be carried out according to the Prescribed Fire Plan and will it meet the planned objective?

If all the questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results

_____ Burn Boss

_____ Date

ELEMENT 3 COMPLEXITY ANALYSIS SUMMARY

PRESCRIBED FIRE NAME			
ELEMENT	**RISK**	**POTENTIAL CONSEQUENCE**	**TECHNICAL DIFFICULTY**
1. Potential for escape			
2. The number and dependence of activities			
3. Off-site Values			
4 On-Site Values			
5. Fire Behavior			
6. Management organization			
7. Public and political interest			
8. Fire Treatment objectives			
9 Constraints			
10 Safety			
11. Ignition procedures/ methods			
12. Interagency coordination			
13. Project logistics			
14 Smoke management			

COMPLEXITY RATING SUMMARY	
	OVERALL RATING
RISK	
CONSEQUENCES	
TECHNICAL DIFFICULTY	
SUMMARY COMPLEXITY DETERMINATION	
RATIONALE:	

ELEMENT 4: DESCRIPTION OF PRESCRIBED FIRE AREA

A. Physical Description

1. Location:
2. Size:
3. Topography:
4. Project Boundary:

B. Vegetation/Fuels Description:

1. On-site fuels data
2. Adjacent fuels data

C. Description of Unique Features:

ELEMENT 5: OBJECTIVES

A. Objectives:

1. Resource objectives:
2. Prescribed fire objectives:

ELEMENT 6: FUNDING:

A. Cost:

B. Funding source:

ELEMENT 7: PRESCRIPTION

A. Environmental Prescription:

B. Fire Behavior Prescription:

ELEMENT 8: SCHEDULING

A. Ignition Time Frames/Season(s):

B. Projected Duration:

C. Constraints:

ELEMENT 9: PRE-BURN CONSIDERATIONS AND WEATHER

A. Considerations:

1. On Site:
2. Off Site

B. Method and Frequency for Obtaining Weather and Smoke Management Forecast(s):

C. Notifications:

ELEMENT 10: BRIEFING

Briefing Checklist:

- ☐ Burn Organization
- ☐ Prescribed Fire Objectives
- ☐ Description of Prescribed Fire Area
- ☐ Expected Weather & Fire Behavior
- ☐ Communications
- ☐ Ignition plan
- ☐ Holding Plan
- ☐ Contingency Plan

☐ Wildfire Conversion

☐ Safety and Medical Plan

☐ Aerial Ignition Briefing (if Required)

ELEMENT 11: ORGANIZATION AND EQUIPMENT

A. Positions:

B. Equipment:

C. Supplies:

ELEMENT 12: COMMUNICATION

A. Radio Frequencies

1. Command Frequency(s):
2. Tactical Frequency(s):
3. Air Operations Frequency(s):

B. Telephone Numbers:

ELEMENT 13: PUBLIC AND PERSONNEL SAFETY, MEDICAL

A. Safety Hazards:

B. Measures Taken to Reduce the Hazards:

C. Emergency Medical Procedures:

D. Emergency Evacuation Methods:

E. Emergency facilities:

ELEMENT 14 TEST FIRE

A. Planned location:

B. Test Fire Documentation:

1. Weather conditions On-Site:

2. Test Fire Results:

ELEMENT 15: IGNITION PLAN

A. Firing Methods (including Techniques, Sequences and Patterns):

B. Devices:

C. Ignition Staffing:

ELEMENT 16: HOLDING PLAN

A. General Procedures for Holding:

B. Critical Holding Points and Actions:

C. Minimum Organization or Capabilities Needed:

ELEMENT 17: CONTINGENCY PLAN

A. Trigger Points:

B. Actions Needed:

C. Additional Resources and Maximum Response Time(s):

ELEMENT 18: WILDFIRE CONVERSION

A. Wildfire Declared By:

B. IC Assignment:

C. Notifications:

D. Extended Attack Actions and Opportunities to Aid in Fire Suppression:

ELEMENT 19: SMOKE MANAGEMENT AND AIR QUALITY

A. Compliance:

B. Permits to be Obtained:

C. Smoke Sensitive Receptors:

D. Potential Impacted Areas:

E. Mitigation Strategies and Techniques to Reduce Smoke Impacts:

ELEMENT 20: MONITORING

A. Fuels Information Required and Procedures:

B. Weather Monitoring (Forecasted and Observed) Required and Procedures:

C. Fire Behavior Monitoring Required and Procedures:

D. Monitoring Required To Ensure That Prescribed Fire Plan Objectives Are Met:

E. Smoke Dispersal Monitoring Required and Procedures:

ELEMENT 21: POST-BURN ACTIVITIES

Post-Burn Activities That Must Be Completed:

A: MAPS

1. Vicinity Map:

2. Project Map:

B: TECHNICAL REVIEWER CHECKLIST

PRESCRIBED FIRE PLAN ELEMENTS:	S /U	COMMENTS
1. Signature page		
2. GO/NO-GO Checklists		
3. Complexity Analysis Summary		
4. Description of the Prescribed Fire Area		
5. Objectives		
6. Funding		
7. Prescription		
8. Scheduling		
9. Pre-burn Considerations and Weather		
10. Briefing		
11. Organization and Equipment		
12. Communication		
13. Public and Personnel Safety, Medical		
14. Test Fire		
15. Ignition Plan		
16. Holding Plan		
17. Contingency Plan		
18. Wildfire Conversion		
19. Smoke Management and Air Quality		
20. Monitoring		
21. Post-burn Activities		
Appendix A: Maps		
Appendix C: Complexity Analysis		
Appendix D: Agency specific job hazard analysis		
Appendix E: Fire Prediction Modeling Runs or Empirical Evidence		
Other		

S = Satisfactory **U = Unsatisfactory**

Recommended for Approval: _____ **Not Recommended for Approval:** _____

_____ _____ _____

Technical Reviewer Qualification and currency (Y/N) Date

☐ **Approval is recommended subject to the completion of all requirements listed in the comments section, or on the Prescribed Fire Plan.**

C: COMPLEXITY ANALYSIS

D: AGENCY SPECIFIC JOB HAZARD ANALYSIS

Congressional Research Service

Forest Fire/Wildfire Protection

Ross W. Gorte
Specialist in Natural Resources Policy

Kelsi Bracmort
Specialist in Agricultural Conservation and Natural Resources Policy

March 7, 2012

Congressional Research Service
7-5700
www.crs.gov
RL30755

CRS Report for Congress
Prepared for Members and Committees of Congress

Summary

Congress continues to face questions about forestry practices, funding levels, and the federal role in wildfire protection. Recent fire seasons have been, by most standards, among the worst in the past half century. National attention began to focus on wildfires when a prescribed burn in May 2000 escaped control and burned 239 homes in Los Alamos, NM. President Clinton responded by requesting a doubling of wildfire management funds, and Congress enacted much of this proposal in the FY2001 Interior appropriations act (P.L. 106-291). President Bush responded to the severe 2002 fires by proposing a Healthy Forests Initiative to reduce fuel loads by expediting review processes.

Many factors contribute to the threat of wildfire damages. Two major factors are the decline in forest and rangeland health and the expansion of residential areas into wildlands—the wildland-urban interface. Over the past century, aggressive wildfire suppression, as well as past grazing and logging practices, have altered many ecosystems, especially those where light, surface fires were frequent. Many areas now have unnaturally high fuel loads (e.g., dead trees and dense thickets) and an historically unnatural mix of plant species (e.g., exotic invaders).

Fuel treatments have been proposed to reduce the wildfire threats. Prescribed burning—setting fires under specified conditions—can reduce the fine fuels that spread wildfires, but can escape and become catastrophic wildfires, especially if fuel ladders (small trees and dense undergrowth) and wind spread the fire into the forest canopy. Commercial timber harvesting is often proposed, and can reduce heavy fuels and fuel ladders, but exacerbates the threat unless and until the slash (tree tops and limbs) is properly disposed of. Other mechanical treatments (e.g., precommercial thinning, pruning) can reduce fuel ladders, but also temporarily increase fuels on the ground. Treatments can often be more effective if combined (e.g., prescribed burning after thinning). However, some fuel treatments are very expensive, and the benefit of treatments for reducing wildfire threats depends on many factors.

It should also be recognized that, as long as biomass, drought, lightning, and high winds exist, catastrophic wildfires will occur. Only about 1% of wildfires become conflagrations, but which fires will "blow up" into crown wildfires is unpredictable. It seems likely that management practices and policies, including fuel treatments, affect the probability of such events. However, past experiences with wildfires are of limited value for building predictive models, and research on fire behavior under various circumstances is difficult, at best. Thus, predictive tools for fire protection and control are often based on expert opinion and anecdotes, rather than on research evidence.

Individuals who choose to build homes in the urban-wildland interface face some risk of loss from wildfires, but can take steps to protect their homes. Federal, state, and local governments can and do assist by protecting their own lands, by providing financial and technical assistance, and by providing relief after the fire.

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The spread of housing into forests and other wildlands,[1] combined with various ecosystem health problems, has substantially increased the risks to life and property from wildfire. Wildfires seem more common than in the 1960s and 1970s, with 2005, 2006, and 2007 being the most severe fire seasons since 1960.[2] National attention was focused on the problem by a fire that burned 239 houses in Los Alamos, NM, in May 2000. Issues for Congress include oversight of the agencies' fire management activities and other wildland management practices that have altered fuel loads over time; consideration of programs and processes for reducing fuel loads; and federal roles and responsibilities for wildfire protection and damages. Funding for wildfire protection programs is also a significant congressional issue, but is covered separately in CRS Report RL33990, *Federal Funding for Wildfire Control and Management*, by Ross W. Gorte and Kelsi Bracmort.

Many discussions of wildfire protection focus on the federal agencies that manage lands and receive funds to prepare for and control wildfires. The Forest Service (FS), in the Department of Agriculture, is the "big brother" among federal wildfire-fighting agencies. The FS is the oldest federal land management agency, created in 1905, with fire control as a principal purpose. The FS administers more land in the 48 coterminous states than any other federal agency, receives about two-thirds of federal fire funding, and created the symbol of fire prevention, Smokey Bear. The Department of the Interior (DOI) contains several land-managing agencies, including the Bureau of Land Management (BLM), National Park Service, Fish and Wildlife Service (FWS), and Bureau of Indian Affairs (BIA); DOI fire protection programs have been coordinated and funded through the BLM. Despite the substantial attention given to the FS and DOI agencies, the majority of wildlands are privately owned,[3] and states are responsible for fire protection for these lands, as well as for their own lands.

This report provides historical background on wildfires, and describes concerns about the *wildland-urban interface* and about forest and rangeland health.[4] The report discusses fuel management, fire control, and fire effects. The report then examines federal, state, and landowner roles and responsibilities in protecting lands and resources from wildfires, and concludes by discussing current issues for federal wildfire management.

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[1] Wildlands is a term commonly used for undeveloped areas—forests, grasslands, brush fields, wetlands, deserts, etc. It excludes agricultural lands and pastures, residential areas, and other, relatively intensively developed areas.

[2] National Interagency Fire Center, "Fire Information—Wildland Fire Statistics," available at http://www.nifc.gov/fire_info/fires_acres.htm. Fire season severity is commonly assessed by acres burned, but larger fires may not be "worse" if they burn less intensely, because their damages may be lower. However, fire intensity and damages are not measured for each wildfire, and thus cannot be used to gauge the severity of fire seasons. It is uncertain whether acreage burned might be a reasonable approximation of severity.

[3] In 2007, there were roughly 815 million acres of *private* forests and rangelands in the coterminous 48 states. (U.S. Dept. of Agriculture, Natural Resources Conservation Service, *Summary Report 2007 National Resources Inventory:* , December 2009, p. 6.) This is substantially more than the roughly 351 million acres of lands in those 48 states administered by the FS and DOI. (See CRS Report R40225, *Federal Land Management Agencies: Background on Land and Resources Management*, coordinated by Ross W. Gorte)

[4] See also CRS Report RS21880, *Wildfire Protection in the Wildland-Urban Interface*, by Ross W. Gorte and Kelsi Bracmort.

Historical Background

Wildfire has existed in North America for millennia. Many fires were started by lightning, although Native Americans also used fire for various purposes. Wildfires were a problem for early settlers. Major forest fires occurred in New England and the Lake States in the late 1800s, largely fueled by the tree tops and limbs (slash) left after extensive logging. One particularly devastating fire, the Peshtigo, is commonly cited as the worst wildfire in American history; it burned nearly 4 million acres, obliterated a town, and killed 1,500 people in Wisconsin in 1871. Large fires in cut-over areas and the subsequent downstream flooding were principal reasons for Congress authorizing the President in 1891 to establish forest reserves (now national forests).

Federal Fire Policy Evolution

The nascent FS focused strongly on halting wildfires in the national forests following several large fires that burned nearly 5 million acres in Montana and Idaho in 1910. The desire to control wildfires was founded on a belief that fast, aggressive control efforts were efficient, because fires that were stopped while small would not become the large, destructive conflagrations that are so expensive to control. In 1926, the agency developed its *10-acre policy*—that all wildfires should be controlled before they reached 10 acres in size—clearly aimed at keeping wildfires small. Then in 1935, the FS added its *10:00 a.m. policy*—that, for fires exceeding 10 acres, efforts should focus on control before the next burning period began (at 10:00 a.m.). These policies were seen as the most efficient and effective way to control large wildfires.[5]

In the 1970s, these aggressive FS fire control policies began to be questioned. Research had documented that, in some situations, wildfires brought ecological benefits to the burned areas—aiding regeneration of native flora, improving the habitat of native fauna, and reducing infestations of pests and of exotic and invasive species. In recognition of these benefits, the FS and the National Park Service initiated policies titled "prescribed natural fire," colloquially known as "let-burn" policies. Under these policies, fires burning within prescribed areas (such as in wilderness areas) would be monitored, rather than actively suppressed; if weather or other conditions changed or the wildfire threatened to escape the specified area, it would then be suppressed. These policies remained in effect until the 1988 wildfires in the area around Yellowstone National Park. Because at least one of the major fires in Yellowstone began as a prescribed natural fire, the agencies temporarily ended the use of the policy. Today, unplanned fire ignitions (by lightning or humans) that occur within site and weather conditions identified in fire management plans are called wildland fires for resource benefit, and are part of the agencies' fire use programs.[6]

Aggressive fire control policies were abandoned for federal wildfire planning in the late 1970s. The Office of Management and Budget challenged excessive proposed budget increases based on the above-mentioned policies and a subsequent study suggested that the fire control policies would increase expenditures beyond efficient levels.[7]

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[5] See Julie K. Gorte and Ross W. Gorte, *Application of Economic Techniques to Fire Management—A Status Review and Evaluation*, USDA Forest Service, Intermountain Research Station, Gen. Tech. Rept. INT-53, Ogden, UT, June 1979.

[6] U.S. Dept. of the Interior and Dept. of Agriculture, *Federal Wildland Fire Management Policy & Program Review: Final Report*, Washington, DC, Dec. 18, 1995. Hereafter referred to as *1995 Federal Wildland Fire Review*.

[7] Stephen J. Pyne, *Fire In America: A Cultural History of Wildland and Rural Fire*, Princeton Univ. Press, Princeton, (continued...)

Concerns about unnatural fuel loads were raised in the 1990s. Following the 1988 fires in Yellowstone, Congress established the National Commission on Wildfire Disasters, whose 1994 report described a situation of dangerously high fuel accumulations.[8] This report was issued shortly after a major conference examining the health of forest ecosystems in the intermountain West.[9] The summer of 1994 was another severe fire season, leading to more calls for action to prevent future severe fire seasons. The Clinton Administration developed a Western Forest Health Initiative,[10] and organized a review of federal fire policy, because of concerns that federal firefighting resources had been diverted to protecting nearby private residences and communities at a cost to federal lands and resources.[11] In December 1995, the agencies released the new *Federal Wildland Fire Management Policy & Program Review: Final Report*, which altered federal fire policy from priority for private property to equal priority for private property and federal resources, based on values at risk. (Protecting human life remains the first priority in firefighting.)

Concerns about historically unnatural fuel loads and their threat to communities persist. In 1999, the General Accounting Office (GAO; now the Government Accountability Office) issued two reports recommending a cohesive wildfire protection strategy for the FS and a combined strategy for the FS and BLM to address certain firefighting weaknesses.[12] The Clinton Administration developed a program, called the National Fire Plan, and supplemental budget request to respond to the severe 2000 fire season. In the FY2001 Interior appropriations act (P.L. 106-291), Congress enacted the additional funding, and other requirements for the agencies.

During the severe 2002 fire season, the Bush Administration developed a proposal, called the Healthy Forests Initiative, to expedite fuel reduction projects in priority areas. The various elements of the proposal were debated, but none were enacted during the 107th Congress.[13] Some elements have been addressed through regulatory changes, while others were addressed in legislation in the 108th Congress, especially the Healthy Forests Restoration Act of 2003 (P.L. 108-148).[14]

(...continued)

NJ, 1982, pp. 293-294.

[8] R. Neil Sampson, chair, *Report of the National Commission on Wildfire Disasters*, Washington, DC, 1994.

[9] See R. Neil Sampson and David L. Adams, eds., *Assessing Forest Ecosystem Health in the Inland West: Papers from the American Forests Workshop, November 14th-20th, 1993, Sun Valley, Idaho*, Food Products Press, New York, NY, 1994. Hereafter cited as *Assessing Forest Ecosystem Health in the Inland West*.

[10] U.S. Dept. of Agriculture, Forest Service, State and Private Forestry, *Western Forest Health Initiative*, Washington, DC, October 31, 1994.

[11] Bob Armstrong, Assistant Secretary for Lands and Minerals Management, U.S. Dept. of the Interior, "Statement," *Fire Policy and Related Forest Health Issues*, joint oversight hearing, House Committees on Resources and on Agriculture, October 4, 1994, U.S. GPO, Washington, DC, 1995, p. 9. Serials No. 103-119 (Committee on Resources) and 103-82 (Committee on Agriculture).

[12] U.S. General Accounting Office, *Western National Forests: A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats*, GAO/RCED-99-65, Washington, DC, April 1999; and *Federal Wildfire Activities: Current Strategy and Issues Needing Attention*, GAO/RCED-99-233, Washington, DC, August 1999. Hereafter cited as GAO, *Cohesive Strategy Needed*. GAO has released numerous reports about wildland fire management, including updates to the aforementioned reports: GAO, *Update on Federal Agency Efforts to Develop a Cohesive Strategy to Address Wildland Fire Threats*, GAO-06-671R (May 2006); and GAO, *Important Progress Has Been Made, but Challenges Remain to Completing a Cohesive Strategy*, GAO-05-147 (January 2005).

[13] See out-of-print CRS Report RL31679, *Wildfire Protection: Legislation in the 107th Congress and Issues in the 108th Congress*, by Ross W. Gorte (available from the author).

[14] For information on recent regulatory and legislative developments on wildfire protection, see CRS Report RL33792, (continued...)

Efficacy of Fire Protection

FS fire control programs appeared to be quite successful until the 1980s. For example, fewer than 600,000 acres of FS protected land[15] burned each year from 1935 through 1986, after *averaging* 1.2 million acres burned annually during the 1910s. As shown in **Table 1**, the average annual acreage of FS protected land burned declined nearly every decade until the 1970s, but rose substantially in the 1980s and 1990s, concurrent with the shift from fire control to fire management. Furthermore, the acreage of FS protected land burned did not exceed 1 million acres annually between 1920 and 1986; since then, more than 1 million acres of FS protected land have burned in each of at least six years—1987, 1988, 1994, 1996, 2000, and 2002. (Statistics on acreage burned by federal agency of jurisdiction have not been available from the National Interagency Fire Center since 2002.) In contrast, the acreage burned of wildlands protected by state or other federal agencies has declined substantially since the 1930s, and has continued at a relatively modest level for the past 40 years, as shown in **Table 1**.

Table 1. Average Annual Acreage Burned by Decade Since 1910

(in acres burned annually)

Decade	Average annual acres burned, FS Protected Lands	Average annual acres burned, Other Lands	Average annual acres burned, Total
1910-1919	1,243,572 acres	not available	not available
1920-1929	616,834 acres	25,387,733 acres	26,004,567 acres
1930-1939	343,013 acres	38,800,182 acres	39,243,195 acres
1940-1949	269,644 acres	22,650,254 acres	22,919,898 acres
1950-1959	261,264 acres	9,154,532 acres	9,415,796 acres
1960-1969	196,221 acres	4,375,034 acres	4,571,255 acres
1970-1979	242,962 acres	2,951,459 acres	3,194,421 acres
1980-1989	488,023 acres	2,494,812 acres	2,982,835 acres
1990-1999	554,577 acres	2,768,981 acres	3,323,558 acres
2000-2009	1,477,463 acres	5,453,461 acres	6,931,327 acres
2010-2011	1,024,834 acres	5,042,212 acres	6,067,046 acres

Sources: U.S. Dept. of Agriculture, *Forest Service Historical Fire Statistics*, unpublished table, Washington, DC; National Interagency Fire Center, *Total Wildland Fire and Acres*, at http://www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html; and National Interagency Coordination Center, *NICC Wildland Fire Summary and Statistics Annual Reports for 2011 and* 2009, http://www.predictiveservices.nifc.gov/intelligence/2011_statssumm/Annual_Report_2011.pdf, with FS acres burned deducted.

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Federal Lands Managed by the Bureau of Land Management (BLM) and the Forest Service (FS): Issues for the 110th Congress, by Ross W. Gorte et al.

[15] Under several cooperative agreements, developed to improve protection efficiency, the Forest Service protects some non-federal lands, while other organizations protect some national forest lands; the total acres protected by the Forest Service roughly equals the acres in the National Forest System.

There are still occasional severe fire seasons, with more than 6 million acres burned 10 times since 1960 and 6 of those in the past decade—1963, 1969, 1996, 2000, 2002, 2004, 2005, 2006, 2007, and 2011.[16] Nonetheless, even the worst of these fire seasons (2006) saw only slightly more acres burned than the annual average in the 1950s.

It should also be recognized that only a small fraction of wildfires become catastrophic. In one case study, for 1986-1995 in Colorado, less than 1% of all wildfire ignitions grew to more than 1,000 acres, but these larger fires accounted for nearly 79% of the acreage burned.[17] More than 95% of the fires were less than 50 acres, and these 12,608 fires accounted for only 3% of acreage burned. Thus, a small percentage of the fires account for the vast majority of the acres burned, and probably an even larger share of the damages and control costs, since the large fires (conflagrations) burn more intensely than smaller fires and suppression costs (per acre) are higher for conflagrations because of overhead management costs and the substantial cost of aircraft used in fighting conflagrations.

Concerns and Problems

Wildfires stir a primeval fear and fascination in most of us. Many have long been concerned about the loss of valuable timber to fire and about the effects of fire on soils, watersheds, water quality, and wildlife. In addition, the loss of houses and other structures adds to wildfire damages. Historically, wildfires were considered a major threat to people and houses primarily in the brushy hillsides of southern California. However, people have increasingly been building their houses and subdivisions in forests and other wildlands, and this expanding *wildland-urban interface* has increased the wildfire threat to people and houses through out the West and in the South. Also, a century of using wildlands and suppressing wildfires has apparently significantly increased fuel loads, at least in some ecosystems, and led to historically unnatural combinations of vegetation and structures, exacerbating wildfire threats.[18]

Wildland-Urban Interface (WUI)

The wildland-urban interface has been defined as the area "where combustible homes meet combustible vegetation."[19] This interface includes a wide variety of situations, ranging from individual houses and isolated structures to subdivisions and rural communities surrounded by wildlands. While this situation has always existed to some extent, subdivisions in wildland settings appear to have grown significantly over the past two decades. Standard definitions of the

[16] The National Interagency Fire Center has revised the data for 1983-2002, dropping 1988 (the year of the Yellowstone fires) off the list.

[17] Leon F. Neuenschwander et al., "Indexing Colorado Watersheds to Risk of Wildfire," *Mapping Wildfire Hazards and Risks*, Food Products Press, New York, NY,2000, pp. 35-55.

[18] R. Neil Sampson et al., "Assessing Forest Ecosystem Health in the Inland West: Overview," *Assessing Forest Ecosystem Health in the Inland West*, pp. 3-10.

[19] *Wildfire Strikes Home! The Report of the National Wildland/Urban Fire Protection Conference*, sponsored by the USDA, Forest Service; the National Fire Protection Association; and the FEMA, U.S. Fire Administration, January 1987, p. 2.

interface have been developed by the federal agencies,[20] but have not been used to assess the changing situation.

Most observers agree that protecting homes and other structures in the interface is an appropriate goal for safeguarding the highest values at risk from wildfire.[21] However, there are differences of opinion about how to best protect the WUI. FS research has indicated that the characteristics of the structures and their immediate surroundings are the primary determinants of whether a structure burns. In particular, non-flammable roofs and cleared vegetation for at least 10 meters (33 feet) and up to 40 meters (130 feet) around the structure is highly likely to protect the structure from wildfire, even when neighboring structures burn.[22] Others propose reducing fuels in a band surrounding communities in the WUI; many proposals for fuel reduction suggest treatments within a half-mile (sometimes a quarter-mile) of WUI communities. Still others suggest that reducing fuels on wildlands removed from the WUI can nonetheless protect communities by reducing the danger of uncontrollable conflagrations.[23] These differences lead to discussions about the proper federal role in protecting homes in the interface (see below).

Forest and Rangeland Health

The increasing extent of wildfires in the national forests in the past two decades has been widely attributed to deteriorating forest and rangeland health, resulting at least in some cases directly from federal forest and rangeland management practices. Ecological conditions in many areas, particularly in the intermountain West (the Rocky Mountains through the Cascades and Sierra Nevadas), have been altered by various activities. Beginning more than a century ago, livestock grazing affected ecosystems by reducing the amount of grass and changing the plant species mix in forests and on rangelands. This reduced the fine fuels that carried surface fires (allowed them to spread), encouraged trees to invade traditionally open grasslands and meadows, and allowed non-native species to become established, all of which, experts believe, induce less frequent but more intense wildfires.[24] In addition, first to support mining and railroad development and later to support the wood products industry, logging of the large pines that characterized many areas has led to regeneration of smaller, less fire-resistant trees in some areas.[25] Roads that provide access for logging, grazing, and recreation have also been implicated in spreading non-native species.[26]

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[20] U.S. Dept. of Agriculture and Dept. of the Interior, "Urban Wildland Interface Communities Within the Vicinity of Federal Lands That Are at High Risk From Wildfire," 66 *Federal Register* 751-754, January 4, 2001.

[21] See CRS Report RL34517, *Wildfire Damages to Homes and Resources: Understanding Causes and Reducing Losses*, by Ross W. Gorte

[22] Jack D. Cohen, "Preventing Disaster: Home Ignitability in the Wildland-Urban Interface," *Journal of Forestry*, vol. 102, no. 3 (March 2000), pp. 15-21.

[23] Personal communication, Harv Forsgren, Regional Forester (Region 3), USDA Forest Service in Washington, DC, on Aug. 21, 2003.

[24] W. W. Covington and M. M. Moore, "Postsettlement Changes in Natural Fire Regimes and Forest Structure: Ecological Restoration of Old-Growth Ponderosa Pine Forests," *Assessing Forest Ecosystem Health in the Inland West*, pp. 153-181.

[25] Jay O'Laughlin, "Assessing Forest Health Conditions in Idaho with Forest Inventory Data," *Assessing Forest Ecosystem Health in the Inland West*, pp. 221-247.

[26] Federal Interagency Committee for the Management of Noxious and Exotic Weeds, *Invasive Plants: Changing the Landscape of America*, Washington, DC, 1998, pp. 23-24.

The nature, extent, and severity of these forest and rangeland health problems vary widely, depending on the ecosystem and the history of the site. In rangelands, the problem is likely to be invasion by non-native species (e.g., cheatgrass or spotted knapweed) or by shrubs and small trees (e.g., salt cedar or juniper). In some areas (e.g., western hemlock or inland Douglas-fir stands), the problem may be widespread dead trees due to drought or insect or disease infestations. In others (e.g., southern pines and western mixed conifers), the problem may be dense undergrowth of different plant species (e.g., palmetto in the South and firs in the West). In still others (e.g., ponderosa pine stands) the problem is more likely to be stand stagnation (e.g., too many little green trees, because intra-species competition rarely kills ponderosa pines).

One FS research report has categorized these health problems, for wildfire protection, by classifying ecosystems according to their historical fire regime.[27] The report describes five historical fire regimes:

I. ecosystems with low-severity, surface fires at least every 35 years (often called *frequent surface-fire* ecosystems);

II. ecosystems with *stand replacement* fires (killing much of the standing vegetation) at least every 35 years;

III. ecosystems with mixed severity fires (both surface and stand replacement fires) at 35-100+ year intervals;

IV. ecosystems with stand replacement fires at 35-100+ year intervals; and

V. ecosystems with stand replacement fires at 200+ year intervals.

It is widely recognized that fire suppression has greatly exacerbated these ecological problems, at least in frequent surface-fire ecosystems (fire regime I)—forest ecosystems that evolved with frequent surface fires that burned grasses, needles, and other small fuels at least every 35 years, depending on the site and plant species (e.g., southern yellow pines and ponderosa pine). Surface fires reduce fuel loads by mineralizing biomass that may take decades to rot, and thus provide a flush of nutrients to stimulate new plant growth. Historically, many surface fires were started by lightning, although Native Americans used fires to clear grasslands of encroaching trees, stimulate seed production, and reduce undergrowth and small trees that provide habitat for undesirable insects (e.g., ticks and chiggers) and inhibit mobility and visibility when hunting.[28]

Eliminating frequent surface fires through fire suppression plus other activities has led to unnaturally high fuel loads, by historic standards, in frequent surface-fire ecosystems. These historically unnatural fuel loads can lead to stand replacement fires in ecosystems adapted to frequent surface fires. In particular, small trees and dense undergrowth can create *fuel ladders* that sometimes cause surface fires to spread upward into the forest canopy. In these ecosystems, the frequent surface fires had historically eliminated much of the understory before it got large enough to create fuel ladders. Stand replacement fires in frequent surface-fire ecosystems might

[27] Kirsten M. Schmidt et al., *Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management*, USDA Forest Service, Rocky Mountain Research Station, Gen. Tech. Rept. RMRS-87, Ft. Collins, CO, April 2002. Hereafter cited as Schmidt et al., *Coarse-Scale Assessment*.

[28] James K. Agee, *Fire Ecology of Pacific Northwest Forests*, Island Press, Washington, DC, 1993, pp. 54-57. Hereafter cited as Agee, *Fire Ecology of PNW Forests*.

regenerate new versions of the original surface-fire adapted ecosystems, but some observers are concerned that these ecosystems might be replaced with a different forest that doesn't contain the big old ponderosa pines and other traditional species of these areas.

Stand replacement fires are not, however, an ecological catastrophe in all ecosystems. Perennial grasses and some tree and brush species have evolved to regenerate following intense fires that kill much of the surface vegetation (fire regimes II, IV, and V). Aspen and some other hardwood tree and brush species, as well as most grasses, regrow from rootstocks that can survive intense wildfires. Some trees, such as jack pine in the Lake States and Canada and lodgepole pine in much of the West, have developed *serotinous* cones, that open and disperse seeds only after exposure to intense heat. In such ecosystems, stand replacement fires are normal and natural, although avoiding the incineration of structures located in those ecosystems is obviously desirable.

Some uncertainty exists over the extent of forest and rangeland health problems and how various management practices can exacerbate or alleviate the problems. In 1995, the FS estimated that 39 million acres in the National Forest System (NFS) were at high risk of catastrophic wildfire, and needed some form of fuel treatment.[29] More recently, the *Coarse-Scale Assessment* reported that 51 million NFS acres were at high risk of significant ecological damage from wildfire, and another 80 million acres were at moderate risk. (See **Table 2**.) The *Coarse-Scale Assessment* also reported 23 million acres of Department of the Interior lands at high risk and 76 million acres at moderate risk. All other lands (calculated as the total shown in the *Coarse-Scale Assessment* less the NFS and DOI lands) included 107 million acres at high risk and 314 million acres at moderate risk of ecological damage.

Fuel Management

Fuel management is a collection of activities intended to reduce the threat of significant damages by wildfires. The FS began its fuel management program in the 1960s. By the late 1970s, earlier agency policies of aggressive suppression of all wildfires had been modified, in recognition of the enormous cost of organizing to achieve this goal and of the ecological benefits that can result from some fires. These understandings have in particular led to an expanded prescribed burning program.

The relatively recent recognition of historically unnatural fuel loads from dead trees, dense understories of trees and other vegetation, and non-native species has spurred additional interest in fuel management activities. The presumption is that lower fuel loads and a lack of fuel ladders will reduce the extent of wildfires, the damages they cause, and the cost of controlling them. Numerous on-the-ground examples support this belief. However, little empirical research has documented this presumption. As noted in one research study, "scant information exists on fuel treatment efficacy for reducing wildfire severity."[30] This study also found that "fuel treatments moderate extreme fire behavior within treated areas, at least in" frequent surface-fire ecosystems.

[29] Enoch Bell et al., *Fire Economics Assessment Report*, unpublished report submitted to USDA Forest Service, Fire and Aviation Management, on Sept. 1, 1995.

[30] Philip N. Omi and Erik J. Martinson, *Effects of Fuels Treatment on Wildfire Severity: Final Report*, submitted to the Joint Fire Science Program Governing Board, Colorado State Univ., Western Forest Fire Research Center, Ft. Collins, CO, March 25, 2002, p. i.

Others have found different results elsewhere; one study reported "no evidence that prescribed burning in these [southern California] brushlands provides any resource benefit ... in this crown-fire ecosystem."[31] A recent summary of wildfire research reported that prescribed burning generally reduced fire severity, that mechanical fuel reduction did not consistently reduce fire severity, and that little research has examined the potential impacts of mechanical fuel reduction with prescribed burning or of commercial logging.[32]

Table 2. Lands at Risk of Ecological Change, by Historic Fire Regime

(in millions of acres)

Risk of Ecological Damage	Regime I 0-35 years; surface fire	Regime II 0-35 years; crown fire	Regime III 35-100+; mixed fire	Regime IV 35-100+; crown fire	Regime V 200+ yrs; crown fire	Total
National Forest System lands						
Class 1: low	19.87	4.46	16.05	5.26	19.31	64.95
Class 2: mod.	34.96	8.66	26.71	7.35	2.76	80.45
Class 3: high	28.83	0.36	11.17	10.49	0.27	51.12
NFS Total	*83.67*	*13.48*	*53.93*	*23.11*	*22.35*	*196.52*
Department of the Interior lands						
Class 1: low	18.70	19.47	62.05	23.98	4.23	128.42
Class 2: mod.	23.83	22.87	25.82	2.93	0.38	75.83
Class 3: high	6.46	0.37	9.92	6.61	0.12	23.47
DOI Total	*49.00*	*42.70*	*97.80*	*33.51*	*4.72*	*227.72*
Private, state, and other federal lands						
Class 1: low	136.46	168.62	49.55	23.83	25.02	404.60
Class 2: mod.	117.37	101.66	59.72	25.06	10.57	313.54
Class 3: high	42.20	9.62	32.92	17.93	4.51	107.18
Other Total	*296.02*	*279.89*	*142.18*	*66.81*	*40.10*	*825.01*

Source: Schmidt et al., *Coarse-Scale Assessment*, pp. 13-15.

Before examining fuel management tools, a brief description of fuels may be helpful.[33] Wildfires are typically spread by fine fuels[34]—needles, leaves, grass, etc.—both on the surface and in the tree crowns (in a stand-replacement crown fire); these are known as 1-hour time lag fuels, because they dry out (lose two-thirds of their moisture content) in about an hour. Small fuels,

[31] Jon E. Keeley, "Fire Management of California Shrubland Landscapes," *Environmental Management*, vol. 29, no. 3 (2002), pp. 395-408.

[32] Henry Carey and Martha Schumann, *Modifying WildFire Behavior—The Effectiveness of Fuel Treatments: The Status of Out Knowledge*, Southwest Region Working Paper 2, National Community Forestry Center, Santa Fe, NM, April 2003.

[33] See Arthur A. Brown and Kenneth P. Davis, "Chapter 4: Forest Fuels," *Forest Fire Control and Use*, McGraw-Hill Book Co., New York, NY, 1973, pp. 79-110. Hereafter cited as Brown and Davis, *Fire Control and Use*.

[34] Robert E. Martin and Arthur P. Brackebusch, "Fire Hazard and Conflagration Prevention," *Environmental Effects of Forest Residues Management in the Pacific Northwest: A State-of-Knowledge Compendium,* USDA Forest Service, Pacific Northwest Research Station, Gen. Tech. Rept. PNW-24, Portland, OR, 1974.

known as 10-hour time lag fuels, are woody twigs and branches, up to a quarter-inch in diameter; these fuels also help spread wildfires because they ignite and burn quickly. Larger fuels—particularly the 1,000-hour time lag fuels (more than 3 inches in diameter)—may contribute to the intensity and thus to the damage fires cause, but contribute little to the rate of spread, because they are slow to ignite. One researcher noted that only 5% of large tree stems and 10% of tree branches were consumed in high intensity fires, while 100% of the foliage and 75% of the understory vegetation were consumed.[35] Finally, *ladders* of fine and small fuels between the surface and the tree crowns can spread surface fires into the canopy, thus turning a surface fire into a stand-replacement fire.

Prescribed Burning

Fire has been used as a tool for a long time.[36] Native Americans lit fires for various purposes, such as to reduce brush and stimulate grass growth. Settlers used fires to clear woody debris in creating agricultural fields. In forestry, fire has been used to eliminate logging debris, by burning brush piles and by prescribed burning harvested sites to prepare them for reforestation.[37]

Prescribed burning has been used increasingly over the past 40 years to reduce fuel loads on federal lands. FS prescribed burning has averaged 1.2 million acres annually over the past 10 years.[38] BLM prescribed burning has averaged nearly 131,000 acres over the past 10 years. These burning programs are a significant increase from historic levels; as recently as FY1995, the acreage in prescribed burns was 541,300 FS acres and 57,000 BLM acres. However, much of FS prescribed burning is in the FS Southern Region; prescribed burning in the intermountain West is still at relatively modest levels.

Typically, areas to be burned are identified in agency plans, and fire lines (essentially dirt paths) are created around the perimeter. The fires are lit when the weather conditions permit (i.e., when the *burning prescription* is fulfilled)—when the humidity is low enough to get the fuels to burn, but not when the humidity is so low or wind speed so high that the burning cannot be contained. (This, of course, presumes accurate knowledge of existing and expected weather and wind conditions, as well as sufficient fire control crews with adequate training on the site.) When the fire reaches the perimeter limits, the crews "mop up" the burn area to assure that no hot embers remain to start a wildfire after everyone is gone.

Prescribed burning is widely used for fuel management because it reduces biomass (the fuels) to ashes (minerals). It is particularly effective at reducing the smaller fuels, especially in the arid West where deterioration by decomposers (insects, fungi, etc.) is often very slow. In fact, it is the

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[35] Agee, *Fire Ecology of PNW Forests*, p. 42. It is also important to recognize that the percentage of biomass in 1-hour, 10-hour, 100-hour, and 1,000-hour fuels depends largely on tree diameter, with the percentage in large fuels increasing as diameter increases.

[36] Historical evidence indicates that current levels of burning through prescribed burns and wildfires represent levels perhaps 10%-30% of pre-industrial burning levels from natural and Native-set fires. See Bill Leenhouts, "Assessment of Biomass Burning in the Conterminous United States," *Conservation Ecology* 2(1), 1998, available on Jan. 16, 2007, at http://www.ecologyandsociety.org/vol2/iss1/art1/. Hereafter cited as Leenhouts, *Assessment of Biomass Burning*.

[37] David M. Smith et al., *The Practice of Silviculture: Applied Forest Ecology*, John Wiley & Sons, New York, NY, 1997. Hereafter cited as Smith et al., *The Practice of Silviculture*.

[38] National Interagency Coordination Center, *NICC Wildland Fire Summary and Statistics Annual Report 2011*, http://www.predictiveservices.nifc.gov/intelligence/2011_statssumm/Annual_Report_2011.pdf.

only human treatment that directly reduces the fine and small fuels that are important in spreading wildfires. However, prescribed fires are not particularly effective at reducing larger-diameter fuels or thinning stands to desired densities and diameters.[39]

There are several limitations in using prescribed fire. The most obvious is that prescribed fires can be risky—fire is not a *controlled* tool; rather, it is a self-sustaining chemical reaction that, once ignited, continues until the fuel supply is exhausted.[40] Fire control (for both wildfires and prescribed fires) thus focuses on removing the continuous fuel supply by creating a fire line dug down to mineral soil. The line must be wide enough to prevent the spread of fire by radiation (i.e., the heat from the flames must decline sufficiently across the space that the biomass outside the fire line does not reach combustion temperature, about 550° F). Minor variations in wind and in fuel loads adjacent to the fire line can lead to fires jumping the fire line, causing the fire to escape from control. Winds can also lift burning embers across fire lines, causing spot fires outside the fire line which can grow into major wildfires under certain conditions (such as occurred near Los Alamos, NM, in May 2000). Even when general weather conditions—temperature, humidity, and especially winds—are within the limits identified for prescribed fires, localized variations in the site (e.g., slope, aspect,[41] and fuel load) and in weather (e.g., humidity and wind) can be problematic. Thus, prescribed fires inherently carry some degree of risk, especially in ecosystems adapted to stand-replacement fires and in areas where the understory and undergrowth have created fuel ladders.

Another concern is that prescribed fires generate substantial quantities of smoke—air pollution with high concentrations of carbon monoxide, hydrocarbons, and especially particulates that degrade visibility. Some assert that prescribed fires merely shift the timing of air pollution from wildfires. Others note that smoke from pre-industrial wildland fires was at least three times more than from current levels from prescribed burning and wildfire.[42] Others have observed that fire prescriptions are typically cooler and more humid than wildfire burning conditions, and thus prescribed fires may produce more pollution (because of less efficient burning) than wildfires burning the same area. The Clean Air Act requires regulations to preserve air quality, and regulations governing particulate emissions and regional haze have been of concern to land managers who want to expand prescribed burning programs. Previous proposed legislation (e.g., H.R. 236, 106th Congress) would have exempted FS prescribed burning from air quality regulations for 10 years, to demonstrate that an aggressive prescribed burning program will reduce total particulate emissions from prescribed burning and wildfires. However, owners and operators of other particulate emitters (e.g., diesel vehicles and fossil fuel power plants) generally object to such exemptions, arguing that their emissions would likely be regulated more stringently, even though wildland fires are one of the largest sources of particulates.[43]

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[39] See Brown and Davis, *Fire Control and Use*, pp. 560-572.

[40] Fire can also be halted by eliminating the supply of oxygen, as occurs when fire retardant ("slurry") is spread on forest fires from airplanes ("slurry bombers"). However, reducing oxygen supply usually can only occur in a limited area, because of the cost to spread the fire retardant.

[41] Aspect is the direction which the slope is facing; in the northern hemisphere, south-facing slopes (south aspects) get more radiant energy from the sun than north aspects, and thus are inherently warmer and drier, and hence are at greater risk of more intense wildfires.

[42] Leenhouts, *Assessment of Biomass Burning*.

[43] See, for example, U.S. House, Committee on Resources, *Hearing on the Use of Fire as a Management Tool and Its Risks and Benefits for Forest Health and Air Quality*, Sept. 30, 1997, Serial No. 105-45, GPO, Washington, DC, 141 p.

Salvage and Other Timber Harvesting

Another tool commonly proposed for fuel treatment is traditional timber harvesting, including salvaging dead and dying trees before they rot or succumb to disease and commercially thinning dense stands. In areas where the forest health problems include large numbers of dead and dying trees, a shift toward an inappropriate or undesirable tree species mix, or a dense understory of commercially usable trees, timber harvesting can be used to improve forest health and remove woody biomass from the forest. Nonetheless, some interest groups object to using salvage and other timber harvests to improve forest health.[44]

Timber generally may only be removed from federal forests under timber sale contracts. Stewardship contracts allow timber sales and forest management services, such as fuel reduction, to be combined in one contract, essentially as a trade of goods (timber) for services (fuel reduction); this form of contracting is discussed below, under "Other Fuel Management Tools." Because timber sale contracts have to be bought and goods-for-services contracts must generate value to provide services, the contracts generally include the removal of large, merchantable trees. Critics argue that the need for merchantable products compromises reducing fuel loads and achieving desired forest conditions.

Timber harvests remove heavy fuels that contribute to fire intensity, and can break fuel ladders, but the remaining limbs and tree tops ("slash") substantially increase fuel loads on the ground and get in the way of controlling future fires, at least in the short term, until the slash is removed or disposed of through burning. "Slash is a fire hazard mainly because it represents an unusually large volume of fuel distributed in such a way that it is a dangerous impediment in the construction of fire lines" (i.e., in suppressing fires).[45]

If logging slash is treated, as has long been a standard practice following timber harvesting, the increased fire danger from higher fuel loads that follow timber harvesting can be ameliorated. Various slash treatments are used to reduce the fire hazard, including lop-and-scatter, pile-and-burn, and chipping.[46] Lop-and-scatter consists of cutting the tops and limbs so that they lie close to the ground, thereby hastening decomposition and possibly preparing the material for broadcast burning (essentially, prescribed burning of the timber harvest site). Pile-and-burn is exactly that, piling the slash (by hand or more typically by bulldozer) and burning the piles when conditions are appropriate (dry enough, but not too dry, and with little or no wind). Chipping is feeding the slash through a chipper, a machine that reduces the slash to particles about the size of a silver dollar, and scattering the chips to allow them to decompose. Thorough slash disposal can significantly reduce fuel loads, particularly on sites with large amounts of noncommercial biomass (e.g., undergrowth and unusable tree species) and if combined with some type of prescribed burning. However, data on the actual extent of various slash disposal methods and on needed slash disposal appear to be available only for a few areas.

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[44] Timber harvesting has a variety of proponents and opponents for reasons beyond fuel management. Some interests object to timber harvesting on a variety of grounds, including the poor financial performance of FS timber sales and the degradation of water quality and certain wildlife habitats that follows some timber harvesting. Others defend timber sales for the employment and income provided in isolated, resource-dependent communities as well as for increasing water yields and available habitat for other wildlife species. The arguments supporting and opposing timber harvests generally have often been raised in discussions about fire protection, but are not reproduced in this report. See out-of-print CRS Report 95-364, *Salvage Timber Sales and Forest Health*, by Ross W. Gorte (available from the author).

[45] Smith et al., *The Practice of Silviculture*.

[46] Ibid.

Other Fuel Management Tools

The other principal tool for fuel management is mechanical treatment of the fuels.[47] One common method is precommercial thinning—cutting down many of the small (less than 4½-inch diameter) trees that have little or no current market value. Other treatments include pruning and mechanical release of seedlings (principally by cutting down or mowing competing vegetation). Mechanical treatments are often effective at eliminating fuel ladders, but as with timber cutting, do not reduce the fine fuels on the sites without additional treatment (e.g., without prescribed burning). Mechanical fuel treatments alone tend to increase fine fuels and sometimes larger fuels on the ground in the short term, until the slash has been treated.

Some critics have suggested using traditionally unused biomass, such as slash and thinning debris, in new industrial ways, such as using the wood for paper or particleboard or burning the biomass to generate electricity.[48] Research has indicated that harvesting small diameter timber may be economically feasible,[49] and one study reported net revenues of $624 per acre for comprehensive fuel reduction treatments in Montana that included removal and sale of merchantable wood.[50] However, thus far, collecting and hauling chipped slash and other biomass for products or energy have apparently not been seen as economically viable by potential timber purchasers, given that such woody materials are currently left on the harvest sites.[51] The market for biomass could change if a clean energy standard (CES) is implemented or if technological advances are made in cellulosic biofuels for the Renewable Fuel Standard (RFS), as this could lead to more presure on the use of biomass for energy purposes.[52]

Another possibility is to significantly change the traditional approach to timber sales. Stewardship contracting, in various forms, has been tested in various national forests.[53] Sometimes, the stewardship contract (payment and performance) is based on the condition of the stand after the treatment, rather than on the volume harvested; this is also known as end-results contracting. A variation on this theme, which has been discussed sporadically for more than 30 years, is to separate the forest treatment from the sale of the wood. The most common form is essentially to use commercial timber to pay for other treatments; that is, the contractor removes the specified commercial timber and is required to perform other activities, such as precommercial thinning of

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[47] Chemical treatments (herbicides) are also used in forestry, mostly on unwanted vegetation, but they are not included here as a fuel treatment tool, because they are used primarily to kill live biomass rather than to reduce biomass levels on a site. Biological treatments (e.g., using goats to eat the small diameter material) are feasible, but are rarely used.

[48] Robert Nelson, University of Maryland, cited in: Rocky Barker, "Wildfires Creating Odd Bedfellows," *The Idaho Statesman*, Aug. 14, 2000, pp. 1A, 7A.

[49] Henry Spelter, Ron Wang, and Peter Ince, *Economic Feasibility of Products From Inland West Small Diameter Timber*, USDA Forest Service, Forest Products Lab, FPL-GTR-92, Madison, WI, May 1996, 17 p.

[50] Carl E. Fieldler, Charles E. Keegan, Todd A. Morgan, and Christopher W. Woodall, "Fire Hazard and Potential Treatment Effectiveness: A Statewide Assessment in Montana," *Journal of Forestry*, vol. 101, no. 2 (March 2003), p. 7.

[51] Research documenting the economics of slash use (in contrast to small diameter trees) is lacking. However, this seems a reasonable conclusion, given that the slash is left on the site by the timber purchaser (who could remove and sell the material) and that the agencies and various interest groups have been trying to develop alternatives to the traditional contracts (e.g., stewardship contracts) to remove thinning slash and other biomass fuels.

[52] A CES could require certain electricity providers to obtain a portion of their electricity from qualifying clean energy sources. The RFS is a mandate requiring that the national fuel supply contain a minimum amount of fuel produced from renewable biomass.

[53] See CRS Report RS20985, *Stewardship Contracting for Federal Forests*, by Ross W. Gorte.

a specified area. Because of the implicit trade of timber for other activities, this is often called goods-for-services stewardship contracting. FS and BLM goods-for-services stewardship contracting was authorized through FY2013 in the FY2003 Continuing Appropriations Resolution (P.L. 108-7). Some observers believe that such alternative approaches could lead to development of an industry based on small diameter wood, and thus significantly reduce the cost of fuel management. Others fear that this could create an industry that cannot be sustained after the current excess biomass has been removed or that would need continuing subsidies.

Fuel Management Funding

Direct federal funding for prescribed burning and other fuel treatments (typically called *hazardous fuels* or *fuel management*) is part of FS and BLM appropriations for Wildfire Management. (See CRS Report RL33990, *Federal Funding for Wildfire Control and Management*, by Ross W. Gorte and Kelsi Bracmort.) Appropriations for fuel reduction have risen from less than $100 million in FY1999 to more than $400 million annually since FY2003, and to $495 million in FY2012, with emergency supplemental funding.

Funds appropriated for other purposes can also provide fuel treatment benefits. As noted above, salvage and other commercial timber sales can be used to reduce fuels in some circumstances. Various accounts, both annual appropriations and mandatory spending, provide funding for reforestation, timber stand improvement, and other activities. Reforestation actually increases fuels, but timber stand improvement includes precommercial thinning, pruning, and other mechanical vegetative treatments included in "Other Fuel Management Tools" (see above), as well as herbicide use and other treatments that do not reduce fuels.

Fire Control

Wildfire Management Funding

The cost of federal fire management is high and has risen significantly from historic levels. Wildfire appropriations for the FS and DOI totaled less than $1 billion annually prior to FY1997. For FY2003-FY2008, funding averaged more than $3 billion annually. (See CRS Report RL33990, *Federal Funding for Wildfire Control and Management*, by Ross W. Gorte and Kelsi Bracmort.) One critic has observed that emergency supplemental appropriations, to replenish funds borrowed from other accounts to pay for firefighting, are viewed by agency employees as "free money" and has suggested that this has led to wasting federal firefighting funds, which he calls "fire boondoggles."[54] Another critic asserts that poorly designed incentives are the principal cause of the current problems and that the current fire management funding system will not resolve those problems.[55]

For FY2012, FS received about 80% of the funds appropriated by Congress for wildfire preparedness and operations (including emergency supplemental funds). The other roughly 20%

[54] Robert H. Nelson, *A Burning Issue: A Case for Abolishing the U.S. Forest Service*, Rowman & Littlefield Publishers, Inc., Lanham, MD, 2000, pp. 15-43. Hereafter cited as Nelson, *A Burning Issue*.

[55] Randal O'Toole, *Reforming the Fire Service: An Analysis of Federal Fire Budgets and Incentives*, Thoreau Institute, Bandon, OR, July 2002. Hereafter cited as O'Toole, *Reforming the Fire Service*.

goes to the BLM, which coordinates wildfire management funding for the DOI land managing agencies (BLM, the National Park Service, U.S. Fish and Wildlife Service, and Bureau of Indian Affairs); the BLM retained about 50% of DOI funding for its wildfire activities in FY2012.

Fire Control Policies and Practices

Federal fire management policy was revised in 1995, after severe fires in 1994 and the deaths of several firefighters. Current federal wildfire policy is to protect human life first, and then to protect property and natural resources from wildfires.[56] This policy includes viewing fire as a natural process in ecosystems where and when fires can be allowed to burn with reasonable safety. But when wildfires threaten life, property, and resources, the agencies act to suppress those fires.

Despite control efforts, some wildfires clearly become the kind of conflagration (stand replacement fire or crown fire) that gets media attention. As noted above, relatively few wildfires become conflagrations; it is unknown how many wildfires might become conflagrations in the absence of fire suppression efforts.

A wide array of factors determine whether a wildfire will blow up into a conflagration. Some factors are inherent in the site: slope (fires burn faster up steep slopes); aspect (south-facing slopes are warmer and drier than north-facing slopes); and ecology (some plant species are adapted to periodic stand replacement fires). Other factors are transient, changing over time (from hours to years): moisture levels (current and recent humidity; long-term drought); wind (ranging from gentle breezes to gale force winds in some thunderstorms); and fuel load and spatial distribution (more biomass and fuel ladders make conflagrations more likely).

Whether a wildfire becomes a conflagration can also be influenced by land management practices and policies. Historic grazing and logging practices (by encouraging growth of many small trees), and especially fire suppression over the past century, appear to have contributed to unprecedented fuel loads in some ecosystems. Fuel treatments can reduce fuel loads, and thus probably reduce the likelihood and severity of catastrophic wildfires, at least in some ecosystems; however, some policies and decisions may restrict fuel treatment—for example, air quality protection that limits prescribed burning or wilderness designation that prevents fuel reduction with motorized or mechanical equipment. Other practices and policies are more problematic. For example, timber harvesting can reduce fuel loads, if accompanied by effective slash disposal, but data on the need for and on the extent and efficacy of slash disposal are not available. Similarly, road construction into previously unroaded areas can increase access, and thus facilitate fuel treatment and fire suppression; conversely, roadless area protection and even road obliteration[57] can impede fuel treatment, but may reduce the likelihood of a wildfire ignition, because human-caused wildfires are more common along roads.

Once a wildfire becomes a conflagration, halting its spread is exceedingly difficult, if not impossible. Dropping water or fire retardant ("slurry") from helicopters or airplanes ("slurry bombers") can occasionally return a crown fire to the surface, where firefighters can control it, and can be used to protect individually valuable sites (e.g., structures). However, this strategy is

[56] *1995 Federal Wildland Fire Review*.

[57] Road obliteration is closing the road and returning the roadbed to near-natural conditions.

not particularly useful in large, extended fires.[58] Setting backfires—lighting fires from a fire line to burn toward the conflagration—can eliminate the fuel ahead of the conflagration, thus halting its spread, but can be dangerous, because the backfire sometimes becomes part of the conflagration. Most firefighters recognize the futility of some firefighting efforts, acknowledging that some conflagrations will burn until they run out of fuel (move into an ecosystem or an area where the fuel is insufficient to support the conflagration) or the weather changes (the wind dies or precipitation begins, or both).

Wildfire Effects

Wildfires cause damages, killing some plants and occasionally animals.[59] Firefighters have been injured and killed, and structures can be damaged or destroyed. The loss of plants can heighten the risk of significant erosion and landslides. Some observers have reported "soil glassification," where the silica in the soils has been melted and fused, forming an impermeable layer in the soil; however, research has yet to document the extent, frequency, and duration of this condition, and the soils and burning conditions under which it occurs. Others have noted that "even the most intense forest fire will rarely have a direct heating effect on the soil at depths below 7 to 10 cm" (centimeters), about 3 to 4 inches.[60]

Damages are almost certainly greater from stand replacement fires than from surface fires. Stand replacement fires burn more fuel, and thus burn hotter (more intensely) than surface fires. Stand replacement fires kill many plants in the burned area, making natural recovery slower and increasing the potential for erosion and landslides. Also, because they burn hotter, stand replacement fires generally are more difficult to suppress, raising risks to firefighters and to structures. Finally, stand replacement fires generate substantial quantities of smoke, which can directly affect people's health and well-being.

Wildfires, especially conflagrations, can also have significant local economic effects, both short-term and long-term, with larger fires generally having greater and longer-term impacts. Wildfires, and even extreme fire danger, may directly curtail recreation and tourism in and near the fires.[61] If an area's aesthetics are impaired, local property values can decline. Extensive fire damage to trees can significantly alter the timber supply, both through a short-term glut from timber salvage and a longer-term decline while the trees regrow. Water supplies can be degraded by post-fire erosion and stream sedimentation, but the volume flowing from the burned area may increase. However,

[58] *Federal Aerial Firefighting: Assessing Safety and Effectiveness*, Blue Ribbon Panel Report to the Chief, USDA Forest Service and Director, USDI Bureau of Land Management, available at http://www.wildfirelessons.net/documents/BRP_Final12052002.pdf.

[59] For a thorough discussion of these effects, see L. Jack Lyon et al., *Wildland Fire in Ecosystems: Effects of Fire on Fauna*, USDA Forest Service, Rocky Mountain Research Station, Gen. Tech. Rept. RMRS-GTR-42-vol. 1,Ogden, UT, Jan. 2000. Hereafter cited as Lyon, et al., *Effects of Fire on Fauna*.

[60] Craig Chandler et al., *Fire In Forestry. Volume I: Forest Fire Behavior and Effects*, John Wiley & Sons, New York, NY, 1983, p. 173.

[61] Paul E. Polzin, Michael S. Yuan, and Ervin G. Schuster, *Some Economic Impacts of the 1988 Fires in the Yellowstone Area*, USDA Forest Service, Intermountain Research Station, Research Note INT-418, Ogden, UT, October 1993.

federal wildfire management includes substantial expenditures, and fire-fighting jobs are considered financially desirable in many areas.[62]

Ecological damages from fires are more difficult to determine, and may well be overstated, for two reasons. First, burned areas look devastated immediately following the fire, even when recovery is likely; for example, conifers with as much as 60% of the crown scorched are likely to survive.[63] Second, even the most intense stand replacement fires do not burn 100% of the biomass within the burn's perimeter—fires are patchy. For example, in the 1988 fires in Yellowstone, nearly 30% of the area within the fire perimeters was unburned, and another 15%-20% burned lightly (a surface fire); 50%-55% of the area burned as a stand replacement fire.[64]

Emergency rehabilitation is common following large fires. This is typically justified by the need for controlling erosion and preventing landslides, and may be particularly important for fire lines (dug to mineral soil) that go up steep slopes and could become gullies or ravines without treatment. Sometimes, the rehabilitation includes salvaging dead and damaged trees, because the wood's quality and value deteriorate following the fire. Emergency rehabilitation often involves seeding the sites with fast-growing grasses. While helpful for erosion control, such efforts might inhibit natural restoration if the grasses are not native species or if they inhibit tree seed germination or seedling survival.

Finally, as mentioned above, wildfires can also generate ecological benefits. Many plants regrow quickly following wildfires, because fire converts organic matter to available mineral nutrients. Some plant species, such as aspen and especially many native perennial grasses, also regrow from root systems that are rarely damaged by wildfire. Other plant species, such as lodgepole pine and jack pine, have evolved to depend on stand replacement fires for their regeneration; fire is *necessary* to open their cones and spread their seeds. One author identified research reporting various significant ecosystems threatened by *fire exclusion*—including aspen, whitebark pine, and ponderosa pine (western montane ecosystems), longleaf pine, pitch pine, and oak savannah (southern and eastern ecosystems), and the tallgrass prairie.[65] Other researchers found that, of the 146 rare, threatened, or endangered plants in the coterminous 48 states for which there is conclusive information on fire effects, 135 species (92%) benefit from fire or are found in fire-adapted ecosystems.[66]

Animals, as well as plants, can benefit from fire. Some individual animals may be killed, especially by catastrophic fires, but populations and communities are rarely threatened. Many species are attracted to burned areas following fires—some even during or immediately after the fire. Species can be attracted by the newly available minerals or the reduced vegetation allowing them to see and catch prey. Others are attracted in the weeks to months (even years) following, to the new plant growth (including fresh and available seeds and berries), for insects and other prey, or for habitat (e.g., snags for woodpeckers and other cavity nesters). A few may be highly dependent on fire; the endangered Kirtland's warbler, for example, only nests under young jack

[62] Nelson, *A Burning Issue*, pp. 37-38.

[63] See Ross W. Gorte, *Fire Effects Appraisal: The Wisconsin DNR Example*, Michigan State Univ., Ph.D. dissertation, East Lansing, MI, June 1981.

[64] See Lyon, et al., *Effects of Fire on Fauna*, p. 44.

[65] Leenhouts, *Assessment of Biomass Burning*.

[66] Amy Hessl and Susan Spackman, *Effects of Fire on Threatened and Endangered Plants: An Annotated Bibliography*, U.S. Dept. of the Interior, National Biological Service, Information and Technical Report 2, Fort Collins, CO, n.d.

pine that was regenerated by fire, because only fire-regenerated jack pine stands are dense enough to protect the nestlings from predators.

In summary, many of the ecological benefits of wildfire that have become more widely recognized over the past 30 years are generally associated with light surface fires in frequent-fire ecosystems. This is clearly one of the justifications given for fuel treatments. Damage is likely to be greater from stand replacement fires, especially in frequent-fire ecosystems, but even crown fires produce benefits in some situations (e.g., for the jack pine regeneration needed for successful Kirtland's warbler nesting).

Roles and Responsibilities

Landowner Responsibilities

Individuals who choose to build or live in homes and other structures in the wildland-urban interface face some risk of loss from wildfires. As noted above, catastrophic fires occur, despite people's best efforts, and can threaten houses and other buildings. To date, insurance companies (and state insurance regulators) have done relatively little to ameliorate these risks, in part because of federal disaster assistance paid whenever numerous homes are burned (such as in Los Alamos in May 2000). However, landowners can take steps, individually and collectively, to reduce the threat to their structures.

Research has documented that *home ignitability*—the likelihood of a house catching fire and burning down—depends substantially on the characteristics of the structure and its immediate surroundings.[67] Flammable exteriors—wood siding and especially flammable roofs—increase the chances that a structure will ignite by radiation (heat from the surrounding burning forest) or from firebrands (burning materials carried aloft by wind or convection and falling ahead of the fire). Alternate materials (e.g., brick or aluminum siding and slate or copper roofing) and protective treatments can reduce the risk. In addition, the probability of a home igniting by radiation depends on its distance from the flames. Researchers found that 85%-95% of structures with nonflammable roofs survived two major California fires (in 1961 and 1990) when there were clearances of 10 meters (33 feet) or more between the homes and surrounding vegetation.[68] Thus, building with fire resistant materials and clearing flammable materials—including vegetation, firewood piles, and untreated wood decks—from around structures reduces their chances of burning.

In addition, landowners can cooperate in protecting their homes in the wildland-urban interface. Fuel reduction within and around such subdivisions can reduce the risk, and economies of scale suggest that treatment costs for a subdivision might be lower than for an individual (especially if volunteer labor is contributed). In addition, as noted above, narrow and unmarked roads can hinder fire crews from reaching wildfires. Assuring adequate roads that are clearly marked and

[67] See Jack D. Cohen, "Reducing the Wildland Fire Threat to Homes: Where and How Much?" *Proceedings of the Symposium on Fire Economics, Planning, and Policy: Bottom Lines* (San Diego, CA: April 5-9, 1999), USDA Forest Service, Pacific Southwest Research Station, Gen. Tech. Rept. PSW-GTR-173, Berkeley, CA, Dec. 1999, pp. 189-195. Hereafter cited as Cohen, *Reducing the Wildland Fire Threat to Homes*.

[68] Ibid.

mapped can help firefighters to protect subdivisions. Finally, communal water sources, such as ponds and cisterns, may improve the protection of structures and subdivisions.

State and Local Government Roles and Responsibilities

In general, the states are responsible for fire protection on non-federal lands, although cooperative agreements with the federal agencies may shift those responsibilities. Typically, local governments are responsible for putting out structure fires. Maintaining some separation between suppressing structural fires and wildfires may be appropriate, because the suppression techniques and firefighter hazards and training differ substantially. Nonetheless, cooperation and some overlapping responsibilities are also warranted, simply because of the locations of federal, state, and local firefighting forces.

In addition, state and local governments have other responsibilities that affect wildfire threats to homes. For example, zoning codes—what can be built where—and building codes—permissible construction standards and materials—are typically regulated locally. These codes could (and some undoubtedly do) include restrictions, standards, or guidelines for improving fire protection in the wildland-urban interface.

The insurance industry, and home fire insurance requirements, are generally regulated by states. State regulators could work with the industry to increase the consideration of wildfire protection and home defensibility in homeowners' insurance. Road construction and road maintenance are often both state and local responsibilities, depending on the road; these roads are usually designed and identified in ways that are useful for fire suppression crews. State and local governments could further assist home protection from wildfires by supporting programs to inform residents, especially those in the urban-wildland interface, of ways that they can protect their homes.

Federal Roles and Responsibilities

The federal government has several roles in protecting lands and resources from wildfire, including protecting federal lands, assisting protection by states and local governments, and assisting public and private landowners in the aftermath of a disaster. These programs and their funding levels are described in CRS Report RL33990, *Federal Funding for Wildfire Control and Management*, by Ross W. Gorte and Kelsi Bracmort, and CRS Report RL31065, *Forestry Assistance Programs*, by Ross W. Gorte and Megan Stubbs.

Federal Land Protection

The federal government clearly is responsible for fire protection on federal lands. Federal responsibility to protect neighboring non-federal lands, resources, and structures, however, is less clear. This issue was raised following several 1994 fires, where the federal officials observed that firefighting resources were diverted to protecting nearby private residences and communities at a cost to federal lands and resources.[69] In December 1995, the agencies released the new *Federal Wildland Fire Management Policy & Program Review: Final Report*, which altered federal fire policy from priority for private property to equal priority for private property and federal

[69] See footnote 11.

resources, based on values at risk. (Protecting human life is the first priority in firefighting.) Funding for fire protection of federal lands accounts for about 95% of all federal wildfire management appropriations. As noted above, fire appropriations have risen dramatically over the past decade.

Cooperative Assistance

The federal government also provides assistance for fire protection. Most federal wildfire protection assistance has been through the FS, but the Federal Emergency Management Agency (FEMA) in the Department of Homeland Security also has a program to assist in protecting communities from disasters (including wildfire).

FS efforts are operated through a cooperative fire protection program within the State and Private Forestry (S&PF) branch. This fire program includes financial and technical assistance to states and to volunteer fire departments. The funding provides a nationwide fire prevention program and equipment acquisition and transfer (the Federal Excess Personal Property program) as well as training and other help for state and local fire organizations. The 2002 Farm Bill (P.L. 107-171) created a new community fire protection program under which the FS can assist communities in fuel reduction and other activities on private lands in the wildland-urban interface. One particular program, FIREWISE, is supported through an agreement with and grant to the National Fire Protection Association, in conjunction with the National Association of State Foresters, to help private landowners learn how to protect their property from catastrophic wildfire.

Funding for cooperative fire assistance rose substantially in FY2001, from less than $30 million to nearly $150 million. Funding has declined since, but remains substantially higher than the $15 million-$20 million annually in the 1990s.

FEMA has programs to assist fire protection efforts.[70] One FEMA program is fire suppression grants under the Stafford Act (the Disaster Relief and Emergency Assistance Act, 42 U.S.C. §5187). These are grants to states to assist in suppressing wildfires that threaten to become major disasters. Also, the U.S. Fire Administration is a FEMA entity charged with reducing deaths, injuries, and property losses from fires; agency programs include data collection, public education, training, and technology development.[71]

The federal government has one other program that supports federal and state wildfire protection efforts—the National Interagency Fire Center (NIFC). The center was established by the BLM and the FS in Boise, ID, in 1965 to coordinate fire protection efforts (especially aviation support) in the intermountain West. The early successes led to the inclusion of the National Weather Service (in the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce) and of the other DOI agencies with fire suppression responsibilities (the National Park Service, Fish and Wildlife Service, Bureau of Indian Affairs, and Office of Aircraft Services). (FEMA is not included in the NIFC.) NIFC also coordinates with the National Association of State Foresters to assist in the efficient use of federal, state, and local firefighting resources in areas where wildfires are burning.

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[70] The annual funding for these programs is not distinguished in the agency's annual budget justification, and thus is not included in this report. See CRS Report R41982, *Homeland Security Department: FY2012 Appropriations*, coordinated by William L. Painter and Jennifer E. Lake.

[71] See CRS Report RS20071, *United States Fire Administration: An Overview*, by Lennard G. Kruger.

Disaster Relief

The federal government also provides relief following many disasters, to assist recovery by state and local governments and especially the private sector (including the insurance industry). The federal land management agencies generally do not provide disaster relief, although there has been some economic assistance for communities affected by wildfires upon occasion, as described above. Wildfire operations funding includes money for emergency rehabilitation, to reduce the possibility of significant erosion, stream sedimentation, and mass soil movement (landslides) from burned areas of federal lands. While not direct relief for affected communities, such efforts may prevent flooding and debris flows that can exacerbate local economic and social problems caused by catastrophic fires. Two authorized programs, FS Emergency Reforestation Assistance and USDA Emergency Forest Restoration, can aid private landowners whose lands were damaged by wildfire, but the programs have not been funded in recent years.[72]

FEMA is the principal federal agency that provides relief following declared disasters, although local, state, and other federal agencies (e.g., the Farm Service Agency and the Small Business Administration) also have emergency assistance programs.[73] The Stafford Act established a process for governors to request the President to declare a disaster, and public and individual assistance programs for disaster victims.

If the risk of catastrophic fires destroying homes and communities continues to escalate, as some have suggested, requests for wildfire disaster relief would also likely rise. This might lead some to argue that a federal insurance mechanism might be a more efficient and equitable system for sharing the risk. Federal crop insurance and national flood insurance have existed for many years, while federal insurance for other catastrophic risks (e.g., hurricanes, tornados, earthquakes, volcanoes) has also been debated.[74] An analysis of these alternative systems is beyond the scope of this report, but these might provide alternative approaches that could be adapted for federal wildfire insurance, if such insurance were seen as appropriate. Some observers, however, object to compensating landowners for building in what critics identify as unsafe areas.[75]

Current Issues

The severe fire seasons in recent years have raised many wildfire issues for Congress and the public. There have been spirited discussions about the effects of land management practices, especially timber sales, on fuel loads. A broad range of opinion exists on this issue, but most observers generally accept that current fuel loads reflect the aggressive fire suppression of the past century as well as historic logging and grazing practices. Some argue that catastrophic wildfires are nature's way of rejuvenating forests that have been mismanaged in extracting timber, and that the fires should be allowed to burn to restore the natural conditions.[76] Others

[72] See CRS Report RL31065, *Forestry Assistance Programs*, by Ross W. Gorte and Megan Stubbs.

[73] See CRS Report RL31734, *Federal Disaster Recovery Programs: Brief Summaries*, by Carolyn V. Torsell.

[74] See CRS Report RS21212, *Agricultural Disaster Assistance*, by Dennis A. Shields and Ralph M. Chite, and CRS Report RL34367, *Side-by-Side Comparison of Flood Insurance Reform Legislation in the 110th Congress*, by Rawle O. King

[75] Personal communication with Tim Hermach, Founder and President, Native Forest Council, Eugene, OR, on Oct. 18, 2000.

[76] Personal communication with Tim Hermach, Founder and President, Native Forest Council, Eugene, OR, on Sept. (continued...)

argue that the catastrophic fires are due to increased fuel loads that have resulted from reduced logging in the national forests over the past decade, and that more logging could contribute significantly to reducing fuel loads and thus to protecting homes and communities.[77] However, the extent to which timber harvests affect the extent and severity of current and future wildfires cannot be determined from available data.[78] Some critics suggest that historic mismanagement—excessive fire suppression and past logging and grazing practices—by the FS warrants wholesale decentralization or revision of the management authority governing the National Forest System.[79]

Research information on causative factors and on the complex circumstances surrounding wildfire is limited. The value of wildfires as case studies for building predictive models is constrained, because the *a priori* situation (e.g., fuel loads and distribution) and burning conditions (e.g., wind and moisture levels, patterns, and variations) are often unknown. Experimental fires in the wild would be more useful, but are dangerous and generally unacceptable to the public. Prescribed fires could be used for research, but the burning conditions are necessarily restricted. Fires in the laboratory are feasible, but often cannot duplicate the complexity and variability of field conditions. Thus, research on fire protection and control is challenging, and predictive tools for fire protection and control are often based substantially on expert opinion and anecdotes, rather than on documented research evidence.[80]

Concerns over forest and rangeland health, particularly related to fuel loads, have been discussed for nearly two decades; a major conference on forest ecosystem health was held in Idaho in 1993.[81] Significant funding to address these concerns, however, was not proposed until September 2000. While higher funding for wildfire protection, including fuel reduction, has persisted, some question whether this additional funding is sufficient to adequately reduce fuel loads. In 1999, GAO estimated that it would cost $725 million *annually*—nearly $12 billion through 2015—to reduce fuels using traditional treatment methods on the 39 million FS acres that were estimated to be at high risk of catastrophic wildfire.[82] This is nearly double the significantly increased appropriations for FS fuel reduction since FY2001.

The cost of a comprehensive fuel reduction program, as many advocate, would likely exceed the GAO estimate of $12 billion, because the scope of potential costs and proposed programs has increased. The FS estimate of FS acres at high risk of ecological loss due to catastrophic fire increased from 39 million acres in 1999 to 51 million acres in 2003. In addition, the GAO cost figure (received from the FS) of $300 per acre on average for fuel reduction might be low. One might anticipate more careful federal prescribed burning after the May 2000 escaped prescribed fire burned 239 homes in Los Alamos, NM; more cautious prescribed burning is likely to have

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(...continued)

26, 2000.

[77] William N. Dennison, Plumas County Supervisor, District 3, "Statement," *Hearing on the Use of Fire as a Management Tool and Its Risks and Benefits for Forest Health and Air Quality*, House Committee on Resources, Sept. 30, 1997, Serial No. 105-45, GPO, Washington, DC, 1997, pp. 107-116.

[78] See CRS Congressional Distribution Memorandum, *Forest Fires and Forest Management*, by Ross W. Gorte, Sept. 20, 2000.

[79] Nelson, *A Burning Issue*; O'Toole, *Reforming the Fire Service*.

[80] Fire experts typically believe (and must believe, to do their jobs effectively) that catastrophic wildfires can and should be controlled; thus, their opinions may be biased, overstating the effectiveness and efficiency of control efforts.

[81] *Assessing Forest Ecosystem Health in the Inland West: November 14th-20th, 1993*. See footnote 8.

[82] GAO, *Cohesive Strategy Needed*.

higher unit costs than the GAO figure. Also, many advocate emphasizing fuel reduction in the wildland-urban interface, and treatment costs in the interface are higher, because of risks to homes and other structures from prescribed burning and because of possible damage to aesthetics from mechanical treatments.

GAO also addressed a subset of the widely advocated comprehensive fuel reduction program, by estimating the cost for the initial treatment of FS high-risk acres. The FS has estimated that there are 23 million high-risk acres of DOI land and 107 million high-risk acres of other land. In addition, many advocate reducing fuels on lands at moderate risk—80 million FS acres, 76 million DOI acres, and 313 million other acres. Finally, in frequent-fire ecosystems, retreatment would be needed on the 5-35 year fire cycle (depending on the ecosystem), suggesting that fuel management costs would need to be continued beyond the 16-year program examined by GAO.

If a comprehensive program were undertaken to reduce fuels on all high-risk and moderate-risk federal lands, using GAO's treatment cost rate of $300 per acre, the total cost would come to $69 *billion*—$39 billion for FS lands and $30 billion for DOI lands—for initial treatment. This would come to $4.3 billion annually over 16 years, whereas the Administration's requested budget for fuel treatment in FY2008 was $499.8 million ($297.0 million for the FS and $202.8 million for the BLM), a little more than 10% of what some implicitly propose. This raises questions about whether a comprehensive fuel reduction program is feasible and how to prioritize treatment efforts.

There is a final significant question: would it work? The answer depends, in part, on how one defines successful fire protection. Fuel reduction might help restore "more natural" conditions to forests and rangelands, as many advocate, and would likely yield some social benefits (e.g., improved water quality, more habitat for fire-dependent animal species). Others, however, advocate fuel reduction to allow greater use of forests and rangelands, for timber production, recreation, water yield, etc. Fuel reduction will certainly not reduce the conflict over the goals and purposes of having and managing federal lands. Reducing fuel loads might reduce acreage burned and the severity and damages of the wildfires that occur. Research is needed in various ecosystems to document and quantify the relationships among fuel loads and damages and the probability of catastrophic wildfires, to examine whether the cost of fuel reduction is justified by the lower fire risk and damage. However, it should also be recognized that, regardless of the extent of fuel reduction and other fire protection efforts, as long as there is biomass for burning, especially under severe weather conditions (drought and high wind), catastrophic wildfires will occasionally occur, with the attendant damages to resources, destruction of nearby homes, other economic and social impacts, and potential loss of life.

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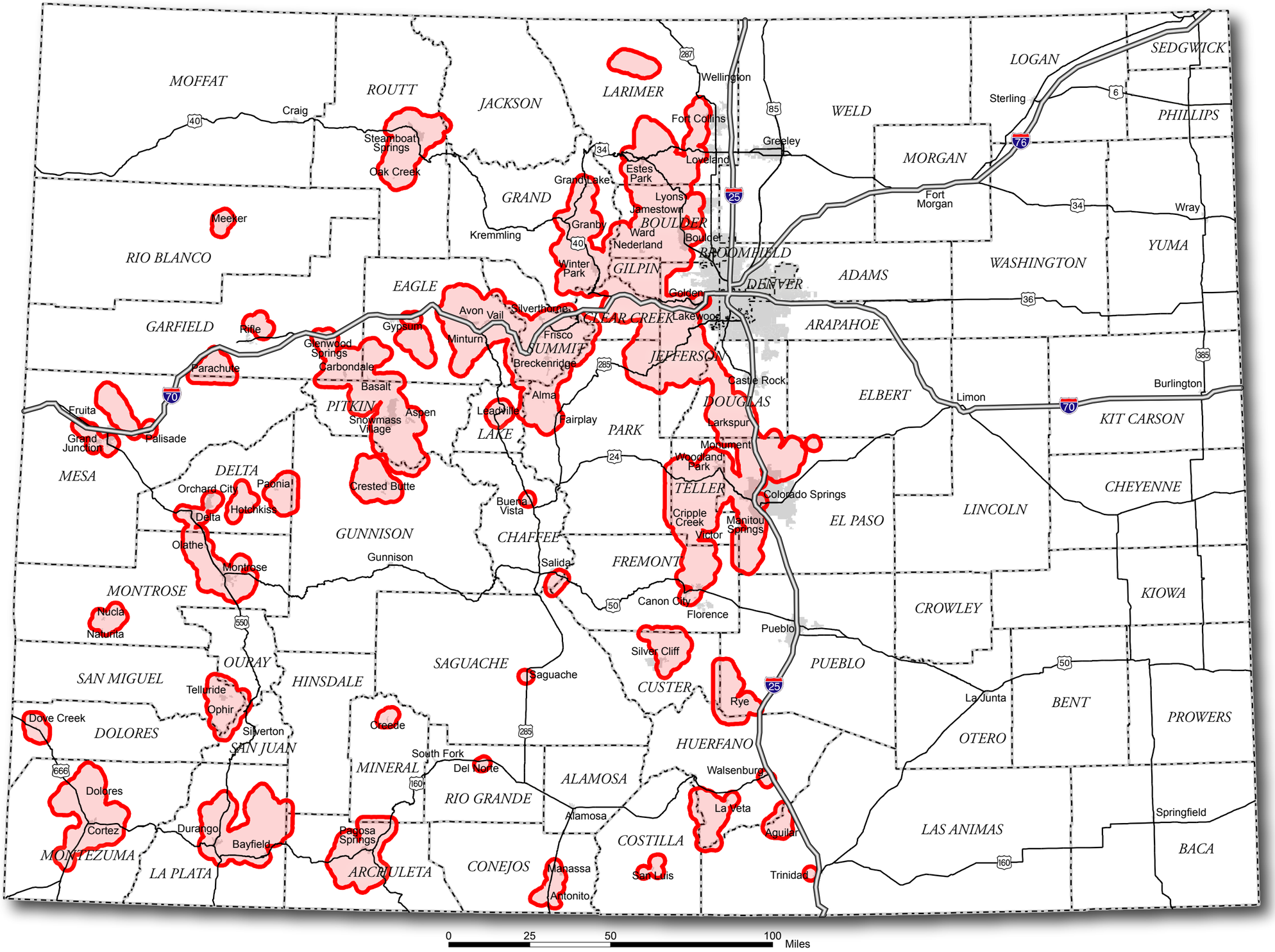
Author Contact Information

Ross W. Gorte
Specialist in Natural Resources Policy
rgorte@crs.loc.gov, 7-7266

Kelsi Bracmort
Specialist in Agricultural Conservation and Natural Resources Policy
kbracmort@crs.loc.gov, 7-7283

Interface Areas of High Wildfire Risk in Colorado



Red Zone Population:
748,350 (1990 Census)
979,851 (2000 Census)

Homes in Red Zone:
370,000 (1990 Census)
474,000 (2000 Census)

Red Zone Acres:
6,300,000 (2000)

Colorado State Forest Service

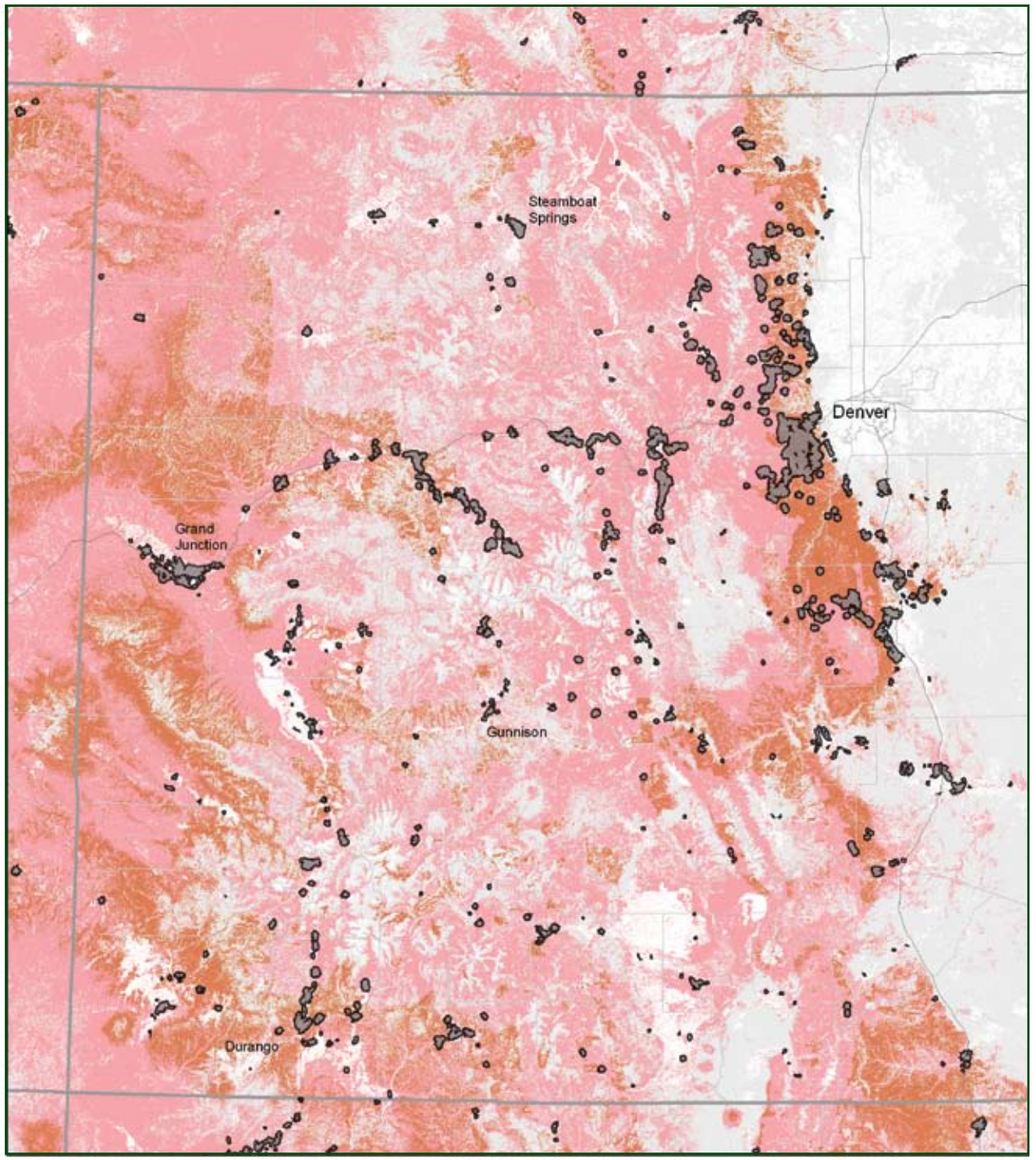
Map Created September 2004
Colorado State Forest Service

Colorado State University

From the *2007 Report on the Health of Colorado's Forests*

Colorado's Wildland-Urban Interface, Current and Projected

Development of natural areas, as is occurring in Colorado, increases demand for and costs of wildfire protection. A Colorado State University analysis (D. Theobald and W. Romme, 2007) projects that the state's wildland-urban interface (WUI) areas will increase from 715,500 acres in 2000 to 2,161,400 acres in 2030, a 300-percent increase. These maps depict Colorado's WUI in 2000 (left) and the likely expansion of WUI in 2030 based on housing development forecasts (right).

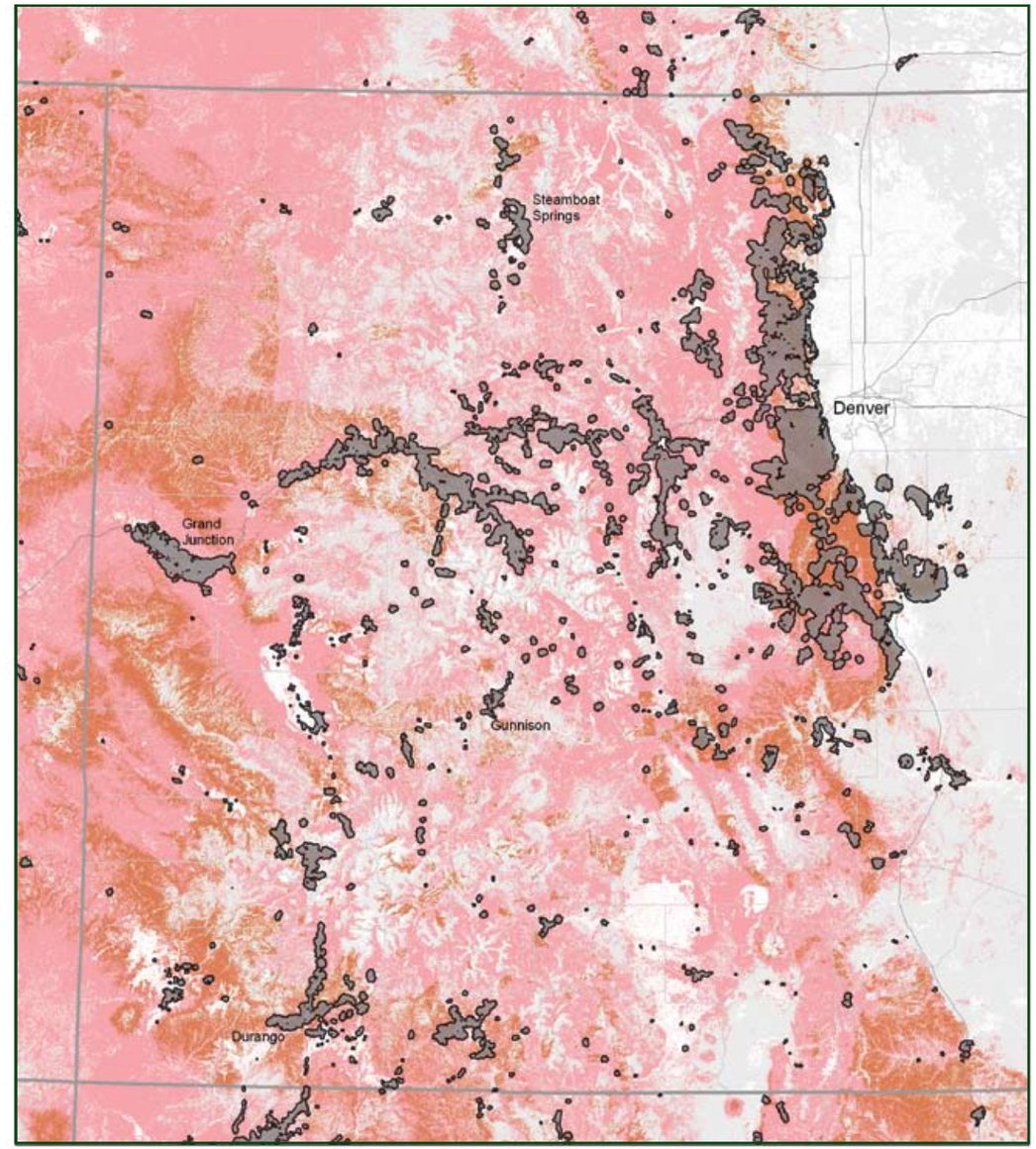


WUI + 1 mi CPZ in 2000

Low hazard | High hazard | High (variable) | None

50 Miles

Map created 23 October 2007 by D. Theobald, Colorado State University.



WUI + 1 mi CPZ in 2030

Low hazard | High hazard | High (variable) | None

50 Miles

Map created 23 October 2007 by D. Theobald, Colorado State University.

Definitions

WUI is the wildland-urban interface. It is the area where homes and urban sprawl press against the wildland, and includes both interface and intermix communities.

CPZ is the community protection zone surrounding the WUI. The analysis shows that there were more than 300,000 homes in the CPZ in 2000, and more than 720,000 homes are projected for 2030.

Low hazard means that most fires burn at relatively low intensity through surface fuels, with little potential for spread into tree or shrub crowns, and would be relatively easy to contain or suppress.

High hazard means that many or most fires burn at high intensity, often through crowns, and would be difficult to contain or suppress.

High (variable) applies to vegetation types in which fires historically were of low or variable intensity, but recently have often burned at high intensity due to a century of fire exclusion, e.g., southwestern ponderosa pine forests.

Firebreak Helps Firefighters Save YMCA Camp and Subdivision

On June 25, 2007, a human-caused fire broke out at the YMCA Snow Mountain Ranch near Winter Park. Although burning conditions were only moderate, the fire grew and spread rapidly, partly due to the dry beetle-killed trees. Recent tree cutting to reduce forest fuels at the ranch and a fast, coordinated response by firefighters kept people and buildings safe.

The Colorado State Forest Service advised ranch managers to protect their cabins from wildfire, and ranch managers did just that. A month prior to the Y Fire, they established a 150- to 200-foot firebreak around several buildings that previously were nestled in a thicket of timber.

"When the fire hit the firebreak, it literally dropped to the ground, and between the weather, a logger who was putting in dozer line, and the rest of our efforts, we were able to get a handle on it," said Ron Cousineau, Colorado State Forest Service firefighter and Granby District forester. "The firebreak did exactly what we wanted it to."

A firebreak at YMCA Snow Mountain Ranch not only protected the YMCA cabins, it also kept the fire from spreading into the neighboring Fairways at Pole Creek subdivision, which has about 100 homes.

Grand County Sheriff and Emergency Medical Services, every fire department in the county, the Colorado State Forest Service, the U.S. Forest Service, and Summit County fire departments all helped with the firefighting efforts.

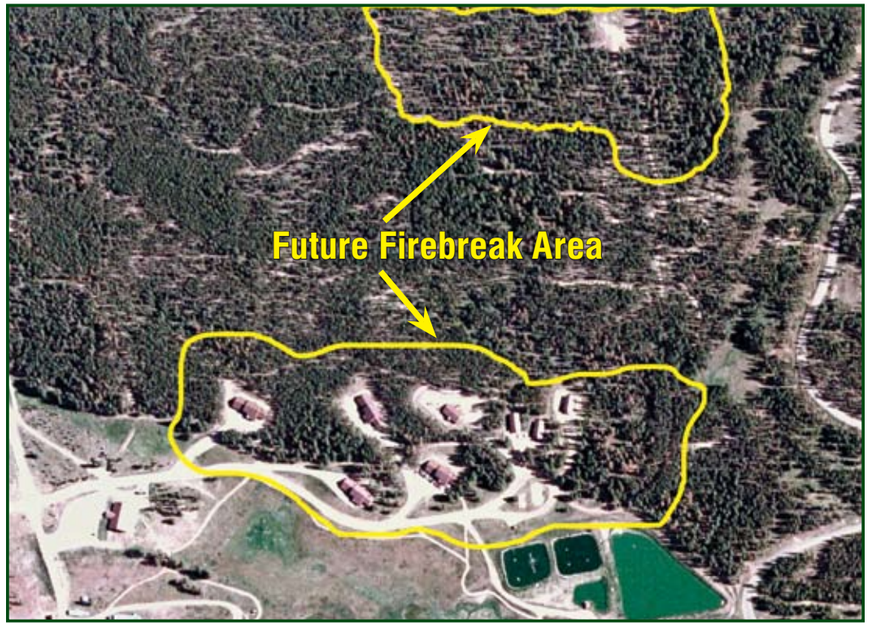
Deborah Carr

Forest thinning work reduced fire behavior in other parts of the fire.

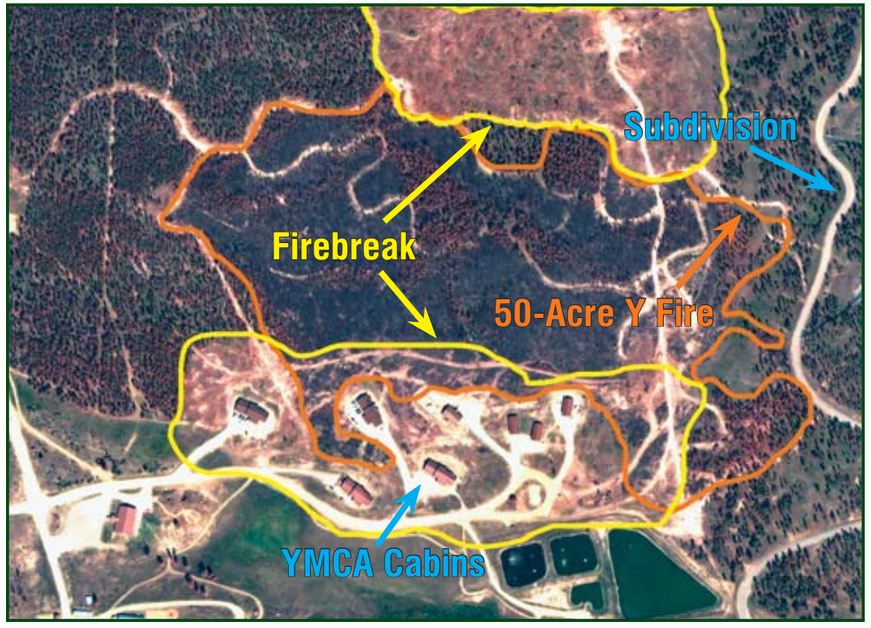
Paul Mintier

Firefighters attribute the fire's unusual intensity for the early time of year and moderate weather to beetle-infested trees.

Aerial imagery of the YMCA camp shows the firebreak location (outlined in yellow) and the extent of the Y Fire (outlined in orange). A firebreak is an area where trees and shrubs are removed so that a wildfire drops to the ground, allowing firefighters a better chance to extinguish the fire. Firebreaks can involve a significant amount of work and hazardous fuel removal, but, as seen in the lower image, can be successful in protecting homes from wildfire.



Before the Firebreak and the Y Fire, 2005



After the Firebreak and the Y Fire, 2007

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QuickBird Satellite Imagery
Courtesy DigitalGlobe, Inc.
and NCDC Imaging & Mapping

Colorado State Forest Service

From the *2007 Report on the Health of Colorado's Forests*

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A
REPORT
TO THE
COUNCIL OF WESTERN STATE FORESTERS

FIRE IN THE WEST

THE WILDLAND/URBAN INTERFACE FIRE PROBLEM

Alaska
Arizona
California
Colorado
Guam
Hawaii
Idaho
Kansas
Montana
Nebraska
Nevada
New Mexico
North Dakota
Oregon
South Dakota
Utah
Washington
Wyoming

A
Report
for the
Western State Fire Managers
by

William C. Teie
Brian F. Weatherford

September 18, 2000

TO: Council of Western State Foresters
FROM: Western State Fire Managers

Structures Lost! is the headline on the morning news more and more these days. It has been thought that this was a problem only in California. It isn't! It is a growing problem throughout the West.

This report was developed in an effort to paint a true picture of the extent of the wildland/urban interface fire problem in the West, and present an action plan on how the states should proceed in an effort to deal with this growing problem. The two most salient points in the report are:

- This problem is going to get a lot worse before it gets better!
- We know what has to be done! We don't have to invent anything! We just have to implement "FireSafe" construction and streamline how we operate.

The Western State Fire Managers want to thank William C. Teie and Brian F. Weatherford for this outstanding report.

Sincerely,

David Behrens, Chair

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Acknowledgment

We would like to thank all those who provided us their expertise on the subject of the wildland/urban interface fire problem. In particular, we would like to thank each of the state fire managers for their input and support. Those questionnaires were not easy to complete.

Specifically, we would like to thank Dave Behrens, Arizona State Land Department; Rich Homann, Colorado State Forest Service; Brian Shiplett, Idaho Department of State Lands, and Tim Murphy, Montana Department of Natural Resources and Conservation; for their support and review of the draft. In addition, we would like to thank Ronny J. Coleman, President FETN and the retired California State Fire Marshal and Chief Deputy Director for the California Department of Forestry and Fire Protection; Ken Blonski, University of California Forest Products Laboratory; Steve Frady, Nevada Division of Forestry; Chris White, Boulder County Land Use Department; Ross Hesseltine, FireSafe Spokane; Gary Marshall, Bend (OR) Fire Department; Jim Graue, Spokane County Fire District 9; and Bob Leaverton, Santa Fe National Forest; for their time and efforts in providing valuable information.

Without the help of these experts, this report would not have been possible.

Additional Copies

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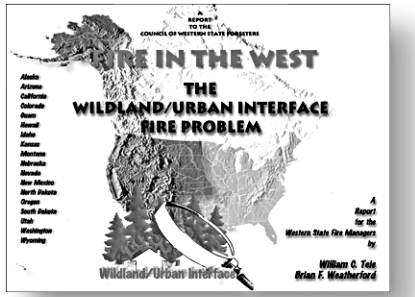


Executive Summary

• Every year wildfires destroy hundreds of structures throughout the West. The wildland/urban interface fire problem exists in every state, and is getting worse. It will continue to get worse before it gets better.

• We already know why houses burn. Quite simply it is because they are not built with fire safe materials and methods, or do not have sufficient clearance from flammable wildland fuels. Building codes, fire codes, and the Urban-Wildland Interface Code have been developed to address the problem. What is lacking is the public and political will to implement the known solutions.

• An increasing amount of attention is being paid to the wildland/urban interface fire problem, both by the media, some state forestry organizations and by the federal government. Attention and funding should be focused on initial attack, mobilization and fuels reduction.

• The disastrous Cerro Grande Fire in Los Alamos provides us a "peek" into the future, and illustrates the "ills" in the wildland fire protection system and how it can fail. It represents an unprecedented learning opportunity for all the players.

• Each state is unique in the authorities and responsibilities given its wildland fire protection agency. Unfortunately, most state forestry departments are not adequately empowered to address the wildland/urban interface fire problem. Codes, regulations, and building standards that would provide for fire safe development in wildland areas exist, but few states or communities have summoned the public and political will to implement them. The most important issues are **ignition-resistant construction** and **defensible space**.

• We need to develop programs that will educate our target public audience (homeowners, legislators, planners, and developers) to the potential for personal disaster in a wildland/urban interface fire. We must change public perceptions and attitudes, and generate a concern for fire safety that will overcome existing public apathy and political inertia.

• States need to map and assess the extent of the wildland/urban interface problem, and share this data with the fire community, planners, developers and legislators.

Wildland/Urban Interface

• The states need to improve their support to local fire forces that can add tremendous capability to initial fire attack operations and structure protection mobilization during major fires. State agencies need to assess and improve their ability to respond to the wildland/urban interface fire problem and to effectively mobilize and manage available local government fire resources.

• States need to take the initiative in transforming their relationship with the federal wildland agencies to one of true cooperation, framed in cooperative fire protection agreements and operating plans.

• States need to apply pressure to the federal government to focus more attention on the problem in the West, and to pressure FEMA to move from funding rebuilding of burned structures to funding mitigation measures before the fire.

• An opportunity exists to combine wildland/urban fire problem mitigation efforts with forthcoming forest health initiatives. Both will require careful planning and execution to be successful. Increased use of prescribed fire can serve both purposes simultaneously, but may require some loosening of Clean Air Act regulations. States need to enact tort claim protections for use of prescribed fire.

• With a proposal to provide an additional $1.6 billion to the budgets of the USDA Forest Service and the Department of Interior for 2000 fire season related issues, and in particular the wildland/urban interface fire problem, it is imperative that the states have a plan.

• The states need to increase the involvement of the private sector in the solutions to the problem. Small landowners, timber companies, insurance companies, developers and builders, and the banking community all have a vested interest in solving the wildland/urban interface fire problem and need to be brought into active partnerships with the total fire community.

• The states should develop plans to move beyond federal excess property. This equipment has served the states and rural fire departments well, but there is a need to develop plans to replace this equipment.

Wildland/Urban Interface

• Critical solutions that need to be implemented include: assessment and mapping of problem areas; public education; adoption of the Urban-Wildland Interface Code; clarification and revision of the Federal Fire Policy; increased use of prescribed fire (both for hazard reduction and forest health); construction of fuelbreaks; improving the training, equipment, and mobilization of local fire forces; establishment of state interagency fire management teams; and clarification of relationships through written cooperative fire agreements and operating plans.

• If nothing else is possible, states should at least focus their limited resources on achieving compliance with **ignition-resistant roofing standards** and providing **defensible space** around all structures in the wildland/urban interface.

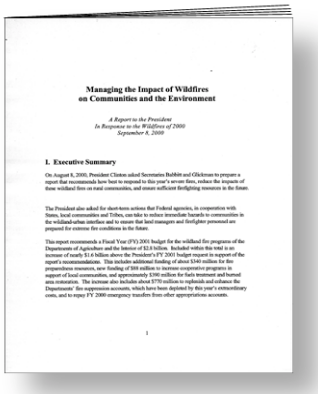
Wildland/Urban Interface

Preface

The wildland/urban interface fire problem has been studied and discussed for years. In the “old days” it was a rural problem. Then in 1961 the Bel Air Fire destroyed over 400 homes in the hills above Los Angeles and a new phrase was born – wildland/urban interface. We as a society want quick fixes to our problems, but there will be no quick fixes to this one. Developing an immediate and politically acceptable solution is unachievable!

The solutions are well understood. It is the implementation of these solutions that is lacking. This report will attempt to put the problem in prospective and present an action plan that is practical and achievable, IF there is a will to do it.

On September 8, 2000, the ***Managing the Impact of Wildfires on Communities and the Environment***, ***A Report to the President***, was published. This report recommends the addition of $1.6 billion to be added to the 2001 budgets of the USDA Forest Service and the Department of Interior. The proper implementation of the recommendations contained in this very important report can go a long ways toward lessening the impacts of the forest fuel buildup and the wildland/urban interface problem.



Managing the Impact of Wildfires on Communities and the Environment

A Report to the President
In Response to the Wildfires of 2000
September 8, 2000

I. Executive Summary

On August 8, 2000, President Clinton asked Secretaries Babbitt and Glickman to prepare a report that recommends how best to respond to this year's severe fires, reduce the impacts of these wildland fires on rural communities, and ensure sufficient firefighting resources in the future.

The President also asked for short-term actions that Federal agencies, in cooperation with States, local communities and Tribes, can take to reduce immediate hazards to communities in the wildland-urban interface and to ensure that land managers and firefighter personnel are prepared for extreme fire conditions in the future.

This report recommends a Fiscal Year (FY) 2001 budget for the wildland fire programs of the Departments of Agriculture and the Interior of $2.8 billion. Included within this total is an increase of nearly $1.6 billion above the President's FY 2001 budget request in support of the report's recommendations. This includes additional funding of about $340 million for fire preparedness resources, new funding of $60 million to increase cooperative programs in support of local communities, and approximately $380 million for fuels treatment and burned area restoration. The increase also includes about $770 million to replenish and enhance the Departments' fire suppression accounts, which have been depleted by this year's extraordinary costs, and to repay FY 2000 emergency transfers from other appropriations accounts.

1

The Council of Western State Foresters asked the Western State Fire Managers to develop a wildland/urban interface strategy for the West. Toward this end, the fire managers commissioned William C. Teie and Brian F. Weatherford to develop a report analyzing the situation, making recommendations on the best strategies and tactics to implement, and providing a list of some of the initiatives being used in various locations in the West.

Wildland/Urban Interface

Introduction

Each summer the headlines in the newspapers of the West read, "***Structures Lost***!" as a reminder that a wildfire has again destroyed someone's home or business. The wildland/urban interface fire problem is one that will get a lot worse before it gets better—and it will never completely go away.

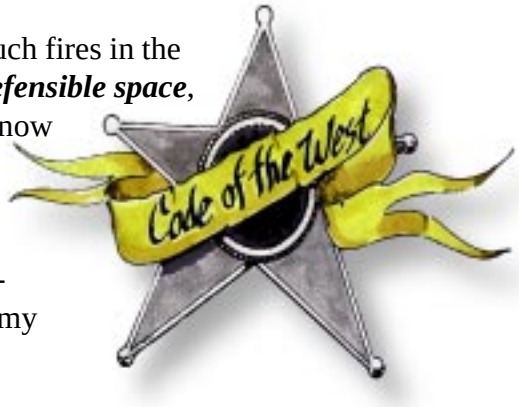
It is no longer just a California problem!

As far back as you want to remember, the wildland/urban interface fire problem was one that most felt was a California problem. With a large population, highly flammable fuels, steep terrain, hot dry summers and the infamous Santa Ana winds, it seemed that each summer and fall homes were burning in the Golden State. The statistics bear this out, with California having had 203 interface fires between 1955 and 1999. These fires burned over 3.2 million acres, destroyed over 11,000 structures and caused the deaths of 62 firefighters or civilians. But the picture has changed in the last decade.

Since the beginning of the '90s, the rest of the West has experienced a growing number of wildland/urban interface fires. Nearly all of the Western States have experienced wildfires that have destroyed homes or businesses. Most of the Western States have now joined California as states that have experienced serious wildland/urban interface fires that have destroyed scores of homes. (See the Appendix for detailed information).

We already know how to make homes FireSafe!

After each devastating fire, people asked, "how can we prevent such fires in the future?" We know the answer…it's ***ignition-resistant construction, defensible space***, enclosed eaves and decks, adequate water, etc. It is not that we don't know the answer, it is that we cannot get the general public, politicians, or private industries interested in implementing the solutions.



The "Code of the West" comes into play…whether it is the homeowner who says: "I didn't move into the woods to cut it down…leave my

Wildland/Urban Interface

trees and brush alone," or the politician saying, "you moved into the country, so don't expect the same level of service you had in the urban area."

Both sides of the issue think it is a problem that will happen to someone else in some other place. That is, until it visits them! Any person who lives in a wildland area is potentially a target for a wildland fire, although some areas are more prone to serious fires than others.

Mitigate growth, existing problems and respond as needed!

Any plan to move toward solving the problem must not only address the growth in the West, it must address the problem of millions of existing structures at risk. It must also address the existing level of fire protection and it's ability to cope with this ever-increasing problem.

In a nutshell, the public, planners, and politicians need to be convinced it is in their best interest to address the issue of growth in the wildland as it develops and to implement actions that will bring both new and existing structures into compliance with fire safe guidelines. Incentives such as strict laws and regulations, low-interest loans, or reduced insurance premiums must be developed to insure the full participation of all homeowners in the wildland/urban interface.

The West is different!

There are several factors that make the West unique when compared to the rest of the Nation. These distinctions must be fully understood and appreciated before we can focus on appropriate funding allocations. Some of those factors are:

Its Size—The West is large. There are 2,119,441 million square miles in the seventeen western states. This is just over 57 percent of the total acres in the Nation.

Its Topography—The West has mountains; "you can lean against most of it." This has a direct impact on fire behavior, resistance to control, access and local weather.

Its Weather—The weather in most of the West features long dry summers, hot dry winds, and extremely low relative humidity; all of which have a direct impact on fire behavior. The regional weather patterns annually spawn dry lightning storms that start thousands of fires. The fall brings strong winds.

Wildland/Urban Interface

Its Forest Conditions—The nature of the wildland vegetation and the many "fire regimes", in combination with topography and weather, create large areas with very high to extreme fire hazard. The forest health is suffering and the buildup of residual fuels is at dangerous levels. This is further complicated by federal land management ownership and policies.

Its Federally Owned Lands—Over 58 percent of the West is in federal ownership. This makes the various federal land management agencies major players in how the forests of the West are managed and protected (Figure 1).

Its Federal Partners—There are six federal wildland fire "fighting" agencies in the West: USDA Forest Service, USDI Bureau of Land Management, USDI National Park Service, USDI Bureau of Indian Affairs, USDI Fish and Wildlife Service, and the Department of Defense. Each of the agencies has different "charters" and land management policies.

	Areas, in acres.							
	Forest Service	*Bur of Land Management*	*Bur of Indian Affairs*	*Fish and Wildlife Service*	*National Park Service*	*Dept of Defense*	*Other Federal*	*TOTAL*
Alaska	22,004,745	86,908,060	1,140,410	76,321,037	52,891,681	1,677,718	22,851	240,966,502
Arizona	11,250,693	14,252,778	20,718,207	1,716,858	2,629,633	1,219,717	2,751	51,790,637
California	20,627,691	14,556,074	191,020	323,642	4,615,013	1,753,493	434,695	42,501,628
Colorado	14,501,592	8,296,512	32,835	81,574	574,689	415,473	358,175	24,260,850
Hawaii	1	0	0	288,511	220,410	127,734	1,627	638,283
Idaho	20,442,651	11,847,328	55,700	76,068	86,866	14,402	1,067,840	33,590,855
Kansas	108,175	0	40,234	58,332	698	143,447	97,088	447,974
Montana	16,872,610	8,060,382	1,074,907	1,153,013	1,221,314	2,540	316,204	28,700,970
Nebraska	352,133	6,580	66,469	172,360	5,863	18,703	119,139	741,247
Nevada	5,815,856	47,844,391	1,233,000	2,318,069	165,500	484,965	1,699,739	59,561,520
New Mexico	9,326,599	12,770,569	8,349,148	384,251	371,827	3,180,226	453,865	34,836,485
North Dakota	1,105,779	59,717	866,896	487,654	71,640	2,112	1,273,320	3,867,118
Oregon	15,664,078	16,223,739	796,588	557,479	194,859	31,072	133,625	33,601,440
South Dakota	2,013,628	279,869	5,002,056	198,086	263,629	890	60,455	7,818,613
Utah	8,112,462	22,877,713	2,331,094	419,169	2,015,426	939,973	660,613	37,356,450
Washington	9,174,956	370,110	2,602,254	186,369	1,932,401	433,251	752,979	15,452,320
Wyoming	9,258,281	18,383,926	1,889,532	86,486	2,393,198	9,512	815,841	32,836,776
TOTAL	166,631,930	262,737,748	46,390,350	84,828,958	69,654,647	10,455,228	8,270,807	648,969,668

Figure 1. Over 58 percent of the land in the West is owned by the Federal government.

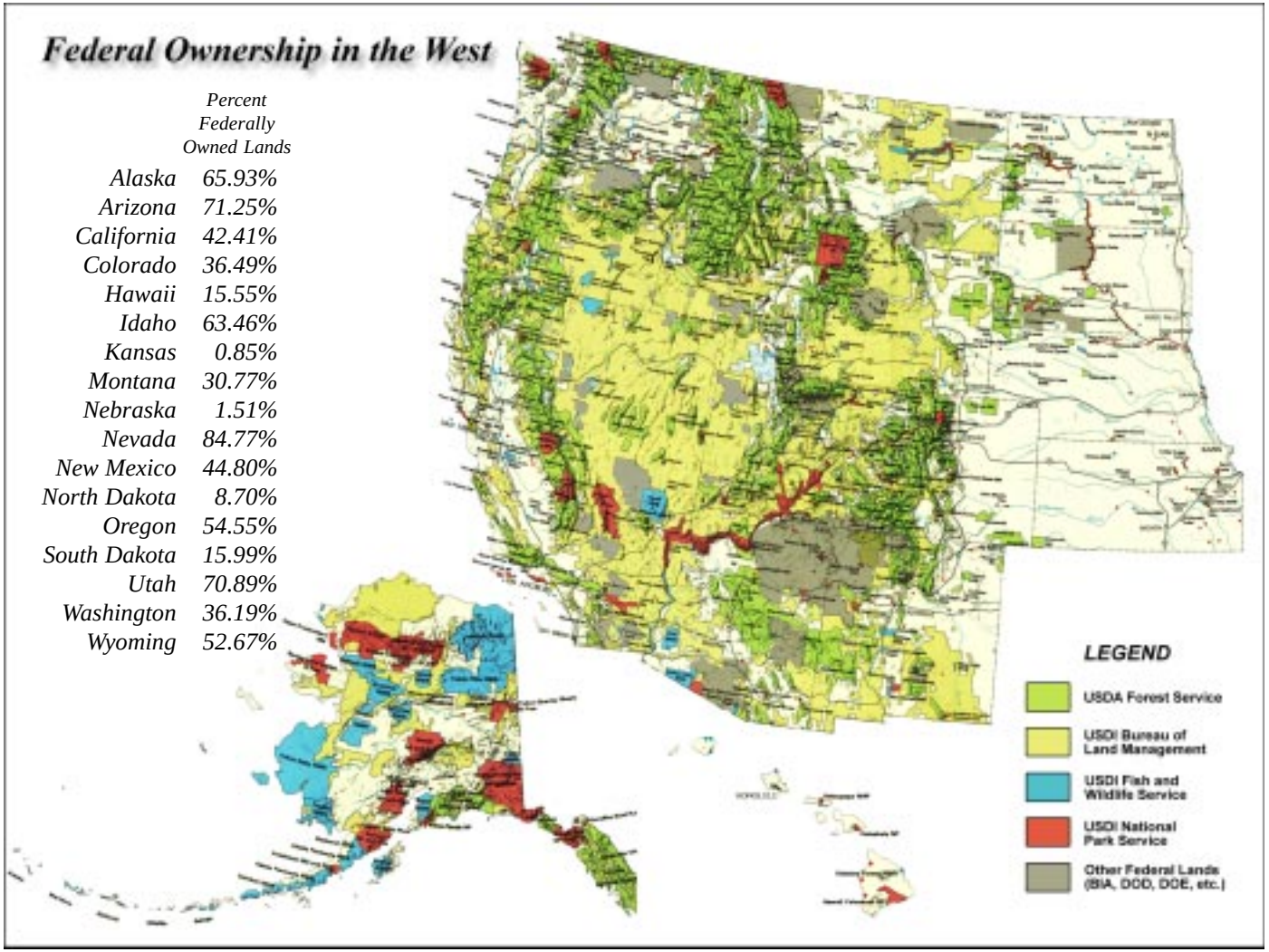
Wildland/Urban Interface

Its Sovereign Nations—The vast majority of Tribal Lands in the Nation are in the West. This is further complicated by the evolving relationship between the USDI Bureau of Indian Affairs and the various Tribal Governments.

Its Forest Service Organization—The Forest Service has seven regional foresters in the West. This complicates the development of a single strategy for how federal dollars will be spent in the West.

The Wildland/Urban Interface Fire Problem—The extent of the Wildland/Urban Interface fire problem in the West cannot be understated. The urban sprawl will continue to grow, placing more homes in danger each year. The West as a whole is now experiencing more and more wildland/urban interface fires. The 2000 fire season dramatically supports this contention.

Its Wilderness and Roadless Areas—The vast majority of federal wilderness and roadless areas are in the West. Both have a significant impact on wildland firefighting operations.



Gathering the Data

The initial phase of data collection for this report was a questionnaire developed by the consultants and sent to the fire managers of each of the seventeen western states and the Pacific island territories. Each of the states completed and returned the questionnaire, along with supporting documents and data relative to their specific issues.

The questionnaire consisted of 24 questions relating to the nature of the wildland/urban interface problem in the state, the state agency's authorities and responsibilities to mitigate the problem, what state fire managers are doing and what they think they should be doing, mutual aid, training, federal agency involvement, and what ideas for problem solutions may be lurking out there.

Fire Managers Responses
Within this report, the responses of the state fire managers to the questionnaire are summarized in text boxes like this one.

Guam

Of the U.S Pacific trust territories, only Guam replied to our wildland/urban interface fire problem questionnaire, and "Yes, Virginia, there is a" wildland/urban interface fire problem in Guam. Because Guam's fire protection system and interface problem are so different, it deserves its own section in this report.

Located some 3,700 miles west of Hawaii, Guam is on the other side of the International Date Line, and thus *"where America's day begins."* While most of us would consider Guam's climate to be tropical (70-90" of rain per year), it has a definite dry season and large areas of grass and brush. El Nino weather patterns bring drought and high fire danger. Much of Guam is set aside in natural reserves (mini-wilderness areas) that complicate the wildland fire problem. Many villages are experiencing rapid growth due to land and housing initiatives for native peoples, and homes are spreading into the wildland. Despite its differences, Guam, like many western states, has lost structures to wildland fires large enough to qualify for FEMA funding. For a more complete description of the wildland/urban interface problems in Guam, refer to the Appendix.

Wildland/Urban Interface

Background

You cannot really understand the complexities of the wildland/urban interface fire problem in the West until you understand something about the fire protection systems in this Nation.

Benjamin Franklin started the first organized fire department in the United States in Philadelphia on December 7, 1736. For over a hundred years fire protection focused on urban areas…rural and forested areas of the Nation went unprotected. The rural areas of this Nation could not afford the level of protection found in most cities. The rural residents provided their own fire protection, using old equipment and staffing the engines with citizen volunteer firefighters. It wasn't until the Forest Service was formed early in the 20th Century that fire protection was provided to wildland areas.

Fire Protection Jurisdictions and Responsibilities

In the United States, there are three basic levels of government: local, state and federal. Each level of government has different authorities and responsibilities, but each has an important role to play in mitigating the wildland/urban interface fire problem.

Local government is defined as incorporated cities, counties, boroughs, or special districts. Volunteer fire companies will be listed under local government. There are thousands of fire departments in the West, most of which have their own fire authority or agency (Figure 2). The protection of life and property is the primary function of a local fire department.

The number of rural and municipal fire departments varies greatly in the West. Hawaii has only seven to deal with, where California has over 900 fire departments in the state. At last count, there are 6,394 rural or municipal fire departments in the West.

Local fire departments often play a major role in protecting structures that are being threatened by a wildland/urban interface fire. None of the western States can adequately deal with a major wildland/urban fire situation without the assistance of local fire departments and the cooperation of the Federal land management agencies. In some parts of the West, rural fire departments are not supported by any taxing authority. In fact, large areas may have no organized fire protection at all.

Even where they do exist, local fire departments provide greatly differing levels of fire protection services. Depending on local conditions, some may have grass or brush fire trucks to deal with small grass or grain fires, but very few have the resources (engines, water tenders, handcrews, aircraft, etc.) to tackle a major wildland fire without state and/or federal assistance.

A typical local government fire department involved in the wildland/urban interface fire problem would be a rural fire district centered on an unincorporated small town with maybe two fire stations, each with a structural fire engine, a grass rig, a water tender, and probably a rescue squad staffed by a small, but dedicated, group of volunteer fire fighters.

While training and equipment standards vary greatly, these local government fire departments wind up being the key players in protecting structures from encroaching wildfires in the wildland/urban interface.

	Number of Local Fire Departments
Alaska	***288***
Arizona	***252***
California	***927***
Colorado	***398***
Hawaii	***7***
Idaho	***209***
Kansas	***673***
Montana	***420***
Nebraska	***490***
Nevada	***211***
New Mexico	***359***
North Dakota	***396***
Oregon	***438***
South Dakota	***364***
Utah	***230***
Washington	***560***
Wyoming	***172***
	6,394

Figure 2. Local fire departments play a vital role in the protection of each state's wildland resources. They especially come into play for structure protection during a wildland/urban fire.

Rural Fire Protection – The most basic of fire protection is provided by thousands of dedicated volunteer firefighters. They provide basic fire protection services to their communities for no pay…just the satisfaction of serving their community. In a lot of cases, taxing authorities do not support these fire departments. They have to raise the money for the gas, oil and insurance by selling baked goods or sponsoring raffles. These types of fire departments usually respond to structure fires, medical aids, traffic accidents and wildland fires. Each year they make the first attack on thousands of wildland fires in the West. They provide this protection with little or no training and frequently are poorly equipped.

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Municipal Fire Protection – As the population of an area increases and the community can afford it, a city or fire protection district may hire some full-time firefighters, operate aerial truck companies, and evolve to a municipal fire department. Municipal fire departments respond to the same type of emergencies as those in the rural areas, but the structures may be taller and the fire protection operations more technical and specialized. Most municipal firefighters, be they volunteer or full-time, are not adequately trained or equipped to fight wildland fires.

Authorities and Responsibilities

Surprisingly, not every state forestry agency has the legal authority to fight wildfires, let alone initiate programs aimed at the wildland/urban interface fire problem. Only four of the state wildfire agencies (CA, KS, NV, WY) have the authority to fight structure fires in the wildland/urban interface. Eight states share responsibility for actions in the interface with some other entity, usually a local government fire agency. Thirteen of the seventeen states said that they thought most of the "players" in the interface understood their individual roles and responsibilities.

State Level Fire Protection

State government in the West addresses fire protection issues in varying ways. In most states, there may be more than one state agency that has some role to play in wildland fire protection. There are the State Forester, the State Emergency Management agency, the National Guard, and the State Fire Marshal, to name a few.

State Forestry Agencies – The state forestry agencies in the West vary greatly in their authorities and responsibilities. Several states have adopted laws that direct the State Forester to provide wildland fire protection and provide funding, personnel, and equipment to deliver services. Other states give the responsibility of providing wildland fire protection to the State Forester, but do not provide funding for such protection. Only Nevada has given its State Forester the responsibility to provide fire protection at the same level as traditional local governmental entities.

Federal Level Fire Protection

Federal Government agencies own or control 648,969,668 acres or 58 percent of the land in the West. The Federal land management agencies provide differing levels of wildland fire protection depending on their authorities and responsibilities. The levels of wildland fire protection provided by the USDA Forest Service and the USDI Bureau of Land Management differ from that provided by the USDI National Park Service, simply because their missions are different.

In some cases, the various authorities and responsibilities between federal, state and local agencies may be overlapping and in conflict. This can lead to confusion and frustration. The wildland fire

Wildland/Urban Interface

protection problem is further compounded by the fact that wildland fires know or respect no political boundaries.

Jurisdiction vs. Responsibility

There is a lot of the West that has no form of fire protection, but where there is protection, there are four basic types: Rural; Municipal; State Forestry; and Federal. Each jurisdiction or agency has different authorities and responsibilities. This section of the report will attempt to describe these differences.

On each piece of ground, only one level of government, and one government agency has *jurisdiction* for wildland fire protection. On federally owned wildland that is one of the federal land management agencies. On private lands, perhaps the state, or a county, city, or district may have jurisdiction. Jurisdiction means having both the legal authority and the financial obligation for fire protection The area of jurisdiction for a city or special district is easily defined; it is the area within the city limits or district boundary. The area of responsibility for a federal agency is the land it owns. The area of jurisdiction for a state is usually most complex. This area, called ***state responsibility area***, is defined in a piece of legislation that places "qualifiers" on the land. It may be land owned by the state, or all forested lands within the state that are not within an incorporated city or owned by the federal government, or all privately owned forested lands (Figure 3).

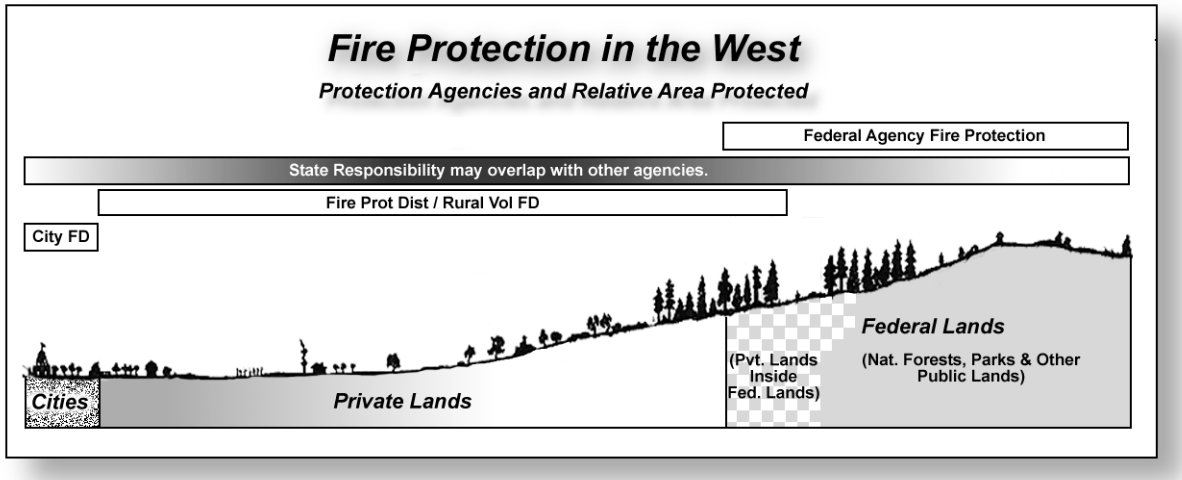


Figure 3. Wildland fire protection can be very complicated. There may be areas where the protection responsibilities overlap and may even be in conflict. Local authority is usually the simplest. State responsibilities differ with each State and usually overlay local government. Federal protection responsibilities differ between the agencies, and the federal government provides some funding to the States and volunteer fire organizations in the West.

There is a difference between jurisdiction and protection responsibility. A jurisdiction may contract the protection of its land to another agency (e.g. in a "balancing of acres" co-operative fire protection agreement, or formal contract).

A *state* ***direct protection area*** is that area of the state where state forces provide direct fire protection. The direct protection area usually includes state responsibility area, but it may also include lands of another agency that it protects under the authority of a contract or cooperative agreement. The best example of this type of protection is when a state protects federal lands that are adjacent to state protected lands, or when the Forest Service protects private lands within a national forest.

A ***local protection area*** is an area where the state has not declared it has a direct responsibility. This may be non-forested area within a city or fire district. The primary fire protection responsibility in these areas lies with the local governmental entity, or there may be no fire protection at all.

Levels of Protection

To fully understand the extent of the wildland fire protection in the West, there has to be a discussion of the various levels of protection provided by the states. As mentioned, there is a vast difference in the authorities, responsibilities, and the levels of protection provided (Figure 4). There are three general levels of wildland fire protection provided by the western states:

- ***Direct Protection*** – A state is providing direct protection when it provides funding for personnel and equipment to protect its state responsibility area. There is a command authority and direct employment of firefighting personnel designated to provide protection. Examples: Alaska, California, Idaho, Montana, Oregon, and Washington.

	Area Protected (in acres)			
	Direct	Cooperative	Coordination	Total
Alaska	151,695,898			151,695,898
Arizona		22,200,000		22,200,000
California	27,740,608	11,000,000		38,740,608
Colorado	41,432,979			41,432,979
Hawaii	850,000		3,306,300	4,156,300
Idaho	6,025,690			6,025,690
Kansas			46,400,000	46,400,000
Montana	5,192,118	45,300,000		50,492,118
Nebraska			49,083,520	49,083,520
Nevada	11,999,791		20,919,540	32,919,331
New Mexico		42,500,000		42,500,000
North Dakota			31,878,661	31,878,661
Oregon	11,300,000	2,300,000		13,600,000
South Dakota	949,117		47,000,000	47,949,117
Utah		15,000,000		15,000,000
Washington	12,708,567			12,708,567
Wyoming	4,237,000		24,863,000	29,100,000
	274,131,768	138,300,000	223,451,021	635,882,789

Figure 4. Each State defines its responsibilities differently. If the State establishes a direct protection area and provides funding and resources to protect it, this is direct protection. Other States may take the responsibility to assist in protection, but use forces from other agencies to protect the area...this is considered cooperative protection. The third type of protection is coordinated protection. This is when the State has given the State Forester broad responsibilities, but limited funding to provide the protection.

- ***Cooperative Protection*** – A state is providing cooperative protection when it provides funding for the protection of its state responsibility area, but provides the protection using other agencies' forces under a cooperative agreement. There is a command authority and limited firefighting forces, but the primary firefighting forces are another agency's employees. Examples: Arizona, New Mexico and Utah.

- ***Coordinated Protection*** – A state is providing coordinated protection when it does not have funding to provide suppression activities, but provides coordination of wildland fire prevention activities and suppression efforts throughout the state. Fire protection of privately owned lands is the responsibility of local agencies. Examples: North Dakota, Kansas, and Nebraska.

There may be hybrids of these three levels of protection. An example is Montana. The state Department of Natural Resources Conservation provides direct protection to 5 million acres of privately or state owned timberlands, but they also provide cooperative protection on 45 million acres of non-forested private lands in the eastern part of the state.

Fire Protection Types

There are three primary types or levels of fire protection services:

- ***Life and Property Fire Protection*** – a service with the primary responsibility to protect structures AND the people who occupy these structures from injury or death. This fire protection service is normally provided by rural and/or local government fire departments, with specially trained and equipped personnel. After life safety, the priority is to keep the fire from leaving the area of origin. It also includes protecting the structure from an advancing wildland fire. Local taxpayers fund this service through a variety of taxing authorities. (The equipment and training required to conduct life and property protection is not normally provided to the wildland firefighter.)

- ***Wildland Fire Protection*** – a service with the primary responsibility of protecting natural resources and watersheds from damage by wildfires. State and federal forestry or land management agencies normally provide wildland fire protection with specially trained and equipped personnel. Various taxing authorities and fees fund this service. Some wildland fire protection agencies have the responsibility for intermingled life and property protection when a

wildland fire threatens structures...and some do not. It is nearly impossible for an incident commander to separate these responsibilities (and the associated costs) during a wildland fire. (The equipment and training required to conduct wildland fire protection is not normally provided to the local government fire department firefighter. If a fire protection agency is routinely called upon to fight wildland fires, they are usually trained and equipped to do so. A significant safety problem arises when personnel from any agency are called upon to fight fires for which they are NOT properly equipped or trained.)

- ***Wildland fire management***– allowing a fire to burn in specific areas, under specified weather conditions, to achieve specific resource management and/or protection objectives. The fire may be an unwanted or a prescribed fire from a natural or planned ignition source. Requires ownership or management authority over the land by the fire protection entity.

Wildland/Urban Interface Conditions

The wildland/urban interface exists where humans and their development meet or intermix with wildland fuels. There are four different wildland/urban conditions:

- ***Interface Condition*** – is a situation where structures abut wildland fuels. There is a **clear line of demarcation** between the structures and the wildland fuels along roads or back fences (Figure 5). Wildland fuels do not continue into the developed area. The development density for an interface condition is usually 3+ structures per acre. Fire protection is normally provided by a local government fire department with the responsibility to protect the structure from both an interior fire and an advancing wildland fire (unless the line of demarcation is also a jurisdictional boundary).

Figure 5. Interface Condition, where there is a clear line between the structures and the wildland fuels.

- ***Intermix Condition*** – is a condition where structures are **scattered throughout** a wildland area (Figure 6). There is no clear line of demarcation; the

wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection, and may also have wildland fire protection responsibilities.

Figure 6. Intermix Condition, where there the structures are scattered throughout the wildland fuels.

- ***Occluded Condition*** – is a situation, normally within a city, where structures abut an **island** of wildland fuels (park or open space). There is a clear line of demarcation between the structures and the wildland fuels along roads or fences. The development density for an occluded condition is usually similar to those found in the interface condition and the occluded area is usually less than 1,000 acres in size. Fire protection is normally provided by a local government fire department. The trend is for local government to require developers to include open space in their plans, but not include a long-term mechanism for their maintenance; thus the hazardous fire condition increases over time.

- ***Rural Condition*** – is a situation where **scattered** small clusters of structures (ranches, farms, resorts, or summer cabins) are exposed to wildland fuels (Figure 7). There may be miles between these clusters. Structural fire protection service may not be available. These types of developments often exceed the capabilities of both the structural and wildland fire protection systems. Wildland fire protection agencies have little or no control over such development and may be unable to provide protection due to statutory barriers.

Figure 7. Rural Condition, where the structures or clusters of structures are situated in wildland fuels. These structures or clusters are often miles apart.

Wildland/Urban Interface

The Status of the Problem in the West

This section of this report will outline the various aspects of this complicated issue. Most of the information that is presented was gathered from the extensive questionnaire and interviews with experts in the field.

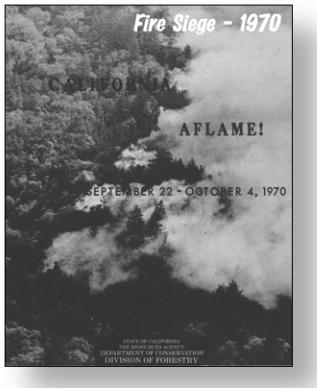
History of Wildland/Urban Interface Fires in the West

The list of wildland/urban interface fires in the West is impressive. There is no question this is a Western problem. Yes, Florida and several other states in the other parts of the Nation experience wildland/urban interface fires, but it is spotty, and usually only during prolonged drought conditions. The West has the dubious distinction of having "the mostest" every year. Not every year will be a bad fire year in every western state, but every year wildland/urban interface fires will threaten and destroy structures somewhere.

Problem Analysis
Every state reported that it had a wildland/urban interface problem, ranging from a small problem in the plains, to an extreme problem in South Dakota, Colorado, Utah, Washington, and California. All states agreed that the problem was increasing. The states reported that the problem was destined to get worse due to high population growth (e.g. +825,000 people by 2010 in Colorado; 30,000 acres per year lost to development in Washington, etc.), lack of local control over development, leapfrog development (i.e. "urban sprawl"), checkerboard ownership patterns, and public ignorance and apathy.

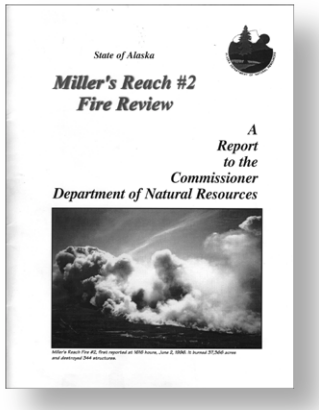
As part of the data collection process for this report, each state submitted its wildland/urban interface fire statistics. For purposes of this report, a wildland/urban interface fire is one that burned more than 25 acres of wildland and destroyed at least three structures. (See Appendix for detailed fire history data). The data support some of our preconceptions, but also reveal some new truths about fire in the interface.

As we would expect, the fire data list from California is by far the most extensive. Since the 1960's, hardly a year goes by in the Golden State without significant structure loss to wildfire. Some years, single large fires (e.g. Bel Air-1961-484 structures) are to blame, and other years a series of large fires (e.g. 1970 Series –722 structures) was responsible for the destruction. A single fire, the Tunnel Fire in Oakland in 1991 created both a lesson for fire managers and a statistical anomaly when it destroyed more than 2900 structures and killed 25 people while burning just 1,600 acres in a densely urban area.



Wildland/Urban Interface

But wildfires with major structure loss do not occur only in California. One of the biggest structure loss wildfires is the Miller's Reach #2 fire in Alaska (our least densely populated state), which destroyed 454 structures in 1996. This year's Cerro Grande fire in New Mexico burned 47,650 acres and destroyed 350 structures, most in the City of Los Alamos. Each year in the 1990's, Montana's list of wildfires destroying structures has been getting longer, and in 2000 apparently will set new records. Of all the western states, only Kansas could not produce data showing structures lost to wildland fire.


State of Alaska

Miller's Reach #2
Fire Review

A
Report
to the
Commissioner
Department of Natural Resources

Unfortunately, not all states regularly collect comprehensive data on wildfires, including structure loss. Some states had to be reminded by old timers of fires that destroyed numerous structures, but which are not captured in a database. Lack of a nationwide, standardized statistical forest fire reporting system and database hinders broader understanding of the wildland/urban interface fire problem.

During the late 80s and 90s, all of the other states (except Kansas) experienced a significant increase in fire activity. Some of the fires of significance were:

	Fire Name	*Year*	*Acres*	*No. Structures lost*
Alaska	Miller's Reach #2	1996	37,336	454
Colorado	Bobcat and High Meadows	2000	21,527	73
Idaho	Lightning Fire Series	2000	1,283,998	100+
Montana	Lightning Fire Series	2000	922,124	322
New Mexico	Cerro Grande	2000	47,650	350
Oregon	Hull Mountain	1994	7,990	44
South Dakota	Westberry Trails	1988	3,840	57
Utah	Wasatch	1990		43
Washington	Fire Storm 91	1991	350,000	191

Wildland/Urban Interface

The 2000 Fire Season

One would hope that the 2000 fire season is an anomaly; but don't bet on it. It is felt that it is just a peek at what can be expected in the future. In 1910, the worst year for fires in the Northern Rockies, the fires burned in forests that had been logged. Ninety years later we say that the fires are burning in

fuels as a result of effective fire suppression efforts. But, let us not forget, it is the weather that starts these fires, and the weather that allows these fires to burn the way they do.

Just look at the acres burned in the Nation since 1990 (Figure 8). The trend predicts a steady increase. If you only look at the last several years the trend line really shows an increase in annual acres burned.

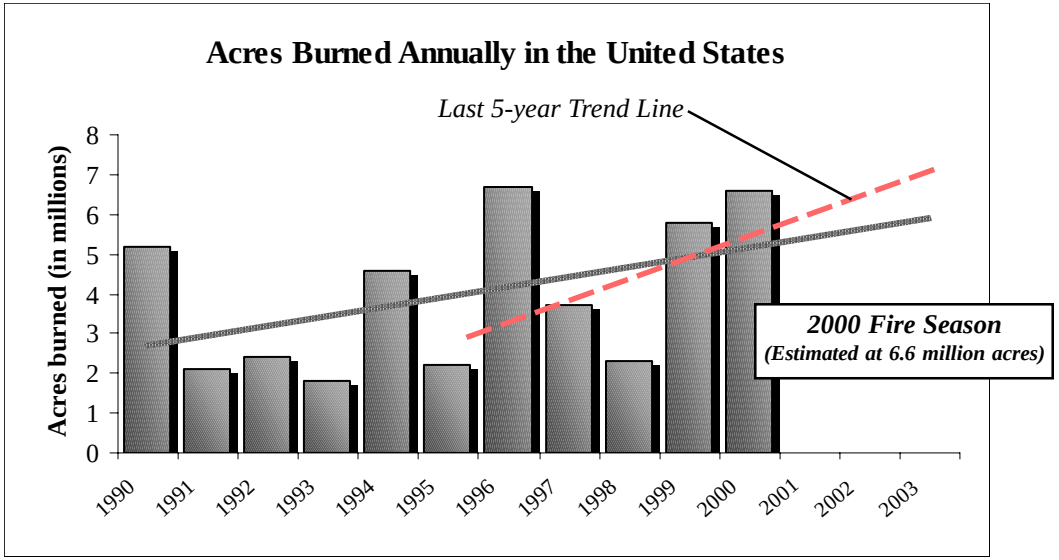


Figure 8. The number of acres burned each year in the United States is on the rise.

Cerro Grande Fire

Early in the 2000 fire season, there was a fire that brings into focus most every thing that is wrong with the system. The Cerro Grande Fire provides a peek into the future…we must learn from this disastrous fire and work toward correcting some of the problems.

The Cerro Grande Fire started on the National Park Service, Bandelier National Monument as a prescribed fire on May 4, 2000. On May 5, 2000 it escaped and was declared a wildfire. On May 10th the fire entered Los Alamos, New Mexico, destroying 450 structures (235 residential structures that housed 410 dwelling units, 195 outbuildings and 20 structures on the National Laboratory). This fire was unique in several ways, and it provides a "peek" into the future. The following are some of the issues raised by this fire:

- **Prescribed Fire** – It doesn't take nuclear scientists to figure out that our land management agencies must conduct more prescribed fires to reduce the buildup of fuels. Planning and conducting a prescribed fire is not an "exact science." Even if all the rules are followed, escapes will happen and homes may be threatened or destroyed. There is a real need to conduct more prescribed fires throughout the West and for everyone to understand that a small percentage of these will escape control. If agency policy and procedures are not followed in planning and conducting prescribed fires, the number of escapes will increase dramatically.

- **Environmental Impact Requirements –** In 1996, the Santa Fe National Forest leadership initiated a report on the wildland/urban interface fire problem in Los Alamos. They developed a plan of action to deal with it. It took four years to complete the environmental review documents so that the work could begin. The fire hit before the work could be completed.

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- **Firefighting Forces** – The execution of a prescribed fire taps firefighting forces and these suppression forces are not available to fight wildland fires.

- **Human Development** – Urban development in or adjacent to the wildlands complicates the use of fire to remove the accumulation of fuels.

- **Smoke** – Some of the more useful prescriptions use low intensity fire, but generate more smoke. Increased burning restrictions from EPA are an obstacle to fuel reduction efforts.

- **Wildland/Urban Interface Planning** – The Santa Fe National Forest had identified the Los Alamos area as a wildland/urban interface area at high-risk for a disastrous fire. They had developed a plan to mitigate this problem, but this plan was shelved until the Environmental Impact Assessment could be completed. Some work had been started, and this was effective.

- **Suppression Operations** – The Incident Organization showed a Structure Protection Group. This group was never fully supported. This was probably a result of the federal fire policy.

- **Clearances** – There were no local ordinances requiring defensible space. There are not any ordinances because the people don't want any. Even after the fire, there are people who do not want to clear the vegetation back from their homes.

- **Building Codes** – There were no extraordinary code requirements developed to attempt to mitigate the hazard that existed.

- **Mobilization** – There was no authority or plan to mobilize local government fire suppression forces available in the State.

- **BAER** – Burned Area Emergency Rehabilitation is a new term in our vocabulary. This is where some of the firefighters have gone! Fire

Wildland/Urban Interface

suppression forces are now used to accomplish this new task. Over $20 million was spent rehabilitating the Cerro Grande fire scar. The actions taken by the Department of Energy, USDA Forest Service and the USDI National Park Service have raised the level of expectation of public related to extent of burned-area rehabilitation that will be taken. Those impacted by wildland fires in the future will expect the government to do more to rehabilitate the burned area.

- **Fire Assignment Rotations** – The federal land management agency fire assignment policy has reduced the maximum days for fire assignments from 21 to 14 days for the 2000 fire season. This will increase the number of firefighters needed to accomplish the same task by at least one-third, and greatly increase travel costs to deliver fresh troops.

- **Area Command** – With the reduction in the level of fire expertise in the various federal agency administrations, some areas have had to establish Area Command Authorities to fill the role of MACS.

- **Incident Management Teams** – The use of these teams has grown tremendously; while the number of teams and level of expertise are declining.

- **Specialization** – The use of more specialists within the federal agencies has depleted the firefighting "militia."

- **Timber Cut** – With the federal land management agencies reducing their annual cut, revenue is lost, the workforce available to fight fire is reduced, and the number of private companies needed to reforest the cut areas is reduced…these people planted in the winter and fought fire in the summer.

- **Budgets** – Fire budgets are static, but the use of these funds is changing. (Example…the timber budgets in some areas were used to purchase engines…for use in slash burning. Now the fire budget has to purchase the engine.)

Roles of State Agencies

Each state government is organized differently, with some fielding strong state forestry agencies with extensive authorities and responsibilities for wildfire prevention and suppression. In other states, the state forester merely provides technical advice, and fire protection is left to local government forces. Funding for wildland/urban interface fire protection is very limited.

If they had the opportunity, the majority of the state agencies would like to be able to sponsor prevention initiatives, provide coordination of mutual aid, provide operational support to local fire agencies, sponsor hazard reduction initiatives, provide more financial support, and have a greater role in direct fire suppression in the wildland/urban interface.

Several states mentioned the need to perform an assessment and mapping of the problem, and to provide more/better wildland fire training to local firefighters.

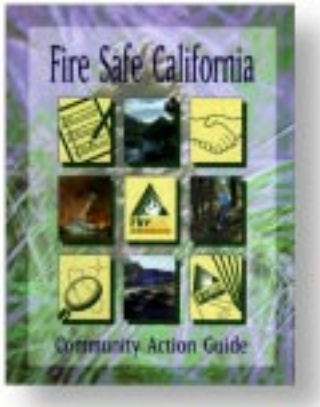
Legislation

Several states reported that significant wildfire events had resulted in some kind of fire safety legislation. After the 1993 fire storms in southern California, the legislature passed the first statewide Class A roofing requirement for high fire hazard areas; after the Tunnel Fire in Oakland, the legislature directed CDF to expand its wildland fire hazard classification system to areas of local responsibility. In Montana, following the disastrous 1988 fire season, the legislature directed the DNRC and State Fire Marshal to develop fire safe guidelines. In Nevada, roofing regulations were developed as the result of bad fires with structure losses. Colorado received a budget augmentation for fire equipment following the 1994 fire season. Unfortunately, most states reported little legislative support for the wildland/urban interface problem.

Twelve of the western states have no state regulations or building standards governing development in the wildland/urban interface. Only seven states have building or fire regulations that can be used to address the interface problem, usually the Uniform Fire Code. In Washington, despite an extreme interface problem and a history of large, damaging fires, the DNRC may only recommend *fire safety features for new development.*

Codes, Regulations and Building Standards

We know the technical measures needed to mitigate the wildland/urban interface fire problem in the West. Unfortunately, we can only implement actions as fast as society allows. Hopefully we are still a system of government that responds to the needs and will of its citizens. Solutions will be implemented only when there is a clear need and strong public support for action. Codes, regulations and ordinances are available if the public can be made sufficiently aware of the problem to generate support for their adoption.



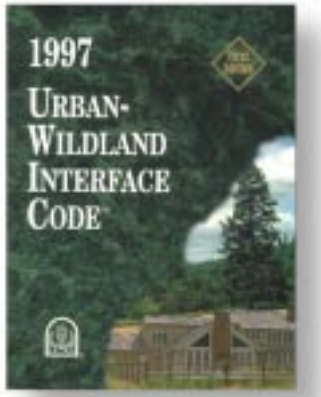
FireSafe California

A variety of FireSafe regulation packages exist in the West. They range from the comprehensive package of statutes adopted by California, to a less-intimidating set of rules adopted by the County of Spokane, and include the new Urban-Wildland Interface Code and NFPA 299. In order to successfully mitigate the wildland/urban interface fire problem in the West, each state legislature must adopt a comprehensive package of FireSafe statutes that apply to the whole state. The problem is too severe and the costs too high to both state and federal taxpayers to leave the implementation of appropriate FireSafe statutes to the multitude of local governments.

Urban-Wildland Interface Code

The 1997 Urban-Wildland Interface Code, published by the International Fire Code Institute, is the first code package developed especially to address mitigation of fire hazards in the wildland/urban interface. The

regulations address both land use and the built environment. Construction requirements are based on the exposure hazards to which the structure may be subjected. Bridging the gap between building codes and fire codes, this code is intended to be enforced by designated local officials of the jurisdictional agency. If adopted by a state, local fire officials could also be delegated enforcement authority. The code is correlated with model building and fire code regulations to avoid conflicting provisions. It offers an opportunity for states or local government entities to adopt a comprehensive package of regulations that can effectively reduce the propagation of the wildland/urban interface fire problem to new developments, and begin the formidable task of applying effective solutions to existing properties.



Roof Coverings and Clearances

The two most important factors in mitigating the wildland/urban interface fire problem in the West are converting to ***ignition-resistant roofing materials*** and achieving ***adequate defensible space***. States need to concentrate their initial efforts on obtaining full compliance with a fire-resistive roofing standard and clearance of flammable vegetation and other materials from around structures in the identified high fire hazard areas. If unable to take any other actions, whether due to political inertia or lack of funds, these two items will contribute to a significant reduction in the number of structures lost to wildfire each year.

An effective fire-resistive roofing standard is not difficult to obtain. A variety of roofing materials are available on the market today that can prevent flying embers from taking hold while still achieving architectural attractiveness. Restrictive CC&R conditions must be eliminated in subdivisions in high fire hazard areas, by state legislation if necessary, in order to allow retrofitting of flammable shake/shingle roofs with ignition-resistant products. Insurance companies could offer premium reductions and lending institutions could offer low-interest loans to encourage residents to switch to nonflammable roofs.

Defensible space is an absolute necessity if firefighters are to be successful in defending structures from encroaching wildland fires. Placing firefighters' lives in jeopardy to try to save a structure where the owner has not provided appropriate defensible space is no longer an acceptable risk. Defensible space (30-100 feet, depending on slope and cover type) can be achieved without decimating the

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Interface Firefighting
The majority of the state agencies are actively involved in the firefight in the interface, with 14 providing direct suppression, 15 providing operational support to other fire agencies, 14 coordinating fire fighting efforts, 11 providing financial support, and 5 providing other aid such as logistical support, contractual assistance, and Incident Command/Management Teams. Only three states thought that their roles might change significantly in the future, due primarily to changes in federal fire policy and reduced funding for federal fire forces.

landscape. Specimen trees, appropriately spaced and pruned, can provide adequate shade and beauty. Fire-resistant shrubs and ground covers can be used in landscaping to achieve desired decoration without adding to the fire hazard. Decks and eaves can be enclosed so as not to trap embers, firewood can be moved away from the structure, and appropriate areas can be sprinklered to maintain high fuel moistures. All that is needed is for residents to understand and appreciate both the severity of the fire hazard and the value of these measures in protecting their homes.

Even if nothing else can be accomplished, converting to ***ignition-resistant roofing*** and providing adequate ***defensible space*** in the high fire hazard areas could significantly reduce the loss of structures to wildfire each year.

Public Education

You cannot legislate a change in attitude! What are needed are incentives that eventually change of habits and attitudes of an educated public. The desired attitude with reference to the wildland/urban interface fire problem is that the residents living in a wildland/interface area must plan, construct and maintain a home that is resistant to ignition. Appropriate goals for educational efforts are:

- The education of individual homeowners to what constitutes a FireSafe home; that it is ultimately their responsibility and they may lose what can never be replaced.

- The education of residents to FireSafe practices so that the community polices itself.

- The enactment of realistic building codes and other regulations that will move toward a more FireSafe community.

- The issuance by lending institutions of low interest home improvement loans for FireSafe projects.

- The adoption by the insurance industry of premium cost reductions for FireSafe structures.

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It isn't just your home you will loose!

Homes and other buildings are not the only victims of wildfire in the wildland/urban interface. There are all the regular victims of forest fires: air quality, water quality, fish and wildlife habitat, recreational opportunities, viewsheds, etc. There are the losses to the community infrastructure (power and phone lines and poles, bridges, fences, roads, etc.) Then there are the ripple economic effects in the community from time lost from work, lower productivity due to stress, displaced businesses, etc. If the damages from the fire are significant, there will be further damage potential from subsequent floods and mudslides. The destruction of the natural environment may cause people to move out of the community or stagnate growth. Any way you measure it, wildfire in the wildland/urban interface is usually a losing proposition for everybody.

Developing Peer Pressure

One of the biggest needs is to achieve broad scale understanding of the wildland/urban interface fire problem among the whole population so that they might generate enough political interest to overcome inertia. As each state completes its assessment project, it then needs to initiate one of the available fire prevention models (FireWise, FireSafe, etc.), and especially the public education component of the model, in its identified target hazard areas. Only when the public truly understands the nature of the wildland/urban interface fire problem will the community-based coalitions needed to effectively mitigate the problem be successful.

Protection in Place

We need to rethink our current attitudes and policies about evacuation. Most fire managers are so afraid of the potential repercussions from a civilian death in a wildfire, that they have trouble seeing the advantages of limiting evacuations and protecting people in place, let alone encouraging able-bodied property owners to stay and assist in protecting their property. The Australian Model not only encourages property owners to stay, it provides them with detailed information on preparing their property and

Public Perceptions

Ideas advanced for correcting the public perception that "their fire department" will save their house in the event of a big wildland fire included public education campaigns, a multimedia advertising campaign, statistical comparisons of structure losses with and without clearance, show me trips after big fires, and putting the public on notice that protecting their home is their responsibility. While the majority of the states agreed that the ultimate solution lies with the homeowner, a significant minority (and one of the authors) believes that the only practical solution is a cooperative effort between homeowners, landowners, and government. Some foresters argued that the land has to be managed on a watershed scale across property lines to achieve forest health, which would presumably lower fire danger.

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Evacuation
Half of the states have an evacuation policy, although some confused authority to evacuate with a policy on evacuation. Some policies are not written, and a couple are in the draft stage. Some places have adopted the "Missoula County Evacuation Plan (McMeekin Plan). In most cases, local law enforcement (especially the sheriff) has the authority to initiate evacuations, but in some states the authority resides with the county commissioners. It appears that little preplanning has gone in to the evacuation issue in the wildland/urban interface.

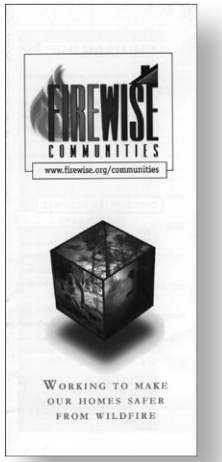
themselves to withstand the onslaught of wildfire. Reducing the amount of people being evacuated reduces traffic congestion, which improves ingress for fire apparatus. It also reduces the likelihood of injuries from traffic accidents. In many mountain communities, the risk to civilians would be less if they were protected in place in a place of refuge (safety island) within the community than left to try to drive themselves out of the area over inadequate roads. Firefighters need to understand the authorities and policies of the agency with evacuation jurisdiction in order to make well-informed decisions about the merits of evacuation.

Australian Evacuation Model

Opposition to the concept that homeowners should be responsible for protecting their homes and not be evacuated was nearly unanimous. Many said "it can't be done", that it conflicted with the goal of maximizing property protection while minimizing risk to the public and firefighters, and that they "can't even conceive of this happening". While a small majority supported homeowners purchasing firefighting equipment, many commented that the private fire protection should be built-in, not requiring people to operate it during the fire. Some said that no policy was the best policy, and that the decision to evacuate should be left to common sense. A few commented that some people could be useful to supplement the efforts of beleaguered local volunteer firefighters.

FireWise

FireWise is a public education model program developed by a consortium of the federal wildland fire agencies, the National Association of State Foresters, the National Fire Protection Association, and Federal Emergency Management Agency as part of the National Wildland/Urban Interface Fire Protection Program. It provides a video, brochures, pamphlets, checklists, etc. directed at fire safety in the wildland/urban interface which state and local agencies can modify with local photographs and statistics to make the program more tailored to local needs. It is a valuable tool readily available to any fire agency to begin making its residents more aware of the wildland/urban interface fire problem and what they can do to make their properties safer from encroaching wildfire.



Wildland/Urban Interface

A series of 2-day seminars is being held in major cities nationwide to acquaint local and state fire officials, as well as interested private citizens and civic groups, with the FireWise program. (Also see: www.firesafe.org)

At least two states, Alaska and Colorado have adopted FireWise as their primary wildland/urban interface fire prevention program statewide.

The package for Alaska is sponsored by the Alaska Wildfire Coordinating Group and follows closely the FireWise model, providing information on the six standard elements of landscaping, access & signs, emergency water supply, FireWise construction, home planning, and when wildfire threatens. The glossy color pamphlets feature photographs of local places, people, and fire situations, which add to the appeal of the product. In addition to the FireWise video, the packet includes numerous fire prevention pamphlets, and a Fire Risk Rating For Homes score sheet.

The Colorado State Forest Service has taken components of the FireWise model and modified them to fit local conditions. They have published a detailed instruction booklet on *"FireWise Construction – Design and Materials"* to help educate developers and builders. In Larimer County in the Rocky Mountain front country, where several significant wildland/urban interface fires have occurred in the past, the Project has produced a very polished and colorful package of educational materials, including the FireWise video, for homeowners associations, community civic organizations, etc. that tailors the standard generic fire safety recommendations to the local conditions in the county. The package starts off with a hard-hitting introduction that asserts, "You are at risk!" and details the wildfire threat in Larimer County. It then covers the gamut of fire safety guidelines for access, water supply, defensible space, fuel management, building construction, and interior fire safety. It concludes with a "What to do when…" checklist to help people prepare themselves to survive a threat from wildfire.

Existing Initiatives
The most popular local wildland/urban interface fire prevention programs were FireWise (AK, CO, HI, WY), FireSafe Councils (CA, NV, HI, WA), and "Living with Fire" in Utah. See the Appendix for discussions of these programs.

FireSafe Spokane

Following a series of major fires in the Spokane (WA) area during a windstorm in October of 1991, several class-action lawsuits against local electric utility companies were combined. The settlement of this suit provided $300,000 to develop a method to improve defensible space around vulnerable homes in this forested community in dry eastern Washington. Thus, *"FireSafe Spokane"* was born.

The mission of this nonprofit corporation, with a five-member board of directors representing the electric utilities, the fire community, and Washington DNR, is to educate, facilitate, and coordinate local community efforts to improve defensible space around homes in the wildland/urban interface to the extent that both fire damages and suppression costs are reduced.

Projects of FireSafe Spokane include demonstration FireSafe houses, educational materials, free home inspections, a spring clean-up week, FireSafe film short, and special teams to emphasize the wildland/urban interface fire problem to the media.

Active since 1998, FireSafe Spokane now has an executive director who has completed a problem assessment and action plan. The group is currently seeking long term funding to extend the project beyond its current three-year funding window. For more information, see Appendix.

FireFree Bend

After the Skeleton Fire in 1996 destroyed 19 structures outside of Bend (OR), the SAFECO insurance company approached the Bend Fire Department with the offer of a donation to buy fire equipment to improve fire protection in the area. The Bend Fire Marshal made a pitch for a prevention program that would get residents to change their attitudes and behaviors about fire. This project was agreed to, with SAFECO providing initial funding of $75,000. A steering committee contracted with a public relations and marketing firm, the RalstonGroup, which has developed an effective and very professional multimedia campaign using a FireFree! logo and a "get in the zone" (i.e. ***defensible space***) motto.

The objectives of FireFree Bend are to mitigate the loss of life and property caused by wildfires through public education; develop a program to foster and promote public education for fire safety; to change attitudes and behaviors toward wildfire safety and survival; and to establish a review and measurement process to assess the effectiveness of the program, and assist the insurance community and fire service in evaluating high fire hazard interface area.

The project has had considerable success and garnered many additional corporate sponsors and significant additional funding. They have produced a professional quality video using "locals" as stars, and sponsored cleanup weekends that have removed more than 10,000 cubic yards of combustible yard waste in one weekend. FireFree Bend now has a self-sustaining hazard reduction program supported by an aware local populace. They have starter kits available for communities interested in starting their own programs. For more information, see Appendix.

Project Impact - Deschutes County

Deschutes County (OR) became one of the first communities in the nation to receive a FEMA Project Impact grant for wildland fire hazard reduction as the result of a grant application put together by the Bend Fire Department.

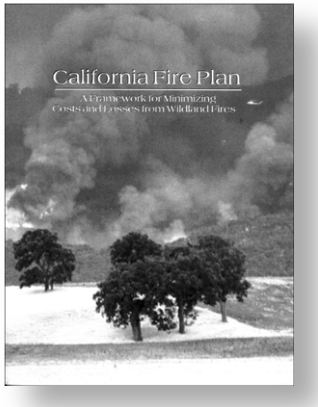
Project Impact is a federally funded grant program that provides funds to one community in each state each year for projects to better prepare it to survive a large-scale disaster. Located on the dry east side of the Cascade Mountains in east-central Oregon, Bend is a growing resort community in the piney woods with a significant wildland/urban interface fire problem.

With $300,000 in federal and $100,000 in local grant funds, the Deschutes County Project Impact team has established the goals of supporting the FireFree Bend project and expanding it countywide, developing additional means of ingress/egress in targeted high-risk subdivisions, completing a standardized rural addressing project, and completing a GIS map database for the county. For more information see Appendix.

Mapping

Thirteen of the states have mapped or begun mapping the extent of their wildland/urban interface problem, most using GIS programs, with ArcView the most common software. Only a few of the states were making these maps available to outside agencies (e.g. other fire agencies, planning departments, etc.). Nine states reported that they were seeking funding sources (usually federal grants) to be able to complete their assessment and mapping projects. Few of the states felt that the current USDA Forest Service project to map the wildland/urban areas in the nation would be useful, as the scale would be too broad, not enough detailed information would be available, and the results would be subject to misinterpretation by the uninformed. Most felt that the project should start at the local level with the data rolled up into a national database.

Mapping of the Wildland/Urban Interface Areas



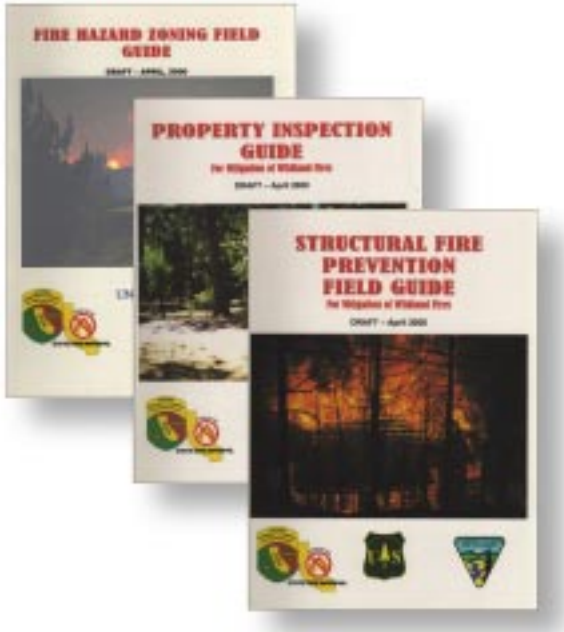
Before you can intelligently discuss the wildland/urban interface fire problem, you must map the areas of concern. Most fire managers can point to the areas within their jurisdiction that pose a problem. The key is to delineate these areas on a map so that they can be defined in detail.

These maps should be of a scale that you can determine whether an individual parcel is in or out of the area of concern. It is best that these maps be developed using geographic information system software (GIS). In this way, the information can be stored, manipulated and shared with cooperating agencies and the insurance industry.

www.ucfpl.ucop.edu

California Fire Plan

One of the most complete programs of wildland/urban interface mapping has been conducted in California. Under policy direction from the Legislature and the Board of Forestry, the Department of Forestry and Fire Protection has mapped the entire state, categorizing areas as to their level of hazard. This mapping is then tied to the ***California Fire Plan, A Framework for Minimizing Costs and Losses from Wildland Fire***, and an outstanding example of a fire plan.

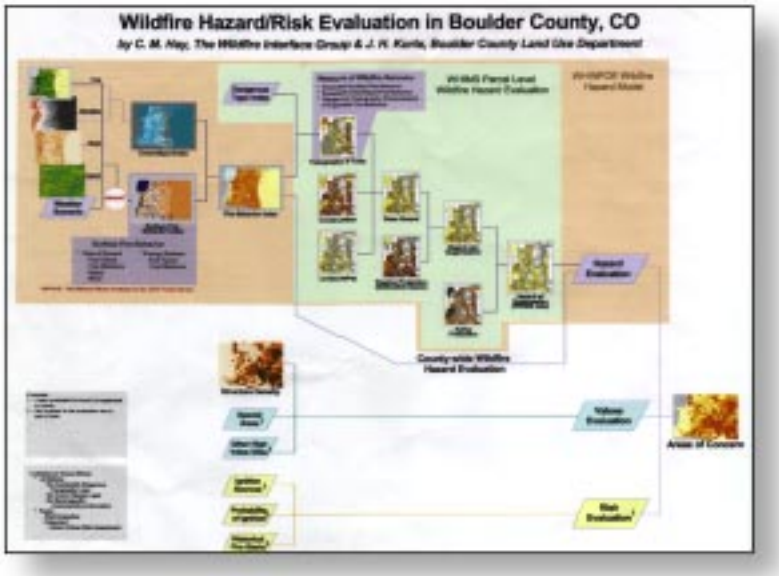


As part of the implementation strategies, the University of California Forest Products Laboratory has produced three guides directed at the wildland/urban interface fire problem. They are the:

- ***Fire Hazard Zoning Field Guide***
- ***Property Inspection Guide***
- ***Structural Fire Prevention Field Guide***

Wildland/Urban Interface

The material developed in California is outstanding. It includes plans and actions that can be taken on a statewide basis, as well as tools for planners and firefighters alike. If any agency is planning on moving their programs forward, time would best be served by reviewing this work.



Boulder County Wildfire Hazard/Risk Assessment

As a result of disastrous fires in the area, the Boulder County (CO) Land Use Department has developed one of the most comprehensive hazard/risk mapping and assessment programs in the nation. This award-winning program is a model that needs to be emulated.

The evaluation program ties all the elements (fuel, elevation, slope and aspect) with weather and predicts fire behavior. This then provides three evaluations: Hazard Evaluation; Values Evaluation; and Risk Evaluation. From all of these various "layers" an Area of Concerns map is produced. See the Appendix for more information.

Mobilization Initiatives

The mobilization of large forces to combat major fires will always be necessary. The states need to address several of the following factors as a means of streamlining emergency operations.

It Isn't Just Mapping

States need also to do an analysis of their capability to respond to the wildland/urban interface fire problem, both before and after the fire. Mitigation of fire hazard and exposure through effective fire prevention programs and effective initial attack suppression actions can significantly reduce the anticipated losses from a major fire.

Federal Funding

If given funding, with which to address with wildland/urban interface fire problem, the state agencies identified mapping/preplanning, supporting local initiatives, adopting FireWise or similar programs, hazard reduction projects, fuelbreaks, demonstration projects, home inspection programs, and tax incentives to homeowners as their priorities. Several states indicated that if "matching funds" were required for grants, they would have little hope of obtaining such funds, let alone the staff to administer such grant programs.

Do you have the Facts?

One of the problems with identifying and assessing the wildland/urban interface fire problem is that in order to make good decisions, you need all of the facts. Many of the states do not at this time have access to the facts (data) necessary to do an effective assessment. Each state needs to make sure that it builds the appropriate foundation for planning and developing solutions by acquiring and maintaining the following types of data:

- Fire weather data
- Fuels data
- Fire occurrence and causal statistics
- GIS data base (interactive with other sources)
- Maps for everybody
- Road/street and addressing database
- Water systems configurations and capabilities
- Telecommunications systems data
- Suppression resource inventories
- Hired equipment vendor database
- Cooperative agreements and operating plans
- Model assessment guide
- Model statutes, codes, and ordinances

Gathering of basic facts and information is the critical first step towards developing a meaningful analysis and understanding of the wildland/urban interface fire problem in any area. If you don't know what's really happening out there, you are probably not prepared to offer meaningful solutions.

Fire Prevention

Fire prevention programs designed to reduce risk need to be targeted at the real causes of large, damaging fires in the high hazard areas. This requires on-going collection and analysis of data on fire causes from all jurisdictions. The need is to be able to target the sources of risk that cause major fires, not just lots of small fires (e.g. power lines vs. kids and matches). Each state needs a comprehensive, standardized fire statistics database collecting information from (and accessible to) all fire agencies. Fire prevention programs such as FireSafe and FireWise are targeted at reducing exposure of existing structures to loss from wildfire. This type of program needs to emphasize to two most important factors in structure survivability: ***ignition-resistant roof coverings*** and ***defensible space***.

Wildland/Urban Interface

Pre-fire Planning

The capability of the suppression system response to the wildland/urban fire problem needs to be analyzed to determine its effectiveness. Are *all* of the fire agencies in the high hazard areas actively involved in joint response planning, training, and drills? Do they have the most effective types of apparatus and equipment, and adequate numbers of trained personnel to operate it? Are there auto aid and mutual aid pre-plans in effect that assure the immediate response of the closest available types of correct resources? Can the players communicate on common radio frequencies when they arrive on the fire ground? Do the initial attack fire agencies have immediate access to specialized types of equipment (e.g. air tankers, helicopters, bulldozers, etc.)? Has the concept of Unified Command been accepted and practiced? If so, the capabilities of the suppression force can mitigate a lot of damage in the wildland/urban interface. Just remember that no suppression force is invincible in the face of the worst possible wildfire conditions.

Training, Communications, Equipment

The most critical components of an effective suppression system in the wildland/urban interface are training, communications, and equipment.

Training means that the players from all agencies (especially the local municipal fire departments and districts) receive regular training in wildland fire fighting techniques. Such training needs to focus on basic wildland fireline evolutions and firefighter safety, not just ICS position training. Regular interagency wildland drills are necessary to keep the players ready. Live fire training is invaluable, if it can be conducted safely.

Training

In the training arena, all of the states provide instructors for wildland firefighting training courses, and the majority also provide training materials to local government firefighters. Several of the states also train/credential local instructors, and/or maintain a certification/qualification system for wildland firefighters. If given more money for training, most states responded that they would expand their existing programs with more instructors, more/better materials, standardized curricula, credentialed instructors, etc.

Communications means primarily radio communications, with two important factors. A dispatch system that can interface with all fire agencies to provide timely dispatch of automatic and mutual aid resources, as well as serve as an efficient collection point for fire intelligence data is critical to effective response in the high hazard areas. Mobile (and portable) radio communications is the second factor. The personnel arriving at the fire scene need to be able to effectively communicate with each other to be able to work safely and efficiently. Common radio frequencies with pre-planned shared use agreements are critical. Adequate numbers of command and tactical nets must be provided.

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Mountain top repeaters (or mobile relays, or remote bases, etc.) are important to maintaining effective communications over wide areas of difficult terrain.

Equipment means the tools of the trade appropriate for the job at hand. If the job is initial attack on a wildfire in the wildland/urban interface, this means engines of a size that can negotiate narrow country roads, light bridges, steep grades, and preferably operate off-road as needed (Type III engines), as opposed to structural engines (Type I engines) that might suffice for structure protection, but won't contribute much to perimeter control. Equipment means having lightweight wildland fire hose, lightweight personal protective equipment, portable pumps, Class A foam systems, etc. Many city fathers in the West would be well advised to acquire a few Type III, four-wheel-drive, pump and roll, foam-equipped engines before "the big one" happens in their backyard.

Only when training, communications, and equipment of all the fire agencies that can reasonably be expected to operate on the fire in the wildland/urban interface in a high fire hazard area have been maximized, can response somewhat mitigate hazard, risk, and exposure.

Master Mutual Aid Agreements

Historically, when fire agencies want to share resources, they enter into local mutual or automatic aid agreements. This system works well when the number of agencies involved are small. As numbers grow, there comes a time when there is a need for state-level legislation that allows the various jurisdictions within a state to move across jurisdictional lines an assist others in need.

As the wildland/urban interface fire problem has grown, the use of local forces to protect threatened structures has increased. Many of the states still do not have adequate authority to properly mobilize the existing forces.

Such agreements are referred to as Master Mutual Aid Agreements. Some of the best systems are found in California, Montana, Oregon and Washington. The system in each state is different in its operations, but similar in that it allows for the movement of firefighting resources statewide.

Mutual Aid

While thirteen of the 17 states have a statute-based mutual aid system, several mentioned the need for improved planning, coordination, and communications in order to make the system functionally effective. Again, additional training was identified as a need in the mutual aid system. Washington for example, had recently overhauled its state mobilization plan, creating regional coordinating groups staffed by local/state fire officials to improve mutual aid coordination.

Compacts

The States have authority to enter into interstate compacts for the movement of firefighting resources and other assets. Compacts are not simple to establish. Since the Civil War, the Congress requires their stamp of approval before they are ratified. There are two compact agreements in the West.

> **Interstate Civil Defense and Disaster Compact –** In 1977 the states of California, Oregon, Washington, Nevada and Idaho entered into a compact to share "forest fire" fighting resources. Since that date, the states of Utah (1987) and Wyoming (1989) have been added. This compact is used when two states want to provide assistance to each other. It can also be used when the national system through the National Interagency Fire Center (Boise) is not responsive.
>
> **Northwest Forest Firefighting Compact –** Congress just recently ratified an agreement between the states of Alaska, Washington, Oregon, Idaho and Montana, and the Canadian Provinces of British Columbia, Alberta and Yukon. It provides for the movement of resources between the various states and the three provinces of Canada.

Compacts should only be used when there is a special need to move forces between the states, or when the national system is not able to respond in a timely fashion. There is a need for those states not presently "signed on" to do so.

Cooperative Relationships

Fighting fire in the wildland/urban interface is a cooperative venture. No one agency can do it alone. For close to a century, the federal land management agencies and the state forestry organizations have had some level of cooperative relationships. The level of these relationships has varied, but the need is greater now. As more large, damaging fires threaten more structures, there is greater need for effective cooperative relationships between wildland fire agencies.

The area that needs the most work is between the state forestry organizations and the various forms of local government fire protection, be it municipal, rural or volunteer. There are many examples of great relationships, but, there more of poor or nonexisting working relationships.

Wildland/Urban Interface

Use of Local Firefighting Forces

Each state needs to assess its needs for both initial attack forces and structure protection engines from local fire agencies, and preplan the mobilization of these resources. Developing cooperative agreements and operating plans that clearly define the responsibilities and roles of the cooperating agencies should be high on the agenda of each state wildland fire agency. States must also establish mutual aid authorities and mobilization plans that allow the effective mobilization and deployment of local government fire resources on a preplanned basis to any major wildfire in the state.

The effective use of local government fire forces, both for initial attack and for structure protection on wildland fires, will require additional training and specialized equipment, especially wildland personal protective equipment. States need to consider the minimal cost of wildland Nomex for local firefighters against the savings in fires held to a small size and structures saved.

Some of the elements of a good mobilization system are:

- ***Enabling Legislation*** – The State Legislature needs to develop legislation that allows state and local government forces to assist each other.

- ***Workers Compensation*** – A system must be in place that provides for firefighters responding to a call for mutual aid to be protected in the event of injury.

- ***Dispatch Coordination*** – The system to mobilize the local forces must use an existing organizational structure, AND involve the local government fire leadership. The system will only work if the locals have a buy-in and are involved in the process.

- ***More than just fire engines*** – The system has to include a way to mobilize more than just fire engines and their crews. Leadership is mandatory if a firefight is to be organized, efficient and effective. Incident management teams are a method of organizing overhead to support large fires.

- ***Payment*** – Mutual aid, by definition is without cost. Mutual aid works when the commitment of the assisting forces is not for an extensive period of time. Since wildland fires can take days before they are controlled, a mechanism has to be established that allows the assisting forces to move from no-cost mutual aid to assistance for hire.

- ***Training*** – Firefighters are only as good as their training. There has to be a way to train all firefighters to effectively and efficiently fight wildland/urban interface fires. There also has to be training on how to manage these types of incidents.

- ***Tactical Communications*** – Day-to-day tactical communications systems do not work well under the workloads placed on them by a fast moving wildland fire. Statewide communications plans need to be developed and implemented to make any major firefight effective.

Equipment

The Federal Excess Personal Property (FEPP) program was a good start. It allowed states to acquire surplus equipment that could be rehabbed and retrofitted and assigned to local volunteer fire departments to give them a wildland initial attack capability they might not otherwise have. The complexity of the wildland/urban interface problem and the increased fuel loading, fire intensities, and values at risk make it now time to move beyond the used equipment concept. Congress (and the states?) needs to provide funding to equip local volunteer fire departments with new, safe, reliable and effective fire apparatus, firefighting equipment, personal protective equipment and the training to properly utilize it. Better equipment and training improves the effectiveness of local volunteer firefighters on initial attack on wildland fires and increases their ability to respond to major disasters. With more frequent large, damaging fires, and declining federal wildfire resources, we need to increase our pool of available resources.

Federal Agencies

The USDA Forest Service is the largest of the federal land management agencies. Congress has provided funding for state and volunteer fire protection through the Forest Service budget for many years.

Federal Fire Policy

You cannot discuss the Federal Fire Policy and its impact on the wildland/urban interface fire problem in the West, unless you first understand the evolution of the USDA Forest Service. For the better part of the 20th Century, the USDA Forest Service operations focused on the "multiple use" of the national forest system lands. They managed the forests for water, recreation, wildlife and sustained forestry. Many of the forests were used for the harvesting of timber, and substantial portions of their budgets were devoted to timber management and protection.

Federal Fire Policy
Most states said that the implementation of the Federal Fire Policy has impacted their state, expressing concerns about reduced federal fire forces, withdrawal of federal fire forces from the interface, less federal agency support for major fires, and reduced cooperation. Only five states indicated they are changing their protection system to compensate for changes in the Federal Fire Policy, most by redeploying or adding state forces to make up for reductions in federal forces. Some were increasing their oversight of federal operations and anticipating more "reasoning

Starting in the 70's, several events occurred that would have an everlasting impact on the agency:

- The environmental movement pushed to change the mission of the agency from that of "multiple use" to that of preservation.

- Increased cooperative relationships between the USDA Forest Service and its many state and local government cooperators resulted in wildland firefighters working side by side with structure firefighters.

- The need for more specialists resulted in the decimation of the "militia" of generalist employees who were used to staff fires.

In the 90's the Forest Service leadership became concerned with the dramatic increase in their cost as it related to the wildland/urban interface. They found themselves protecting developed areas as a result of "balancing of acres." They were being pressured by "on the ground firefighters" for training and equipment (such as self-contained breathing apparatus) so that they could properly protect structures.

All of this dictated that the Forest Service and other federal land management agencies develop a policy and plan to deal with this growing concern. The result was the Federal Wildland Fire Policy; a long overdue document, but one that is not well understood. The USDA Forest Service is concerned about the level of understanding within it's employee ranks. They are presently surveying their employees as to their understanding of this very important policy (See Appendix for a Summary of the Policy).

We don't fight structure fires!

The issue of federal firefighters being involved in the protection of structures was festering, but it came to a head in the late 80's when the press aired a sound-bite by a federal firefighter on a fire near Woodfords, California, who said, "we don't fight structure fires!" What he meant was that they don't fight structure fires in the way municipal fire departments do. To become structural firefighters would greatly increase training and equipment costs for the federal agencies (Figure 9).

At the same time, federal agency auditors began questioning the propriety of federal agencies cost-sharing the increasingly large bills for local government forces amassed to protect structures located outside federal jurisdiction, especially when the fire didn't start on federal land.

These cost concerns, coupled with increasing pressure to allow fire to resume its natural ecological role and other factors, lead to a major revision of Federal Wildland Fire Policy.

Current federal fire policy then calls for increasing reintroduction of wildfire into the ecosystem, consistent with both resource management and fire plans. It calls for property and resource protection needs to be assessed based on values at risk. It redefines the federal role in the wildland/urban interface to include wildland firefighting, hazard reduction, cooperative prevention and education, and technical assistance. It properly defines the ultimate responsibility for property protection in the interface to belong to state and local governments.
Thus, from the federal agencies' perspectives, all fires are certainly not to be immediately extinguished regardless of cost, and federal firefighters are not to be used in place of local government forces to fight structures fires (at least from the inside out). The policy does however, recommit the federal agencies to continued cooperative fire protection efforts with all partner agencies.

The problems encountered so far with the new federal fire policy have not been so much with the policy itself, but with its interpretation and implementation by local federal line officers. There are examples where USDA Forest Service line officers have informed cooperating agencies that federal forces will be withdrawn from a fire if structures are to be protected. Using the Federal Wildland Fire Policy as the authority for such an action is clearly outside the intent of the policy. While federal agency fire forces can and should be used as necessary to protect structures from encroaching wildfire (but not fighting interior structure

Figure 9. There is a difference between fighting structure fires and protecting a structure from a wildland fire. The firefighter entering the structure is properly trained and equipped. The firefighter protecting the structure is also trained and properly equipped. Each is in the right place--their roles are correct!

fires), the federal agencies will continue to resist having to absorb the costs (and certainly the full responsibility) of structure protection.

The primary problem with the Federal Fire Policy is it is open for any interpretation. It can justify federal involvement in the protection of structures, or it can justify the withdrawal of any federal forces on a fire where structures are threatened. What is needed is clarification from the Washington, D.C. level, clearly stating, in operational terms, what can and cannot be done under it. The policy is so important to so many entities, that the ambiguity that allows so many interpretations must be removed.

Federal Emergency Management Agency

FEMA
Several of the states have been involved with fires significant enough to generate FEMA reimbursement funding for suppression costs exceeding the floor costs.

Only five states said that they would change their approach to the wildland/urban interface fire problem if given FEMA dollars for initiatives. They cited initiating hazard reduction projects and adopting fire prevention programs such as FireWise, but were concerned about "the strings" that would be attached. The two primary recommendations the states had for proactive use of FEMA funds were mapping/preplanning and hazard reduction.

Are the bailouts helping? Probably not! Applying federal funds to help people rebuild their homes lost to a wildland fire, without strong fire safe regulations to provide ***ignition-resistant roofing*** and ***defensible space***, is merely perpetuating the problem.

The use of federal funds to "pay back" state and local government costs for fighting major fires tends to become a political excuse not to invest state and local funds in solutions to the fire problem.

Perhaps the FEMA funds would be more effective if applied *before* the fire, to build fuelbreaks, improve water supplies, train and equip local firefighters, and promote ***ignition-resistant roofs*** and ***defensible space*** around homes in the wildlands.

Wildland/Urban Interface

Forest Health

One of the areas of increasing concern in the West is forest health, meaning the overall well being of the forest as an ecosystem. Partially as a result of the exclusion of fire in the last half of the 20th Century, the forests of the west are very different than the ancient forests. The woods today contain many more trees per acre and much more brush undergrowth and slash (deadwood) than the forest primeval. Insects and disease have gained the upper hand, creating large stands of dead timber. On many privately owned forest lands in the west, a succession of profit-oriented ownerships has over logged and over grazed the land, resulting in weak stands of immature timber. In general, the woods of the west are not as healthy as they could or should be, given our knowledge of natural systems. Unfortunately, the free enterprise economic model of the U.S. encourages extensive, rather than *intensive* management of our forest resources.

A significant new term has crept into the wildland lexicon in the last few years:" *forest health."* This new term is an attempt to focus perspectives on the forest as an ecosystem made up of a multitude of components, each of which has a role in determining the overall vitality of the ecosystem.

While climate, water and soil are obvious factors in determining the type of vegetative cover, the presence and influence of a great variety of other factors can significantly influence the overall vigor or health of the ecosystem. For example, a lack of water during a period of drought may place the trees in a forest stand under stress, which could make them more susceptible to attacks from insects and diseases. Should an insect epidemic kill a large stand of trees, that forest is less healthy than it was (both biologically and financially). It also now is at great risk for a catastrophic wildfire, which could not only destroy the dead trees, but also carry on into the healthier portions of the forest, or into homes at the interface.

Grant Funding
The most popular solutions to the wildland/urban interface fire problem if federal grant funding was to be made available were public education, mapping/preplanning, supporting local initiatives, training volunteer firefighters, hazard reduction projects, demonstration projects, fuelbreaks, and home inspections, in that order. There was little support for tax incentives for homeowners, and a plea to eliminate federal agency pass-through costs ("skimming").

Fire is one factor in determining the overall health of a wildland ecosystem. Many native plant species are fire adapted, and thrive when occasional, low intensity fires move through their habitat, reducing competing plant species and destroying insect populations and disease vectors. Fire replaces mature brush with new growth that is more nutritious for browsing animals such as deer. Fire eliminates accumulations of dead and down materials, converting their components to essential nutrients that boost soil fertility.

During the past 80-90 years, we have evolved to a position of suppressing most forest (and other wildland) fires as a threat to our forest resources and associated private property values. This trend of excluding fire from the wildlands has been exaggerated by increasing development of wildland areas and the need to protect man's improvements from fire. One result of the successful fire suppression policy has been a tremendous increase in the available fuel volume (measured in tons/acre). Some estimates show that fuel volumes in our national forests are now 3-5 times greater than the historical average and that continuous blocks of heavy fuels cover 3-5 times as much area as before fire was excluded. This means that now wildfires are likely to be 3-5 times as difficult to put out and apt to become 3-5 times larger than in "the good old days."

Fuel Modification

While few of the state wildfire agencies have the authority to manage fire for resource benefit on private lands, several do so on state lands. Only five states (CA, CO, NM, NV, and UT) have protection from liability lawsuits, but eleven of the states have active prescribed fire programs. The most common prescribed fire objectives are slash disposal, hazard reduction, range improvement, timber stand improvement, pest control, and wildlife habitat improvement, in that order. About half of the states have the authority to establish fuelbreaks and/or firebreaks, but only with the permission of private landowners. Eleven states have the authority to initiate hazard reduction programs, frequently focused on slash disposal, and generally requiring cooperative agreements. Most of the states provide technical advice to private landowners who wish to undertake hazard reduction projects, but only half can provide operational support to such projects.

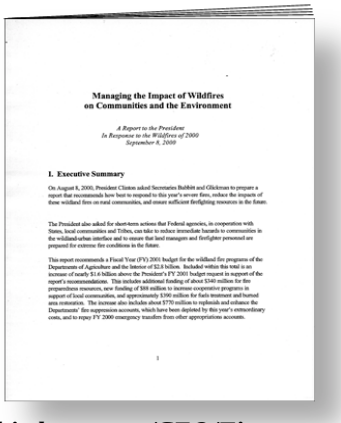
A chorus of voices is now calling for the reintroduction of fire into the ecosystem at levels that would improve forest health. We can anticipate a couple of problems with this concept: first, the fuel volumes will have to be reduced to keep fires controllable: second, the fuel accumulations will have to be broken into manageable blocks; and third, fire is *not* necessarily beneficial to all species. Careful planning of the timing, location, intensity, and duration of fire will be required to achieve maximum contributions to forest health without endangering threatened plant and animal species, and intermixed private property interests.

There is a role that fire management can play in improving forest health that will concurrently reduce the potential for major wildfires. State forestry agencies need to work with federal and private forest landowners in support of forest health initiatives, including selective logging, thinning, fuel reduction by prescribed fire, fuelbreaks, etc., especially in high fire hazard areas at the wildland/urban interface. One example of such a program is the Grand Canyon Forests Partnership, working to improve forest health and reduce fire danger in the wildland/urban interface around Flagstaff (AZ). For more information see www.gcfp.org.

To the extent that wise use of fire to remove hazardous fuel accumulations and contribute to forest health can be properly planned, funded, and executed, fire managers should get on the forest health bandwagon.

Managing the Impact of Wildfires on Communities and the Environment

On September 8, 2000, the White House published a report to the President, outlining a major Federal initiative on dealing with the buildup of fuels and the wildland/urban interface fire problem.



Managing the Impact of Wildfires on Communities and the Environment

A Report to the President
In Response to the Wildfires of 2000
September 8, 2000

I. Executive Summary

On August 8, 2000, President Clinton asked Secretaries Babbitt and Glickman to prepare a report that recommends how best to respond to this year's severe fires, reduce the impacts of these wildland fires on rural communities, and ensure sufficient firefighting resources in the future.

The President also asked for short-term actions that Federal agencies, in cooperation with States, local communities and Tribes, can take to reduce immediate hazards to communities in the wildland-urban interface and to ensure that land managers and firefighter personnel are prepared for extreme fire conditions in the future.

This report recommends a Fiscal Year (FY) 2001 budget for the wildland fire programs of the Departments of Agriculture and the Interior of $2.8 billion. Included within this total is an increase of nearly $1.6 billion above the President's FY 2001 budget request in support of the report's recommendations. This includes additional funding of about $340 million for fire preparedness resources, new funding of $88 million to increase cooperative programs in support of local communities, and approximately $390 million for fuels treatment and burned area rehabilitation. The increase also includes about $770 million to replenish and enhance the Departments' fire suppression accounts, which have been depleted by this year's extraordinary costs, and to repay FY 2000 emergency transfers from other appropriations accounts.

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www.whitehouse.gov/CEQ/Firereport.pdf

This report recommends a $1.6 billion budget increase in the USDA Forest Service and US Department of Interior budgets. Most of these funds are earmarked to cover costs incurred fighting fires this summer and to increase the Federal firefighting force. But, just over $73 millions is designated for State, Volunteer and Rural Fire Assistance programs.

Table 1
FY 2001 Funding Summary, USDA Forest Service and the US Department of the Interior

USDA Forest Service and the US DOI	FY 2000 Final	FY 2001 President's Budget	FY 2001 Additional Needs	FY 2001 Total Needs	FY 2001 House Action	FY 2001 Senate Action
			...Dollars in thousands...			
Fire Preparedness	$584,618	$586,433	$336,381	$922,814	$586,433	$586,683
Fire Operations	323,995	331,136	677,711	1,008,847	320,107	579,394
Emergency Fire Contingency	290,000	150,000	476,000	626,000	200,000	150,000
State Fire Assistance	23,929	30,006	42,994	73,000	25,000	28,042
Volunteer Fire Assistance	3,240	2,510	10,790	13,300	5,000	5,000
Rural Fire Assistance	0	0	10,000	10,000	0	0
Forest Health Management	62,075	62,842	12,000	74,842	63,794	63,383
Economic Action Programs	20,198	17,267	12,500	29,767	14,246	23,486
TOTAL	**$1,308,055**	**$1,180,194**	**$1,578,376**	**$2,758,570**	**$1,214,580**	**$1,435,988**

Rural Fire Assistance - This is a new program within the US Department of Interior directed at volunteer fire departments in small, rural communities.

State Fire Assistance - This $43 million increase includes $20 million for fuel reduction and $4 million for FireWise implementation. The actual unspecified increase to the States is about $25 million.

Volunteer Fire Assistance - This is an increase of over 500%.

Figure 10. This is Table 1 from the Presidential Report titled "Managing the Impact of Wildfires on Communities and the Environmental, dated September 8,2000. It outlines a $1.6 billion program to cover the extraordinary costs associated with the 2000 Fire Season and an increase in several programs that involve the States.

This requires the State Foresters to have plans on how this money should be distributed and used (Figure 10). On September 20th, Congress passed a $1.8 billion plan.

The three programs that directly effect the States are State Fire Assistance, Volunteer Fire Assistance and a new program within the US Department of Interior, Rural Fire Assistance. The States have been involved with the first two programs for years. The proposed State Fire Assistance budget has a general across-the-board increase of just over $24 million (about 100 percent over FY 2000), $20 million for "high priority forest management practices on lands to reduce fire risk and fuel loads," and $4 million for "fire education," presumably the FireWise program.

The Rural Fire Assistance program is new. The report says, "Rural fire district assistance in the Department of the Interior is a new program to provide technical and financial support to volunteer fire departments that protect communities with populations of less than 10,000. Emphasis is on areas intermingled with lands managed by the Interior Department (especially the Bureau of Land Management). For US Department of the Interior $10 million."

It will be interesting to see if the Department allocates these funds to the various State Foresters for distribution to the rural "fire districts" or develop a Federal to Rural program. After the Point Fire, where two volunteer firefighters were killed on a Bureau of Land Management fire, the Bureau proposed a program where they would use the money to have a direct relationship between rural volunteer fire organizations, excluding the States. This program was opposed at that time and should be now! The State Foresters should make it very clear that funding to the rural communities of this Nation should continue to go through the states -- just like the Volunteer Fire Assistance program managed by the USDA Forest Service.

Private Landowners and Industry

Any plan to help correct the problems of fuel loading buildup and the wildland/urban interface growth should include private landowners and the forest products industry.

Small Landowners

Since much of the wildland acreage in the west is in federal ownership, the federal land management agencies will probably assume a leadership role in forest health issues. Much of the wildland/urban interface area however, is in small private ownerships where forest health and hazard reduction

issues are much more complicated. Using prescribed fire to reduce fuel loading in a small drainage in a national forest is relatively easy to accomplish compared to trying to put together a hazard reduction burn in a rural subdivision with thirty owners of ten-acre parcels. The hodgepodge ownership patterns of much of the wildland/urban interface areas will require extensive preplanning and marketing to a variety of audiences to make prescribed fire an effective tool in restoring forest health.

Partnerships
The laundry list of potential partnerships for cooperation in solving the wildland/urban interface problem included insurance companies, local fire departments, local government, planners, builders, developers, homeowner's associations. Nobody mentioned corporations other than insurance companies or local civic clubs, both potential sources of project dollars.

Timber Companies

In much of the West, private timber companies own significant tracts of timberland. While fire exclusion has created forest health concerns in these areas also, management of these lands is based almost exclusively on an economic model, as opposed to the ecological model the Forest Service plans envision. Fuel accumulation and fire hazard on these lands vary proportionately with the economic success of the timber company. That is, timber companies with good profit margins can afford to invest more in hazard reduction. A trend in recent years is for these private timberlands to be consolidated under fewer larger companies than in the past, but bigger may not necessarily mean better financial or forest management. Many timber companies need economic incentives not currently available in the free market in order to invest significantly in hazard reduction, let alone be able to significantly improve overall forest health.

Prescribed Fire

The West has such large expanses of open wildlands with high and increasing fuel volumes that hazard reduction measures must take place on a large scale to be effective. Prescribed fire is a necessary management tool if fuel loading is ever to be significantly reduced in the western woods. Prescribed fire is cheaper per acre (at least at this time) than other available fuel reduction methods (mechanical clearing, chipping, etc.). Cheap is important, especially to private landowners who may not have the level of funding to address the fuels problem that Congress can make available to the federal land management agencies.

The two most significant roadblocks to successful use of prescribed fire for hazard reduction projects in the West are environmental regulations and litigation. In many instances, each separate project may require a full environmental impact report/assessment, which is time-consuming and

expensive (California has had success using a “program EIR” to cover all projects generically). Increasingly strict air pollution regulations, including protecting the “veiwshed” of National Parks, place further restrictions on when and how much burning can be conducted in any region. Prescribed burning can usually be done safely only in short intervals of the spring or fall (depending on fuel type), and usually requires light winds, which are not conducive to dispersing the smoke. Further complications arise if there is any chance that the area to be burned may contain any “threatened or endangered” species of flora or fauna. Finally, lawyers spring to the aid of landowners whose “valuable” property may suffer any damages from an escape, dramatically increasing agency costs. These factors have combined to reduce the amount of prescribed fire use in the West significantly. Certainly, the escape of a federal prescribed fire operation in New Mexico this year will be another stumbling block.

In order to utilize prescribed fire to its full potential in hazard reduction in the West, states are going to have to seek reasonable exemptions from overly strict environmental regulations, and provide protection from tort claim liability to those agencies that must manage prescribed fire. There are several pieces of legislation that the State Foresters may want to analyze and support. They are:

- **H.R. 236** by Representative James Rogan titled: *To exempt prescribed burning on National Forest System lands from regulation under the Clean Air Act.*

- **H.R. 1522** by Representative Helen Chenoweth-Hage, titled: *To safeguard communities, lives, and property from catastrophic wildfire by authorizing contracts to reduce hazardous fuels buildups on forested Federal lands in wildland/urban interface areas while also using such contracts to undertake forest management projects to protect non-commodity resources, and for other purposes.*

- **H.R. 1530** by Representative Mark Roley, titled: *To make forestry insurance plans available to owners and operators of private forest land, to encourage the use of prescribed burning on private forest land, and for other purposes.*

Other hazard reduction measures can be effective, but only on a smaller scale. Fuelbreaks and firebreaks can protect high hazard subdivisions and even small communities, but their maintenance requires use of herbicides, which may not be politically popular. Mechanical thinning and clearing can be effective in small areas, but are very expensive without financial incentives. Greenbelts can be built in to new developments to serve multiple duties as wildlife habitat, recreation space, and fuelbreaks.

National Fire Protection Association

The National Fire Protection Association (NFPA) is an international organization that develops fire protection standards. It has only been in the last several years that they moved from the "structure" firefighting arena to the wildland firefighting arena. The two NFPA standards that have direct impact on the wildland/urban interface fire problem are:

- Protection of Life and Property from Wildfire (NFPA 299). This standard outlines an analysis system, fuel modification planning, street and road standards, water supply, structural design and fire prevention measures.

- Standard for Wildland Fire Fighter Professional Qualifications (NFPA 1051). This standard outlines the basic qualifications for a wildland firefighter and officer. The new standard that will be issued in 2001 will include the qualifications for a wildland/urban fire specialist.

Insurance Industry Initiative

It is easy to say "what we need is the insurance industry to give the homeowner a break on insurance rates if they have a FireSafe home." This may be one of the incentives, but not all that has to be done. "Fire" is not the main concern the insurance industry has. Wind (hurricanes), water (floods) and earthquakes are at the top of their list. Fire is sixth on their list…and, except for "Oakland" sized fires, they have the losses covered by the premiums.

States need to work with representatives from the insurance industry to develop an understanding of this issue. If states can show insurance companies that they have correctly (and scientifically) diagnosed the extent of the wildland/urban interface problem, and can share maps and data that are useful to them, perhaps the insurance companies can be encouraged to develop premium reductions for FireSafe homes and to support local initiatives such as FireWise, FireSafe, etc.

Wildland/Urban Interface

Again, the two most important elements to structure survival are ***ignition-resistant construction*** and ***defensible space***. These are the elements we need to try to convince insurance companies to give credit for first.

Building Industry

Currently, there are no incentives for developers and/or builders to spend the extra money for the materials needed to make homes fire safe. Most homebuyers are ignorant of the factors that make homes fire safe.

Until homeowners are educated to the point that they begin to demand built-in fire safe features, or fire safe codes are adopted to require such features, builders will continue to follow the cheap path.

Local government planning and building officials still are not well educated in fire safe building and development standards.

Banking Industry Initiative

We need to be able to convince the banking industry that it is in the best financial interest of the lending community to provide low-interest loans to homeowners who wish to retrofit their homes with FireSafe roofing materials. The concept is simple, the smaller the chance of the house burning down, the greater the chance that the full mortgage will get paid off. While this is not a large chunk of the bank's business, it could be important to the long term financial health of the community to keep lots of houses from burning down. State and local fire agency officials need to meet with representatives of the lending community to begin dialog on this issue.

Recommendations

Whenever you take on a major task, it is best to have a plan and to do it in small steps. The hurdles involved in the wildland/urban interface fire problem did not arise over night, and will not be overcome quickly. And, the problem will never be solved if steps are not taken in a planned and organized manner.

The following recommendations are presented as a plan to address the problem in relatively small steps. Some of the recommendations are directed to the Council of Western State Foresters and the National Association of State Foresters. Some are directed toward individual states and communities. The goal is not to attempt too much, but to start down a path that facilitates change.

Initiatives and Solutions
The laundry list of incentives for homeowners to make their homes fire safe included insurance premium rebates, property tax rebates, development of the biomass industry, more stringent fines for violations, public recognition for compliance, operational support for projects, community block grants, roof retrofit cost-share programs, subsidized home improvement loan rates, and cost-sharing for hazard reduction or reroofing. Among statutory and regulatory solutions suggested were fire safe building construction, UBC and UFC, defensible space, require insurance premium rebates, mandatory water supply, adequate ingress and egress, and fuelbreaks around subdivisions. Surprisingly, three states recommended no new laws/ regulations.

Public Education

One of the biggest needs is to achieve broad scale understanding of the wildland/urban interface fire problem among the whole population so that they might generate enough political interest to overcome inertia. Public attitude drives what they will do to prepare for a fire, as well as drives any political action at all levels of government.

Any message must be in language they understand. Experts in any field tend to speak in technical terms, not terms understood by the average citizen.

■ ***Recommendation*** – That each state move as quickly as possible to implement the FireWise public education model. Funding should be targeted for development, distribution and training.

Federal Initiative

The potential for federal funding of various wildland/urban interface initiatives is high. There is the legislation following the Cerro Grande Fire, designating $120 million to the Departments of Agriculture and Interior for fuel modification on federal lands near the wildland/urban interface.

Wildland/Urban Interface

The $1.6 billion initiative developed by the President needs immediate attention. The State Foresters should develop proposals on how this expected funding would be used. The funding should NOT be simply divided by 50, it should be directed toward specific projects.

■ ***Recommendation*** – That a plan be developed to allocate any federal funding to specific projects in this order of priority. This plan should follow the recommendations of the States, but include items that increase the effeciency of initial attack and mobilization of fire forces. Some specific areas are:

- ***Public Education*** – To fund FireWise or other public education fire prevention projects.

- ***Fuels Treatment*** – Focus on fuel treatment projects that have a wildland/urban interface component and complement cooperative programs between federal/state/private entities.

- ***Initial Attack*** – Improve the level of initial attack through the use of rural volunteer fire departments by providing them more and better funding, training, and equipment.

- ***Extended Attack*** – Improve the capabilities of the states to assist local forces during this crucial time in the fire attack. A preplanned and organized transition from initial attack to extended attack will facilitate earlier control of major fires and reduce damages and suppression costs.

- ***Major Incident Management*** – Improve the capabilities of the State and Local fire authorities to manage major incidents without reliance on the federal teams.

- ***Mobilization*** – States need to establish authorities and procedures for effective mobilization of available local government resources to respond to major wildfires.

Recommended Priorities
The States were asked what would be their priorities for programs. These percentages were developed from their responses:

Public Educations	20%
Training Rural Firefighters	20%
Local Initiatives	15%
Mapping and Planning	15%
Hazard Reduction	10%
Fuel Breaks	10%
Demonstration Projects	5%
Home Inspections	5%

Wildland/Urban Interface

■ ***Recommendation*** -- That the Department of Interior funds for the new Rural Fire Assistance program be channeled through the States, in the same way the Forest Service allocates their Volunteer Fire Assistance funds.

Mapping the Wildland/Urban Interface Areas

Before you can begin to educate the public and planners and governmental leadership, you must define and delineate the wildland/urban interface areas within each state. The goal should be that the maps be of such detail that they would designate whether an individual parcel is in a hazardous zone or not. The maps should also be developed using ArcView or a compatible Geographic Information System database.

■ ***Recommendation*** – That each state map and assess the wildland/urban interface areas in the state and share this information with local planning agencies and the insurance industry.

Federal Fire Policy Clarification

The Federal Fire Policy is a necessary document, but it needs clarification so that its interpretation is limited to its intent.

■ ***Recommendation*** – That a list of specific questions and/or concerns be developed and sent to the appropriate federal agencies for clarification and interpretation. That the clarifications and interpretations then be distributed to all appropriate levels within the states and federal agencies.

Forest Health

Forest health is a technical term that means something to foresters and wildland fire managers. It means nothing to the general public. It is important that when attempting to remedy a hundred years of fire policy, that the thinking go beyond 30-feet of clearance, and include incentives for the small landowner, timber company and federal land management agency. Defensible space is vital, but the term implies that a firefighter will be necessary and present during the fire. The plan must include the reintroduction of fire to the forests and use other fuel-modification methods when appropriate.

■ ***Recommendation*** – That some simple explanations be developed that describe what forest health means for the layman.

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■ ***Recommendation*** – That public education programs move beyond "defensible space" to include forest health issues.

■ ***Recommendation*** – That Congressional action be enlisted to support some exemptions from the Clean Air Act for prescribed fire.

Mobilization Checklist

Most of the states in the West do not have authorizing legislation to move local government firefighting forces statewide as needed. Even with proper authorization, there is also a need for a established system to:

1. Activate and mobilize the needed forces.
2. Provide Worker's Compensation and other liability insurance.
3. Provide logistical support to the responding forces.
4. Reimburse agencies for assistance that goes beyond mutual aid.

■ ***Recommendation*** — Each of the states should conduct a "self-evaluation" survey of their authorities, responsibilities, and capabilities to ensure that they are ready to move the necessary forces when needed.

Adoption of Urban-Wildland Interface Code

We know what makes a home FireSafe! There are several ways that codes, regulations and building standards can be developed and implemented. Each state or local entity will have to develop standards that are appropriate to their community. The Urban-Wildland Interface Code is the most comprehensive available. It can be adopted as a regulative code or as a model code.

■ ***Recommendation*** – That the Urban-Wildland Interface Code be used as the model code recommended by the state forestry agencies in the West.

Interstate Compact

Only seven of the seventeen states in the West are signatories to the Interstate Civil Defense and Disaster Compact.

Wildland/Urban Interface

■ ***Recommendation*** – That the ten states not signatories to the interstate compact take the appropriate actions to join the compact.

■ ***Recommendation*** – That an operations plan be developed for the movement of state personnel and equipment as authorized by the interstate compact. That each spring, this operating plan be updated and refined as necessary.

Major Incident Management Teams

The use of major incident management teams is becoming more and more important. The complexities of managing fires or other disasters is so complicated that a team approach is appropriate. The use of the federal teams has been the only option for some states. The federal teams are excellent at what they do, but sometimes do not adjust to the needs and wants of state or local officials. Establishing state teams is not a move away from cooperative programs with the various federal agencies, it is an augmentation of cooperation. There is enough work for all the qualified teams.

■ ***Recommendation*** – That each state develop their own major incident management teams, utilizing state, local and federal personnel.

Delegation Authority

All too often, when a federal team is requested to manage a state emergency, the team brings with it the policies and procedures of their "home agency." A letter of delegation is issued that allows the team to function on the incident. But, in most cases, the letter of delegation does not adequately spell out the expectations of the entity being served.

With the issuance of the Federal Fire Policy, structure protection issues have become more complicated. If a team is not specifically given the responsibility to protect structures they may not do so. All too often, the incident management team assumes they are to apply their agency's policies and procedures to the operation, rather than use the authorities, responsibilities and policies of the agency giving them authority to fight fire on their behalf. This is especially true on fires burning in multiple jurisdictions when the non-federal agencies are not able to assume their fair share of a true *unified command* operation. Lacking the full input provided in unified command, it is imperative that jurisdictional agencies utilizing the federal or interagency Incident Management Teams specify upfront in their

delegation of authority to the team, the authority, responsibility, and funding mechanism to be used to provide protection of structures from the encroaching wildfire.

■ ***Recommendation*** – Develop a standard letter of delegation to be used by the states with federal incident management teams. Insure that the delegation authority includes a statement that the team is to concern itself with structure protection or any other specific areas of local concern.

Use of Local Firefighting Forces

Each year, the forces of rural county fire departments, fire protection districts, and local volunteer fire companies make initial attack on thousands of wildland fires in the West. During major wildland fires, these same forces are called upon to protect the structures threatened when wildfires encroach into the wildland/urban interface. The majority of the local government firefighting forces lack the training, equipment, and communications to operate safely and effectively on major wildland fires.

■***Recommendation*** **–** That states assume a leadership role in improving the safety and effectiveness of local government firefighting forces on wildland fires, especially in the wildland/urban interface. States should provide more and better training, equipment, and communications capabilities to local fire forces.

■***Recommendation*** **–** The states must also begin to develop plans that will begin to phase-out the federal-excess property equipment and replace it with more up-to-date apparatus.

Wildland/Urban Interface

Appendix

Definitions

Before you can fully understand the wildland/urban interface fire problem, you must know the language and the terms. The following are some of the unique definitions associated with the problem:

Areas of Safe Refuge – an area of safe refuge is like a safety zone, a place where a person is safe from a fire. Structures can be constructed in such a way to provide a place of refuge during a wildland fire.

Dwelling Unit – is a house, home, apartment, etc. where humans reside. A motel or hotel room is not a dwelling unit, because the length of say is usually short-term.

Hazard – the degree of flammability of the fuels once a fire starts. This includes the **fuel** (type, arrangement, volume, condition, etc.), **topography** and **weather**.

Home or House – is usually a privately owned structure in which people live. It does not house more than one family.

Ignition-Resistant Construction – incorporates the use of materials and design that enables a structure to withstand ignition form radiant heat, fire brands or direct flame impingement.

Risk – the chance of a fire starting from any cause.

Structural Fire Protection – is defined as interior and exterior actions taken to suppress and extinguish a burning structure or improvement utilizing standard building fire protection methods, equipment and training (Figure 10). Structural fire suppression is generally the responsibility of a

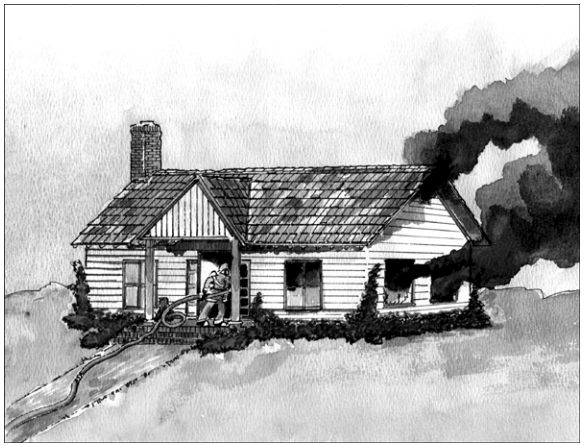

Figure 10. Structure fire protection usually involve the interior attack of a structure.

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local government entity, although there are some locations in the West where there is currently no structural fire agency in place.

Structure – is a building, home, business, barn, etc., that is built within one foundation/ framework. An apartment building is a structure.

Structure Protection – to protect structures from the threat of damage from an advancing wildland fire (Figure 11). This normally does not include an attack on fire that is inside the structure. It involves the use of fire control lines (constructed or natural) and the extinguishment of spot fires near or on the structure. This protection can be provided by the rural and/or local government fire department firefighter and the wildland fire protection firefighter.

Figure 11. Structure protection is the protection of a structure from an advancing wildland fire. It normally does NOT include an interior attack.

Structures saved – a structure is considered saved if it is within the exterior boundaries of the fire or directly adjacent to the fireline, and did not burn down or suffer serious damage as a result of the wildfire.

Structures threatened – a structure is considered threatened if it is within the exterior boundaries of the fire, or within ¼-mile of the exterior boundary of the fire and within the fire behavior projection for the next 24-hours.

Suppression – taking specific actions to control and extinguish an unwanted wildland fire.

Wildfire Causes – there are three general causes of wildland fires, **natural** (lightning), **accidental** (debris burning, children with matches, etc.) and **intentional** (arson).

Wildland/urban interface fire – is a fire that **burning primarily in wildland fuels** that destroys or threatens several structures.

Wildland/Urban Interface

Wildland/Urban Interface Fire History

(A wildland/urban interface fire is defined as one that destroyed at least three structures and burned over 25 acres of wildland.)

State	Year	Fire Name	Acres Burned	Structures Lost	Deaths
Alaska					
	1996	Prator Lake	120	3	
		Miller's Reach #2	37,336	454	
Arizona					
	1983	Pretzer	200	3	
	1990	Dude	25,000	30	6
	1995	Oldt	100	14	
		Bagdad	200	4	
	1996	Points	26	3	
	1997	Kuyhendall	410	6	
California					
	1955	Humboldt/Siskiyou	152,245	13	
		Refugio	84,770	20	
	1956	East Highlands	15,330	5	1
		Sherwood	9,428	8	
		Newton	26,169	50	
		Hume	1,940	9	
	1960	Homstake	10,948	10	
	1961	Harlow	41,200	106	2
		Bel Air	6,090	484	
	1964	Hanley/Series	71,601	174	
		Weldon/Series	11,650	20	
		Coyote	67,000	94	1
	1965	Northern Cal Series	113,766	41	
		Suncrest	1,260	7	
	1967	Sence Ranch	17,431	5	
		Santa Susanna	25,000	10	
		Paseo Grande	48,639	61	
		Baliff	23,929	8	1
		Woodson	17,560	30	
	1968	Louis	1,327	5	
	1969	Walker	17,000	8	
	1970	Statewide Series	567,508	722	19
		Reche	4,168	3	
		Bear	53,100	54	
	1972	Swasey	1,933	8	
		Bradford	1,760	4	
	1973	Boulder	8,478	17	
	1975	Grundy	1,710	3	
		Pendleton	2,400	10	
	1976	Quarry	38,346	8	
		Jacksonville	5,307	3	
		Honey	1,482	3	
	1977	Sycamore	804	234	
	1978	Creighton Ridge	11,405	64	
		Mandeville Canyon	5,500	18	
	1979	Hesperia	1,525	25	1
		Northern Cal Series	3,200	7	
		Laurel Canyon	150	24	
		Bernardo	9,000	10	
	1980	Tower House	2,349	3	
		Riverside	500	5	
		Dry Flat	28,655	6	
		Turner	28,000	7	
		Indian	28,200	7	
		Lakeland	8,400	4	
		Stable	5,482	65	
		Summit/Series	41,472	355	
		Panorama	23,600	7	
		Kiowa	2,440	11	
	1981	Thunder	11,500	29	
		Atlas Peak	22,000	69	
		Flat	1,500	3	
		Rieche/Series	29,704	6	

Note: Fire History Data as of August 31, 2000. The daily NIFC report was the source for the 2000 data.

State	Year	Fire Name	Acres Burned	Structures Lost	Deaths
		Swall	1,900	3	
		Oat Mountain	17,500	9	
		Cow Mountain	25,534	4	
	1982	Gypsum	16,800	14	
		Daydon Haul	57,000	65	
		Dulzura	5,019	7	
	1983	Porta Costa Series	325	10	
	1985	Hidden Valley	1,250	20	
		Eight-Mile	462	13	
		Seco	1,954	3	
		Gorda Rat	55,889	8	
		Cherry	40,231	17	
		Las Pilitas	74,640	41	
		Pala	325	3	
		Wheeler	120,000	26	
		Miller	8,000	3	
		Deer	520	8	
		Delta	1,620	3	
		Lafayette	100	3	
		Lehr	200	64	
		Page Mill	100	13	
	1987	Dog Bar	362	9	
		Stanislaus Complex	144,762	28	
		Clark	37,530	4	
		Gulch	6,800	6	
		Yellow Complex	47,770	3	
		Glasgow	13,370	3	
		Salmon/St. Clair	8,600	35	1
		Post	546	3	
		Baldwin Hills	500	21	2
		Morse (Pebble Beach)	160	37	
	1988	Amador	600	3	
		Railroad	10,750	15	
		Mason	4,072	5	
		Orinda	15	7	
		Lake	10	4	
		Miller	38,600	7	
		49er	33,700	312	
		State 1807	4,738	5	
		Stagecoach		15	
		Rosa		4	
		Yucca	931	3	
		Fern	7,790	58	
		Preston	1,000	7	
		Geysers	352	7	
		PG E #19	8,648	3	
		Miller	10,000	18	
	1989	Kelly Ridge		4	
		Highway 26	400	9	
		Calaveras	425	4	
		Powerhouse	11,680	22	
		Olivas	813	3	
		Eagle	4,600	3	
		Poppet	1,328	3	
		Ortega	6,100	13	
		San Benito	52	7	
		Joshua	690	6	
		San Martin	375	17	
		Two Rock	161	7	
		Greenwood Series		159	
		Tuttletown	740	8	
	1990	Monterey	18	8	
		Paint	4,900	641	1
		Carbon Canyon	6,640	14	
		Bedford	490	20	
		Glendale	75	50	
		Cottonwood		5	
		A Rock	12,136	66	
		Pine	125,892	27	
		Long Gulch	2,100	3	

State	Year	Fire Name	Acres Burned	Structures Lost	Deaths
		Knoll	300	7	
	1991	Fiddle	20	3	
		Tunnel	1,600	2900	25
	1992	Borax	1,920	15	
		Jay	550	3	
		Maidu	675	10	
		Villa	6,700	19	
		Fawn	350	13	
		Fountain	63,960	636	
		Cleveland	24,580	26	2
		Moccasin	8,370	6	
		Clear	190	5	
		Idaho	50	4	
	1993	Greenmeadow	40,051	66	
		Kinneloa	5,715	149	1
		Stagecoach	546	8	
		Mill Creek	4,680	6	
		California	25,100	107	
		Ortega	21,392	15	
		Guejito	20,722	9	
		Laguna Canyon	14,808	366	
		Topanga	16,885	300	3
		Reppier	5,956	15	
		Old Coach	2,139	36	
	1994	Kelsey	860	33	
		Raulson	1,000	13	
		Bailey	7,000	8	
		Broens	1,650	4	
		Creek	442	3	
		Highway 41	48,531	37	
		Lakeland	2,400	8	
		Scout	3,023	9	
		Lucas	8,464	40	
		Hemet Complex	19,200	14	
	1995	Jenny	420	6	
		Sycamore	10,000	3	
		Warners	2,400	20	
		Riverside	5,000	6	
		Bluff	2,624	3	
		Vision	12,354	45	
		Lopez	1,985	4	
	1996	Ellis	43	6	
		State 837	653	5	
		Weber	360	4	
		State	165	3	
		Dove	930	3	
		Riverside	40	3	
		Pechanga	1,336	3	
		Gifford	31	3	
		PGE #8	80	5	
		Stumpfield	3,000	43	
		Lightning #29	7,000	20	
		Peachland	25	4	
		Highway 58	33,094	13	
		Riverside	1,210	6	
		Harmoney	8,592	110	
		Rincon	1,800	6	
		Calabasas	13,010	6	
	1997	Riverside	320	3	
		Grove	1,235	3	
		Calimesa	377	9	
		Priest	250	10	
		Wohlford	457	8	
		Pamela	25	3	
		Pauba	7,800	10	
		Wildwood	940	6	
		Poppet	1,500	5	
		William	5,810	85	
	1998	Juniper	6,000	89	
		Edna	28,164	5	1

State	Year	Fire Name	Acres Burned	Structures Lost	Deaths
		Taylor	2,160	5	1
		Bitterwater Valley	420	5	
	1999	Lowen	2,000	23	
		Dunstone	268	3	
		Bloomer #3	2,590	9	
		Musty #3	7		
		Willow	21,900	60	
		Canyon #4	2,580	230	
		Rumsey	3,015	6	
		Shockey	3,885	3	
		Oregon	280	5	
		Jones	26,202	264	
	2000	Manter	72,750	16	
		Berryessa	1,731	15	
		Morgan	3,316	3	
		Happy	5,500	3	
		Union	350	5	
Colorado					
	1989	Black Tiger	2,000	44	
	1990	Old Stage	2,000	10	
	1994	Hour Glass	1,275	13	
		Wake	3,846	3	
	1996	Buffalo Creek	10,000	10	
	1999	Monument	100	9	
	2000	Bobcat	10,600	22	
		High Meadow	10,927	51	
		Pony	5,240	4	
Hawaii					
	2000	Puu Kapu	4,500	3	
Idaho					
	1989	Lowman	46,000	25	
	1991	Hauser Lk Complex	1,700	5	1

State	Year	Fire Name	Acres Burned	Structures Lost	Deaths
	2000	Clear Creek	126,000	10	
		Burgdorf Junction	64,666	19	
		Fisher Springs	22,000	4	
		Lookout Point	4,000	3	
		Trail Creek	34,759	30	
		SCF Wilderness	171,560	22	
		North Fork Wilderness	14,506	5	
		Indian/Prospect	11,100	3	
		Morse	4,275	3	
Kansas					
Information is not available.					
Montana					
	1977	Pattee Canyon	1,200	7	
	1983	Baney Coulee	2,500	3	
	1984	Houghton Creek	12,061	3	
		Hawk Creek	180,508	44	1
	1988	Red Bench	14,000	24	
		Storm Creek	30,000	12	
		Canyon Creek	120,000	6	
		Whitehall	1,630	3	
	1991	Holter Lake	125	3	2
	1998	Shepard Mountain	30,000	34	
	1999	NE Corner	3,917	10	
		Fishel Creek	28,155	5	
		Anelope	7,240	20	
		Outlook	6,952	10	
	2000	Canyon Ferry	43,922	50	
		Fort Howes	55800	4	
		Average Bad Day	1,310	11	
		Monture/Spread Ridge	21,800	4	
		Hell Creek	750	3	
		Valley Complex	173,563	227	
		Thursday	750	3	

State	Year	Fire Name	Acres Burned	Structures Lost	Deaths
		Thursday	750	3	
		Blodget Trailhead	10,764	8	
		Gilger	640	3	
		Maloney Creek	72,000	12	
		Boulder Complex	12,604	9	
		Skalkaho Complex	64,794	4	
Nebraska					
	1999	Thedford	75,000	15	4
Nevada					
	1994	Crystal Peak	7,310	3	
	1996	Autumn Hills	3,800	4	
	1999	Spring Creek	200	2	
	2000	Coyote	15,000	3	
		South Cricket	65,000	5	
New Mexico					
	1974	Spring	14,500	45	
	1993	Burgett	5,350	8	
	1996	Hondo	7,651	32	
	2000	Cree	6,488	3	
		Scott Able	16,034	64	
		Manuelitas	1,410	4	
		Cerro Grande	47,650	350	
		Viveash	28,283	4	
North Dakota					
	1999	Gap	69,000	16	
Oregon					
	1975	Ten Mile Valley	232	4	
	1987	Bland Mountain	9,593	35	
	1988	Milepost 70	160	4	
	1990	Awbrey Hall	3,353	26	
	1994	Blackwell Road	65	14	
		Hull Mountain	7,990	44	
	1996	Wheeler Point	14,960	11	
		Skeleton	17,736	36	
	1998	Lone Pine	5,290	3	
	2000	East Complex	45,000	3	
South Dakota					
	1959	Deadwood	2,500	60	
	1988	Westberry Trails	3,840	57	
	2000	Flagpole Mountain	7,800	4	
		Jasper	82,600	3	
Utah					
	1990	Wasatch		43	2
	2000	Box Canyon	200	3	
Washington					
	1985	Barker Mountain	60,000	4	
	1987	Hangman Hills	1,500	24	
	1988	Dinkleman	50,000	3	
	1991	Firestorm 91	350,000	191	1
	1992	Castle Rock Canyon	5,400	24	
	1994	Chelan/Leavenworth	58,000	54	1
	1996	Bowie Road	3,020	7	
	1997	Red Lake	1,151	5	
	1998	Cleveland	118,500	14	
	2000	Rocky Hill	9,404	37	
		Goodnoe	4,800	3	
		Mule Dry	76,800	25	
		Eastside Complex	5,924	3	
Wyoming					
	1988	Clover-Mist	319,575	14	
		North Fork	531,182	7	

Wildfire Hazard Classification for Boulder County, CO

By C.M. Hay, The Wildfire Interface Group, cmh_twig@excite.con
& J.H. Korte, Boulder County Land Use Department, jhklu@co.boulder.co.us
June 2000

Boulder County, Colorado:

Boulder County located 40 miles northwest of Denver, CO on the east side of the Colorado Rockies covers approximately 750 square miles. The county lands range from semi-arid grasslands and plains in the east through montane forests and alpine tundras in the west. Steep rugged canyons, strong Chinook and Bora winds, and semi-arid conditions characterize mountainous areas. Public open space, intermix with private landholdings in the western mountainous half of the county where fire protection is provided by 18 local fire protection districts.

The Problem:

The possibility of a wildfire is an ever-present danger in the County. Eighty years of fire suppression preceded by earlier European settler grazing have left the forests with vegetation densities 10 to 100 times their historic levels. This results in fires that are more intense and devastating than the previous historical norm. Combined with increased residential development and high recreation demands in the mountains, the potential for catastrophic wildfire has reached crisis levels.

The intermixing of residential structures with wildland vegetation creates a significant fire management problem. In one case, wildland fuels are partially dependent upon fire as part of their ecology. In the other case, structures are not compatible with a fire environment. This mixture of two different types of fuel with different tolerances for fire is the crux of the wildfire management problem in the urban wildland interface.

In the past few years, Boulder County has experienced several wildfires and the situation reached a crisis point in 1989, when the Black Tiger Fire consumed 44 homes and blackened 2,000 acres of forested land in the western part of the county.

The Response:

In 1990 the Boulder County Wildfire Mitigation Group (BCWMG) was formed consisting of members from public agencies along with private citizens. The group's mission was to determine and coordinate actions that could help minimize loss of life and property from wildfires.

By 1992, a technical team from the BCWMG began designing and developing the Wildfire Hazard Identification and Mitigation System (WHIMS). Using geographic data management and analysis technologies, WHIMS' goal is to identify wildfire hazards, educate homeowners, assist land managers, and assess the risks involved due to wildfires.

Wildland/Urban Interface

The Approach:

Lot boundaries and ownership information are extracted from the Assessor's parcel database. Topographic information is extracted from USGS digital elevation model data (DEM). Fuel type data were specifically mapped for the county, and parcel-specific hazard data are collected on-site using a specially designed WHIMS questionnaire.

Two levels of spatial focus are a part of the analysis. Broad level analysis occurs countywide and site-specific analysis is focused on individual parcels. The parcel analysis fully nests within the countywide broad analysis and is directly linked through the spatial (GIS) database.

An overall wildfire hazard assessment along with individual factor ratings are produced using a hazard-rating model (**WHINFOE)** that is based upon a standard wildfire behavior model (**BEHAVE**) and the expertise of wildfire behavior specialists. The **WHINFOE** model is a hierarchical model with 3 factor categories (Base Hazard, Passive Protection, and Active Protection categories) that group 7 primary information factors: The **Base Hazard** is the hazard due to the existence and characteristics of the 'burnable stuff'. This category is made up of the Topography and Fuels (County-wide & Parcel Specific) factor, the Building Construction and Design (Parcel Specific) factor, and the Landscaping within 150 feet of a structure (Parcel Specific) factor. **Passive Protection** evaluates Defensible Space, which if present decreases fire intensities allowing a structure to better withstand the passage of the flame front, or so that fire fighters can more easily protect the structure (Parcel Specific). **Active Protection** evaluates Accessibility, Fire Protection Response Time, and Water Availability (Parcel & Subdivision Specific). If present the Protection Categories contribute to a reduction in the Base Hazard.

The Results:

In districts where the parcel-based hazard questionnaires have been completed and evaluated, the WHIMS information has been valuable in raising homeowner awareness of the wildfire danger to their property. Several mitigation projects have been initiated and/or completed as a result of heightened wildfire hazard awareness within the county due to the efforts of the BCWMG and WHIMS.

Next Steps:

Acquire House Pad Locations so that structure focused proximity analysis can be performed within the GIS as opposed to parcel-aggregated evaluations. Such data would improve the analysis of topographic and fuels data relative to structure location on large parcels. Such data would also solve the multiple structures per parcel problem in the most efficient way.

A **dangerous topography evaluation** is part of the parcel-based evaluations, and is evaluated directly on site for each structure. It is desirable to conduct this evaluation as part of the countywide hazard classification. However, a dangerous topography data layer has not been developed as yet for the entire county. Plans to acquire this information are currently being developed.

Wildland/Urban Interface

The county is currently undertaking a **countywide risk 'first look' evaluation** where risk is the probability of an event occurring. That information will be combined with the hazard/values at risk classifications for a follow-on county-wide integrated hazard-risk evaluation to be used to guide planners in the site plan review process for new or remodel building permits.

Author Biographies

Claire M. Hay is a principal with the Wildfire Interface Group. She is a wildland-urban interface specialist and a remote sensing and GIS specialist. She has been involved in the Boulder County WHIMS project since 1992. She obtained her B.A. in Geography from the University of California, Berkeley, and her M.S. and Ph.D. in Forest Sciences from Colorado State University.

James H. Korte is a GIS Specialist for the Land Use Department at Boulder County, Colorado and has been there since 1989. He has been working with the county's WHIMS project since it's inception in 1992 as GIS Specialist. He obtained his B.S. degree in Geography at Pennsylvania State University in 1988.

Federal Wildland Fire Policy – A Summary

The challenge of managing wildland fire in the United States has dramatically increased in complexity and magnitude over the decades. Large wildfires now threaten millions of both public and private acres, particularly where vegetation patterns have been altered by development, land-use practices, and aggressive fire suppression. Potentially serious ecological deterioration is possible where fuel loads have become extremely high. In these areas, public and private values are at risk. To reduce the threat of these catastrophic fires, federal wildland fire policy was revised in 1995 and engages a proactive approach to managing fire.

Because wildland fire respects no boundaries, uniform policies and programs are essential, as well as strengthening cooperators' relationships. The Departments of the Interior and Agriculture, together with tribal and state governments and other jurisdictions, are responsible for the protection and management of natural resources on public lands. And, as firefighting resources become increasingly scarce, it is more important than ever to strengthen cooperative relationships.

The Federal Wildland Fire Management Policy and Program Review was chartered in 1994 by the Secretaries of the Interior and Agriculture to ensure that federal policies are uniform and programs are cooperative and cohesive. The review was conducted by the Forest Service, the Bureau of Land Management, the National Park Service, the U.S. Fish & Wildlife Service, and the Bureau of Indian Affairs. The National Biological Service, Environmental Protection Agency, National Weather Service, and FEMA also were involved.

The resulting report presents fundamental principles of fire management and recommends a set of federal wildland fire policies. Though the different missions of the agencies sometimes result in differences in operations, a cohesive set of federal fire policies improves the effectiveness and efficiency of fire management - and our ability to meet modern challenges posed by seasonal wildland fire conditions. Some of the key points in the policy include:

- Protection of human life is the first priority in wildland fire management. Once firefighters are committed to an incident, they are the number one priority. Property and resource values are the second priority, with management decisions based on values to be protected.

Wildland/Urban Interface

- Wildland fire, as a critical natural process, must be reintroduced into the ecosystem. Fire will be allowed to function as nearly as possible in its natural role to achieve the long-term goals of ecosystem health. Where wildland fire cannot be safely reintroduced because of hazardous fuel buildups, some form of pretreatment must be considered, particularly in wildland/urban interface areas.

- Wildland fire management decisions and resource management decisions go hand in hand and are based on approved Fire Management and land and resource management plans. Fire managers also have the ability to choose from the full spectrum of fire management options, from prompt suppression to allowing fire to function in its natural ecological role.

- The role of federal agencies in the wildland/urban interface includes wildland firefighting, hazard fuels reduction, cooperative prevention and education, and technical assistance. Primary responsibility rests at the state and local levels. Structural fire protection in the wildland/urban interface is the responsibility of tribal, state, and local governments.

- The Western Governors' Association will serve as a catalyst to involve state and local agencies and private stakeholders in achieving a cooperative approach to fire prevention and protection in the wildland/urban interface. Federal agencies must place more emphasis on educating internal and external audiences about how and why we use and manage wildland fire.

Our success depends upon four things: Every agency administrator must ensure that these policies are incorporated into all actions. Fire professionals must work with agency administrators to make the policies work on the ground. Managers and staffs must actively implement the recommendations and work with their constituents to ensure success. Every employee of every agency must also be committed to follow through on the ground.

Finally, agencies and the public must change their expectation that all wildfires can be controlled or suppressed. No organization, technology, or equipment can provide absolute protection when unusual fuel buildups, extreme weather conditions, multiple ignitions, and extreme fire behavior periodically come together to form catastrophic events.

Taken from the USDA Forest Service Home Page.

Wildland/Urban Interface

FireSafe SPOKANE

Prior to 1987, everybody in the Spokane (WA) fire community was “fat, dumb, and happy.” Few people had even considered the possibility that this large, rapidly growing metropolitan area of 360,000 in the piney woods of eastern Washington might have a wildland/urban interface fire problem.

Then came the Hangman’s Valley Fire! This fast-moving, wind-driven wildfire moved through a fuel bed of mostly Ponderosa Pine and annual grass (FBA Fuel Model 2) toward an upscale suburban subdivision that previous pre-fire plans had rated as not threatened, due to its protective ring of wide, green golf course fairways. Unfortunately, long-range spotting conditions laid down a barrage of firebrands on untreated wood shake roofs up to a mile ahead of the fire, and many beautiful homes were lost in one exciting afternoon.

Following this eye-opener, a group of players including area fire chiefs and other interested fire safety advocates began developing a package of proposed legislation that would establish the first statewide FireSafe regulations. This ambitious package included clearance requirements, minimum road standards, street sign and address standards, power line clearances, rated fire resistant roofing standards, and other built-in fire protection features already adopted by several other states or pulled from model fire codes. This first draft package was soundly rejected by the legislature, which clearly indicated it would not consider such sweeping reforms without strong representation on the committee from developers and builders.

Thus, a new larger committee was formed with significant representation from the planning, development, and building constituencies and began reconsidering the complexities of such comprehensive FireSafe regulations. In the meantime, time marched on.

In mid-October, 1991, the Spokane area experienced a wind event that started more than 104 wildland fires in one day. Conditions were already drier than normal, and sustained 60+ m.p.h. winds toppled trees into power lines, starting multiple vegetation fires all around the area. Downed trees and blowing dust and smoke made it difficult for various fire authorities to reach, size-up, and contain many of these wildfires. On the first day, at least 20 fires in the Spokane area reached “project fire” size, and homes were threatened simultaneously on several fronts. Area fire forces were strained beyond their limits, local authorities were slow to realize the scope of the “big picture”, and mutual aid

forces were slow to arrive due to travel problems created by the windstorm. By the time it was over, "Fire Storm '91 had burned more than 35,000 acres and destroyed 114 homes (see also *Fire Storm '91 Case Study* by the NFPA).

Following this disaster, several significant actions have been taken to improve the overall level of wildfire protection in the Spokane area:

- Spokane County Commissioners adopted the package of now more "user-friendly" FireSafe regulations the committee had long been working on.
- Area fire agencies consolidated their multiple dispatch centers into four regional interagency dispatch offices with linked communications.
- The radio communications system was reorganized to provide common command and tactical nets, as well as common frequencies for mutual aid forces.
- The state Fire Mobilization Plan was overhauled and mutual aid coordination improved.
- Interagency ICS wildland fire training classes were conducted.
- Interagency Incident Management teams were organized, including an Area Command Authority (ACA) support team to prioritize multiple incidents and allocate scarce resources.
- FireSafe SPOKANE was born.

Most of the wildfires in Fire Storm '91 were caused when the extremely high winds blew down power lines, or toppled trees across them. The electric utility companies were besieged by lawsuits brought by the many insurance companies who had covered lost homes. Eventually, some twenty fire lawsuits were combined into one class-action lawsuit that was finally settled out-of-court. The settlement provided $300,000 to develop a method to improve defensible space around vulnerable homes in the Spokane area.

To oversee this new effort, a non-profit corporation was formed with a five-member board of directors representing the electric utilities, the fire community, and the Washington Department of Natural Resources (WADNR), the statewide wildland fire authority. This board established the following mission statement for what has come to be FireSafe SPOKANE:

> ***To educate, facilitate, and coordinate local community efforts to improve defensible space around homes in the wildland/urban interface to the extent that both fire damages and suppression costs are reduced.***

FireSafe SPOKANE has recently hired its first permanent (part-time) executive director, who has completed a fire problem assessment and developed an action plan. Projects completed and being undertaken by this group include:

- Creating several demonstration FireSafe houses in cooperation with homeowners on a cost-share basis.
- Developing and distributing a *10 FireSafe Steps* educational brochure.
- Providing free voluntary home fire safe inspections upon request.
- Sponsoring a spring cleanup week with subsidized chipping, hauling, and dumping fees so that homeowners can more economically reduce their dooryard fuel beds.
- Working with homeowner/neighborhood associations to initiate and sustain fire safe awareness and FireSafe activities in critical areas.
- Developing a FireSafe film short to be shown in local theaters and in conjunction with the FireSafe-sponsored showing of “Feel the Heat” at the Imax Theater in Spokane.
- Working with WADNR to develop Fire Information Strike Teams (FIST) to emphasize the wildland/urban interface fire prevention message to the media during the “teachable moment” of coverage of a major fire.

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- Seeking additional funding from grants and/or corporate sponsorships to continue the program beyond its current three-year funding window.

While FireSafe SPOKANE has made some progress and has a plan in place to further their mission, the going hasn't been easy. Board members have come to realize that public apathy is rampant, cooperation isn't always easy to achieve, and funds are hard to come by. A significant "speed bump" may be a recent court case where a homeowner's association won a lawsuit against a homeowner who converted his wood shake roof to fire-resistant material in violation of the subdivision CC&Rs. Nevertheless, they remain committed to their mission statement and goals and are working hard to help protect the Spokane area from wildland fire.

For more information, contact: Ross Hesseltine, Executive Director, FireSafe SPOKANE, 11418 N. Dakota, Spokane, WA 99208. (509) 464-1086 www.firesafespokane.com

Wildland/Urban Interface

FIREFREE! BEND

Opportunity knocked twice in Bend, Oregon! Fortunately, sharp people at the Bend Fire Department were there to answer the door.

The first opportunity came in 1998, when representatives of SAFECO Corporation, a Seattle-based Fortune 500 insurance company, offered to donate some money to purchase a new piece of fire equipment to protect their investment in this wildland/urban interface community in central Oregon's high desert. Bend Fire Marshal Gary Marshall argued that instead of another piece of equipment, what the fire community really needed was funding to develop a public education program to create and maintain defensible space around homes in the piney woods.

Marshal Marshall (I couldn't resist that one) is a strong believer in individual responsibility; the opposite of the theory that government exists to do everything for everyone. He wanted to put the responsibility to protect homes from wildfire back on the homeowners and develop a major public education effort to get people to change their attitudes and behaviors about wildfire. His presentation impressed the SAFECO people and they agreed to provide initial funding of $75,000. A steering committee of interested people from the fire and business communities was formed to establish goals and objectives, and develop a strategy for the campaign.

The steering committee recognized that a professional product would probably produce better results than a homemade one, and put out requests for proposals from professional marketing firms interested in developing the educational program. They selected the RalstonGroup, a nationally known marketing firm that just happened to have relocated to Bend to escape the rat race of the big city. RalstonGroup then developed an extremely effective and professional multi-media campaign using the FireFree! logo and a "get in the zone" (i.e. defensible space) motto.

The objectives of the FireFree! program are to mitigate the loss of life and property caused by wildfires through public education; develop a program to foster and promote public education for wildfire safety; to change attitudes and behaviors toward wildfire safety and survival; and to establish a review and measurement

Wildland/Urban Interface

process to assess the effectiveness of the program, and assist the insurance community and fire service in evaluating high fire hazard interface areas.

The program consists of brochures, multi-media advertising, speakers bureau, team leader training, and other materials focused on educating people of the need to create a minimum 30-foot defensible space around their homes. A professional quality video, starring a variety of local characters, captures people's interest and gets them thinking about the FireFree! message. The video was made available at local fire stations, video rental stores, and libraries.

This educational program culminates each spring in two FireFree! clean-up weekends where residents can recycle their yard trimmings at no charge at the local landfill. In its' first year, the project generated 9,102 cubic yards of combustible yard debris, most of which had to be cut, chipped, and hauled off the streets by employees and equipment from cooperating government agencies (ODF, BLM, FS, Deschutes County, etc.).

The first year results were so impressive that SAFECO increased funding to a total of $200,000 in addition to the time, materials, and equipment donated by dozens of corporate sponsors. Media outlets contributed matching funds to expand the advertising effort. Homeowner associations created task forces to perform work and raise funds to chip and/or haul their own debris. By the third year of the program, the clean-up weekends generated 10,860 cubic yards of material from 3,949 participating homeowners. The program has become self-sustaining to the point that the cooperating government agencies have been able to reduce their participation significantly, with the majority of the costs transferred back to the homeowners.

The FireFree! program has been a resounding success in Bend and is expanding. The Oregon State Fire Marshal has adopted the program statewide, and the City of Eugene has adopted the program.

PROJECT IMPACT

Opportunity knocked a second time when Fire Captain Peter Ribble of the Bend (OR) Fire Department was exploring the FEMA website looking for new ideas on fire safety programs and found FEMA's Project Impact grant program.

Project Impact is a federally funded grant program that provides funds to one community in each state each year to better prepare it to survive a large-scale disaster. This disaster resistant communities approach is most often focused on floods, earthquakes, tornadoes, hurricanes, etc. But Captain Pribble decided that the biggest threat to his community was a major wildfire. He completed and submitted a grant application that was approved.

Thus was born the Deschutes County Project Impact wildland/urban interface fire safety effort. FEMA provided initial funding of $300,000, with Deschutes County providing $100,000 in matching local funds. A 16-person steering committee was formed to oversee the project, and Captain Ribble was hired as the project coordinator.

The objectives of Project Impact in Deschutes County are to improve the efficiency of fire protection and the safety of residents in the wildland/urban interface by:

1. Supporting the FireFree! project and expanding it to countywide;
2. Developing additional means of ingress/egress (new roads) in targeted high-risk subdivisions;
3. Completing the rural addressing project by providing standardized reflective address signs to all residents; and
4. Completing the geo-coding of all addresses in the county to improve the accuracy of the GIS database used by planning and emergency services agencies.

By utilizing the business continuity approach to disaster planning, Project Impact has been able to attract several corporate sponsors. The project has built from an already well-established base of good cooperative relations among the fire agencies, and is working cooperatively with both FireFree! and Keep Oregon Green to spread the fire safety message in Deschutes County.

Other activities that may be included are expansion of an outdoor environmental classroom in Redmond, and a living forest classroom at the High Desert Museum in Bend.For more information, contact:Deschutes County Project Impact,63333 Highway 20 West,Bend, OR 97701 (541) 312-6008 E-Mail: peterr@Deschutes.org

Wildland/Urban Interface

GUAM

Of the U.S Pacific trust territories, only Guam replied to our wildland/urban interface fire problem questionnaire, and "Yes, Virginia, there is a" problem. We felt that Guam is so different, that it deserved its own section in this report.

Located some 3,700 miles west of Hawaii, Guam is on the other side of the International Date Line, and thus "where America's day begins." The island's 210 square miles consist of a northern limestone plateau rising to a southern chain of volcanic mountains which feature steep coastal cliffs to the east, but more gently sloping terrain to the west. The general elevation averages about 500 feet above sea level (and there is plenty of sea to go around, thank you), with the highest point being 1,334-foot Mt. LamLam.

Since the annual rainfall ranges from 90-100", and the temperatures run from 70 to 90 degrees, you would expect the vegetation to be tropical and lush, which it is, mostly. There is a distinct dry season from November – June, and some drier areas are covered in what most of us would think of as brushfields and grasslands. When periods of drought occur, there is plenty of fuel loading (30-40 tons per acre), and wildfire can become a serious problem. Much of the island is set aside in conservation reserves (i.e. natural wildland areas).

Guam is a self-governing organized unincorporated U.S. territory actively seeking commonwealth status, but politics being what they are, such legislation has languished in the Congress. In 1994, however some 3,200 acres of land were transferred to private ownership, thus creating the opportunity for "uncontrolled development". Currently some ten major villages have housing developments encroaching into the wildland, resulting in a moderate, but increasing wildland/urban interface fire problem. The Chamorro Land Trust Act gave each native islander a housing lot, some of which are in the wildland areas, and other affordable housing measures are resulting in a (by small island standards) building boom. The Forestry and Soil Resources Division's fire program is funded half by the government of Guam and half from State Fire Assistance funds administered by the Forest Service.

The Forestry and Soil Resources Division is authorized to fight wildland fires, providing both direct suppression and operational support to local fire agencies. FSRD also provides command and control, as well as coordination of the island mutual aid system, with resources available from the Guam Fire Department and the military (including water-dropping helicopters from the Navy). Like nearly everybody else in the West, they would like to improve coordination, communications, planning and training to achieve a more effective system. FSRD is actively involved in training of local forces that would respond to a wildland/urban interface fire problem, providing all facets of a comprehensive training program.

Guam has no codes or regulations aimed specifically at the wildland/urban interface fire problem, but does administer the 1994 edition of the Uniform Fire Code. They have mapped the interface areas, using ArcView software, and have contracted with the Bureau of Planning to provide the fuels, infrastructure, and housing layers of the puzzle.

Like many of the other western states, Guam indicated they would like to have funding for all of the initiatives listed in the questionnaire, except tax incentives to homeowners.

They have an active prescribed fire program, on state lands only, burning primarily for fire hazard reduction. They have a system of fuelbreaks established in the conservation areas. They are also using prescribed fire to attempt to convert the flashy grassland fuels to less flammable tree stands.

The El Nino climate phenomenon, which changes our "normal" fire weather all over the West, visits a drought upon Guam, which in 1998 resulted in the Toto-Tiyan complex of wildfires, which netted a $600,000 FEMA reimbursement. That year Guam had 1,950 wildland fires that burned 13,315 acres and lost one home (not bad for a tropical climate!). The occasional typhoon can also add significantly to the fuel loading problem.

Long term solutions favored by Guam included mapping/preplanning, hazard reduction, fuelbreaks/firebreaks, and a public education campaign to teach the concept of fire safe homes to residents. The FSRD has no evacuation policy, and evacuation authority lies with the state police and state emergency services authorities. They don't support the Australian no-evacuation policy, but do support homeowners purchasing fire tools and equipment.

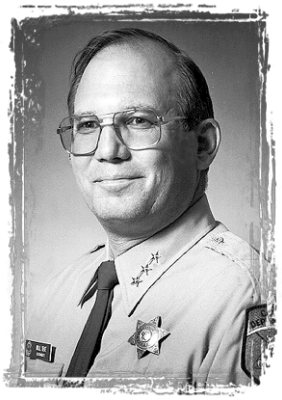
So far, probably because of a distinct shortage of national forests, the Federal Fire Policy has not had any impact on Guam, and they are not making any changes in their fire protection system to compensate for federal program changes.

If Congress were to make funding available, Guam FSRD would like to invest it in demonstration projects, hazard reduction, fuelbreaks, mapping/preplanning, public education, and in support of local initiatives. They believe that there would be opportunities to forge partnerships with the Department of Housing and Development, the local emergency services agency, and housing developers to better mitigate the wildland/urban interface fire problem. They have received a grant from FEMA's Hazard Mitigation Grant Program (HMGP) to initiate a fuelbreak/firebreak project to compartmentalize their wildland/urban interface fire problem target hazard areas.

About the Consultants

William C. Teie retired from the California Department of Forestry and Fire Protection (CDF) after a successful 34-year career. He worked up through the ranks from seasonal firefighter to Deputy Director for Fire Protection. In this position, he was responsible for all of the fire protection programs within CDF.

Chief Teie was very active in the California fire service. He was on several statewide boards and committees and was elected President of the California Fire Chiefs Association in 1986.



Chief Teie is also very active as a fire protection consultant. He is working with Rockwell International on the application of space and military technology to emergency management and operational support. In August 1996, Chief Teie was involved in the review of the 37,000-acre Miller's Reach Fire in Alaska for the Division of Forestry. He acted as a consultant for the State of Washington after their fire siege during the 1994-fire season and conducted an operational review for the Montana Department of State Lands. He was the fire protection expert used by OSHA in their report on the South Canyon fire tragedy in Colorado in July 1994.

He is the author of the ***Wildland Firefighting Fundamentals, Firefighter's Handbook on Wildland Firefighting,*** and ***Fire Officer's Handbook on Wildland Firefighting*** and has developed several other training and operational aids for the firefighter.

Brian F. Weatherford retired from CDF after a 35-year career that included fighting fires from Alaska to Mexico and from Montana to California. He rose through the ranks from firefighter to fire chief and at the time of his retirement commanded an organization including three county fire departments and two city fire departments with 62 fire stations, 88 engine companies and nearly 900 paid and volunteer firefighters.

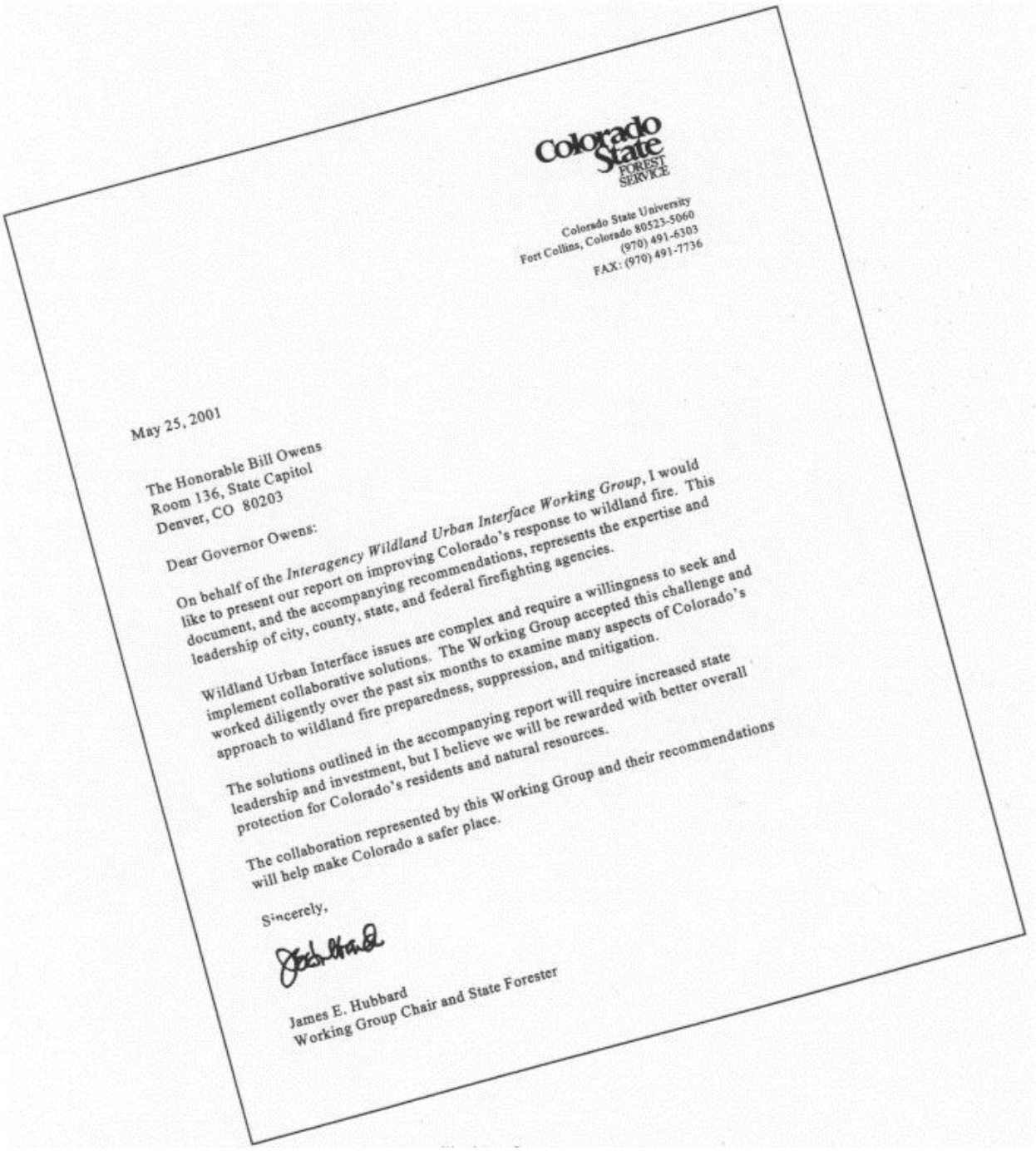
He currently provides consulting services to local government agencies in the areas of fire protection planning, budget development, organizational theory, and management audits for specialized services, but only to the extent that these projects do not interfere with his primary avocation of fishing.

Wildland/Urban Interface

Report to the Governor

Colorado's Wildland Urban Interface

May 2001



Colorado State Forest Service

Colorado State University
Fort Collins, Colorado 80523-5060
(970) 491-6303
FAX: (970) 491-7736

May 25, 2001

The Honorable Bill Owens
Room 136, State Capitol
Denver, CO 80203

Dear Governor Owens:

On behalf of the *Interagency Wildland Urban Interface Working Group*, I would like to present our report on improving Colorado's response to wildland fire. This document, and the accompanying recommendations, represents the expertise and leadership of city, county, state, and federal firefighting agencies.

Wildland Urban Interface issues are complex and require a willingness to seek and implement collaborative solutions. The Working Group accepted this challenge and worked diligently over the past six months to examine many aspects of Colorado's approach to wildland fire preparedness, suppression, and mitigation.

The solutions outlined in the accompanying report will require increased state leadership and investment, but I believe we will be rewarded with better overall protection for Colorado's residents and natural resources.

The collaboration represented by this Working Group and their recommendations will help make Colorado a safer place.

Sincerely,

James E. Hubbard
Working Group Chair and State Forester

Working Group

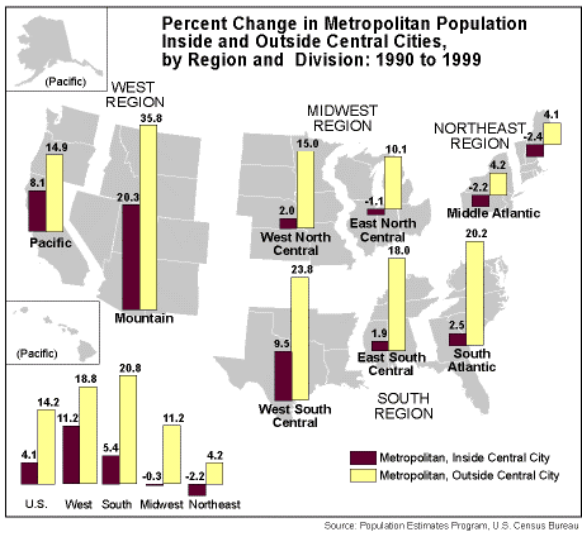
Jim Hubbard, Director, Colorado State Forest Service, Chairman • Greg Walcher, Director, Department of Natural Resources • Al Dyer, Dean, College of Natural Resources, Colorado State University • Tom Grier, Director, Office of Emergency Management • Suzanne Mercer, Director, Department of Public Safety • Ann Morgan, State Director, USDOI Bureau of Land Management • Rick Cables, Regional Forester, USDA Forest Service • T.Wright Dickinson, Moffat County Commissioner • Tom Stone, Eagle County Commissioner • Rick Sheehan, Jefferson County Commissioner • Fred Wegener, Park County Sheriff • Larry Donner, Boulder Fire Chief

Special thanks to: Carol Small, Jefferson County • Eric Bergman, Colorado Counties, Inc.• Bill Wallis, Bureau of Land Management • Paul Cooke, Division of Fire Safety • Colorado Insurance Industry • Paige Lewis, Colorado State Forest Service • Rich Homann, Colorado State Forest Service

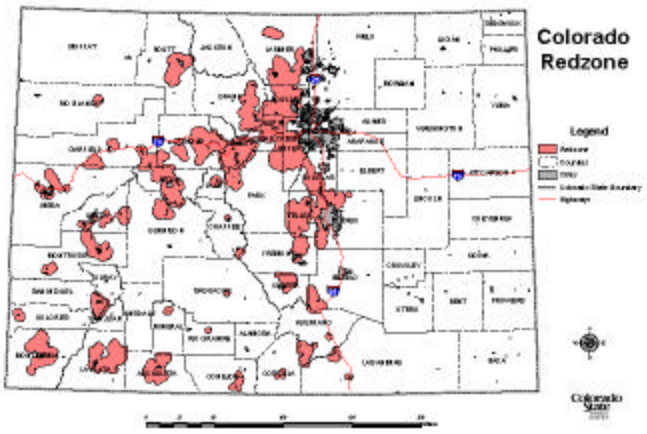
Executive Summary

The risk of wildfire in Colorado's wildland-urban interface poses a daunting challenge to public safety, fiscal responsibility and natural resource integrity in the state. The 2000 fire season brought this challenge to the forefront of public attention when four wildland urban interface fires along Colorado's Front Range destroyed 74 structures and threatened thousands more, interrupted utility service, and impacted water and air quality. The cost to state coffers for suppressing these fires was a staggering $10.1 million, contributing to the most expensive wildfire season to date.

While these numbers are dramatic, they are not surprising. A century of aggressive fire suppression, combined with cycles of drought and changing land management practices, has left many of Colorado's forests unnaturally dense and ready to burn.



At the same time, the state's record-setting growth has driven nearly a million people into the forested foothills of the Front Range and along the West Slope and central mountains – the same landscapes that are at highest risk for large-scale fire. This movement of urban and suburban residents into the wildland-urban interface (WUI) significantly increases the values-at-risk from wildland fire – the most critical of these being human life.



The cost of suppressing unnaturally large and destructive fires in the complicated environment of the WUI has pressed state and local resources beyond their capacity and has revealed complexities that are not adequately addressed by the existing system of interagency wildfire response.

Governor Bill Owens, recognizing the urgent need to more effectively address the WUI situation in Colorado, appointed a diverse working group of local,

state, and federal leaders to explore the current situation, identify opportunities for improvement, and make recommendations for change.

Over a six-month period, the Governor's Interagency Wildland Urban Interface Working Group identified several areas of concern:

- Wildfire suppression in the interface stretches the capability of response personnel in terms of safety, training, and equipment and challenges the ability of local and state governments to cover related costs. Interface protection also demands a higher level of interagency communication and coordination than currently exists.
- Mitigation of hazardous fuels in the interface is not occurring on a landscape scale, across ownerships. The implementation of planned mitigation projects is complicated by costs to private landowners, availability of a trained work force, compliance with federal requirements, and the lack of options for utilizing removed materials.
- Efforts to combat wildfire risk are complicated by a lack of awareness and/or support from local communities and the urban public.

Out of the working group's deliberations came the recognition that, in the wildland-urban interface, failure to prepare, communicate, and respond in an interagency manner could result in devastating consequences.

The time is ripe for the State of Colorado to step forward and provide the kind of leadership and coordination needed to ensure the best possible wildfire protection for its citizens.

Recommendations

The Governor's working group identified a total of 15 recommendations within the categories of preparedness and suppression, hazard mitigation, and public awareness. Those recommendations are summarized as follows:

1. Strengthen Local Capacity in Wildland Fire Preparedness, Suppression, and Mitigation.

- Provide state-supported technical and cost-sharing assistance to counties for the development and implementation of expanded county Fire Management Plans.

- Institute a consistent annual appropriation to provide for wildland-urban interface management needs and for a fuels mitigation cost-sharing program.

- Develop a statewide wildland-urban interface training program for local fire service personnel.

- Establish a mechanism for the state to contribute to the Emergency Fire Fund (EFF).

2. Enhance State Leadership and Coordination in Interagency Wildland Fire Response.

- Coordinate and fund the development and implementation of a statewide, county-by-county wildfire risk assessment.

- Provide statutory clarification of wildland fire roles and responsibilities held by county sheriffs, fire protection districts, and related local response personnel.

- Clarify in the *Colorado Interagency Cooperative Fire Protection Agreement* (Master Agreement) interagency roles and responsibilities for fire protection in the wildland urban interface.

- Provide state-level support for expanded state participation in zone dispatch centers and in the extended attack phase of wildfire suppression.

- Investigate and identify statewide protocols for radio communication across local, state, and federal jurisdictions.

- Coordinate interagency implementation and allocation of funds related to the National Fire Plan, the Ten Year Comprehensive Strategy, and similar efforts.

3. Improve Statewide Public Awareness Regarding the Role of Fire in Colorado Landscapes and Tools for Wildland Fire Prevention.

- Provide state leadership in developing and delivering coordinated interagency wildland fire messages to homeowners, landowners, land management agencies, the general public, and others.

- Encourage the development of a professional outreach and information campaign to targeted audiences within the state.

Governor's Wildland-Urban Interface Working Group
Report

Background

The risk of wildfire in Colorado's wildland-urban interface (WUI) poses a daunting challenge to both public safety and fiscal responsibility in the state. The 2000 fire season brought this challenge to the forefront of public attention when four wildland urban interface fires along Colorado's Front Range destroyed 74 structures and threatened thousands more, interrupted utility service, and impacted water and air quality. The cost to state coffers for suppressing these fires was a staggering $10.1 million, contributing to the most expensive wildfire season to date.

The magnitude and urgency of Colorado's WUI problem is influenced by a number of factors. First, among these, is the state's record-setting growth, particularly in the foothills of the Front Range and along the Western Slope and I-70 corridor. The 2000 Census revealed that Colorado gained nearly 1 million people over the past decade, making the state third in the nation in terms of percentage gained. Of this growth, nearly 80 percent occurred in the ten counties along the Front Range, with the central mountain counties of Park, Eagle and Summit close behind.

The Colorado State Forest Service (CSFS) estimates that approximately 1/4th of the state's current population resides within the Red Zone, an area characterized by over 6 million acres of forest land at high risk for large-scale wildland fire. The majority of these residents moved to the mountains from urban and suburban neighborhoods, bringing with them little knowledge of fire's natural role in Colorado's ecosystems or of what they might do to protect themselves and their property.

Low-elevation ponderosa pine, Douglas fir and piZon-juniper woodlands provide the scenic backdrop to much of the state's interface expansion. Unfortunately, these landscapes are also at the highest risk of suffering a catastrophic wildfire. A century of aggressive fire suppression, combined with cycles of drought and changing land management practices, has left many of Colorado's forests unnaturally dense and susceptible to damage from insects, disease, and fire. Thick ladder fuels characterize many of these landscapes, providing an easy route for fire to climb from

the forest floor to the trees' crowns.

Fires in the WUI are particularly dangerous to firefighters because of the complexity involved in suppressing wildfire around homes and communities. Local fire departments, both volunteer and paid, provide initial attack on most of the state's interface fires. These first responders arrive with an inconsistent range of training and equipment and are often unprepared for the combination of wildland and structural firefighting skills required in the interface. Firefighters are further challenged by subdivisions with inadequate access, lack of available water supply, and structures built with highly combustible materials.

Landowners and managers have several tools available to them to begin mitigating the wildfire risk on their property. The most common of these tools are thinning of dense trees and shrubs and the use of controlled, low-intensity fire, known as prescribed burning. Mitigation and risk reduction efforts achieve maximum effectiveness if they are carried out on a large-scale across ownership boundaries.

This kind of action involves bringing together many individuals and agencies, providing them with guidance and incentives to act, and facilitating a governing environment conducive to change. Such action is particularly complicated in western states like Colorado which are characterized by a checkerboard pattern of federal and non-federal land ownership.

Working Group / State's Role

Governor Bill Owens recognized the urgent need for Colorado to respond to the WUI in a manner that would improve the safety of firefighters and residents, enhance protection of valuable natural resources, and ensure responsible allocation of taxpayer funds.

In August of 2000, Gov. Owens issued an Executive Order charging a twelve member working group, consisting of local, state, and federal representatives, with the following mission:

- Assess and make recommendations on fire policies and funding priorities for implementation in the wildland urban interface;
- Assess and make recommendations on how to increase cooperation and coordination in the use of land management practices to mitigate fire danger in the interface;
- Enhance the involvement of diverse stakeholders, professionals, and decision-makers on fire policy matters;
- Focus on awareness programs, land use development policies, cooperation between landowners, local government and developers, and the sharing of knowledge and policies that increase public safety, reduce wildfire hazards, and achieve desired ecological goals in interface areas; and

- Identify barriers to mitigating wildland urban interface fire hazards and recommend solutions to overcome these barriers.

The Governor's Interagency Wildland-Urban Interface Working Group met from December 2000 through April 2001 to consider these and other issues central to interface protection in Colorado. The group identified several areas of concern in the state and developed recommendations, contained in this report, on those areas they felt would most benefit from the Governor's leadership.

Wildland Fire Preparedness and Suppression

A. Current Status

Response to wildland fire consists of two equally important components: *preparedness* and *suppression*. Preparedness involves activities such as interagency planning; formation of cooperative agreements; training of personnel; equipment maintenance and positioning; and extensive communication. It means knowing what values are at risk to wildfire and having the resources necessary to combat that risk at all levels.

Wildfire suppression is the mobilization of available resources in response to a wildland fire incident. The first phase of suppression, or initial attack, is generally provided by local fire departments, with back up from state or federal resources depending on where the incident occurs. If a wildfire escapes initial attack and continues burning over an extended period of time, personnel with specialized experience and training are called in to manage the fire. The effective transition of fire management from initial to extended attack is essential to both public and firefighter safety.

Although the concepts of preparedness and suppression appear straightforward, a number of complications can arise in the course of an incident. In Colorado, state statute gives county sheriffs the responsibility for managing wildland fire on non-federal land. The sheriff may transfer this duty to the State Forester if he or she feels an incident has exceeded local capacity.

Many communities have also formed fire protection districts (FPD) to respond to wildland fire within a smaller geographic area. Some of these communities believe the county sheriff only has jurisdiction over wildfires outside of FPDs. Most sheriffs disagree with this interpretation. Sorting out this local debate can be risky in the face of a fire.

Wildfire response in the state is coordinated through either local or interagency dispatch centers that track available personnel and resources and mobilize them to a site as needed. Complications arise when a fire in the interface requires people or resources equipped for both structural and wildland fire protection. Most firefighters are prepared for one or the other scenario, but not both. In addition, when structural personnel are called out for an interface fire, crews from other jurisdictions must be brought in to provide backfill protection in their city or area of protection.

Some consensus on wildfire roles and responsibilities in the state is obtained through a chain of voluntary agreements. The state and federal agencies cooperate via a "master agreement" titled the *Colorado Interagency Cooperative Fire Protection Agreement*. The state also negotiates individual cooperative agreements with each county. Local fire departments may enter into mutual aid agreements, but there is no process in place to collect, track, or coordinate these local arrangements. Some counties and local departments also develop mobilization guides and/or Annual Operating Plans to supplement their fire response strategies. No counties currently have a comprehensive Fire Management Plan to bring all their wildfire-related activities and agreements together.

This series of cooperative agreements functions well until an on-the-ground incident reveals areas of conflict that were not adequately resolved during preseason negotiations. The federal responsibility for interface protection is one such issue, as is the authority of the county sheriff to represent fire protection districts in agreement negotiations.

Economic Impacts of Catastrophic Wildfire

Fire	Cost (estimates)	Acres
Davis Ranch	$111,900	125
Bobcat	$3,330,992	10,599
Hi Meadow	$5,298,067	10,800
Eldorado	$1,369,664	1,067

Another area with potential for conflict is the allocation of costs. Wildland-urban interface fires pose new challenges related to cost accountability and responsibility. They can become extraordinarily expensive because of the number and type of suppression resources required, and the values-at-risk. Suppression costs are generally shared by those responsible for the land on which the fire occurs. This distribution of financial responsibility is much less clear in the interface, where a variety of public and private values are threatened.

The incompatibility of radio equipment and frequencies used by individual fire response entities imposes further limitations on the ability of firefighters, incident managers, and agency leaders to communicate with each other.

Limited financial assistance is available for counties and local fire departments to help defray both suppression and preparedness costs. The CSFS, for example,

administers a federal Volunteer Fire Assistance cost-sharing program that helps local firefighters obtain badly needed training and equipment. Requests for this assistance usually far exceed available dollars.

Counties provide for fire suppression costs that exceed local capacity through the Emergency Fire Fund (EFF). Participating counties pay an annual assessment to the fund, which covers the expenses of a member county once they have depleted their available suppression budget. The EFF is not adequate to cope with interface suppression costs and can be quickly depleted in a bad fire year. If the EFF is fully expended, additional costs are often covered by the State Emergency Disaster Fund or through an Executive Order.

Currently, no direct state assistance is available to strengthen local fire planning or preparedness efforts.

B. Recommendations

- **Improve Wildland Fire Response Capability at the Local Level**
  - Provide state-level technical and cost-sharing assistance to counties for the development and implementation of county Fire Management Plans.
  - Require all relevant entities within a county, including fire departments and fire protection districts, to sign an Annual Operating Plan (AOP).

- **Clarify Roles and Responsibilities Related to WUI Response**
  - Provide statutory clarification regarding the fire protection responsibilities delegated to county sheriffs versus those held by local fire protection districts.
  - Amend the statewide master agreement to include a clarification of interagency roles and responsibilities in the WUI.
  - Provide statutory clarification regarding the state's responsibility for reimbursing local suppression costs once the EFF is expended.

- **Enhance Statewide Tracking and Mobilization of Resources**
  - Expand state involvement in zone dispatch centers.
  - Clarify, in county Fire Management Plans, a process for backfilling of local firefighting personnel and resources that have been dispatched out of their jurisdiction.

Hazard Mitigation

A. Current Status

Fire needs oxygen, heat and fuel to spread across the landscape. The easiest of these factors to influence is the amount and distribution of vegetative fuels. The primary tools used by land managers to reduce hazardous fuels in the interface are thinning and removal of dense trees and shrubs and the use of controlled, low-intensity fire, known as prescribed burning. The USDA Forest Service estimates that every dollar invested in prevention and mitigation activities can save up to $7 in future wildfire suppression costs.

Limited fuel mitigation projects have been implemented in Colorado by local, state, and federal land management agencies as well as private individuals. Boulder, Jefferson, Larimer, Summit, and Clear Creek Counties, for example, have wildfire mitigation programs that range from fuels reduction and prescribed burning on county-owned lands to assisting private landowners with similar actions on their own property. Some local governments have also adopted defensible space and emergency access requirements for new development in the interface.

The CSFS also works with local government, other state agencies, the federal government and private individuals to plan and implement risk reduction projects across jurisdictional boundaries.

Unfortunately, the majority of hazard mitigation projects in Colorado are contained within specific ownership or jurisdictional boundaries. The isolated nature of these projects means that wildfire risk is not reduced on a scale large enough to provide meaningful protection across a landscape. A homeowner's creation of defensible space will be less effective in the face of a raging fire if his or her neighbors have not taken complimentary action. Likewise, fuel reduction on non-federal land adjacent to a National Forest or Park will not provide the best level of protection if that reduction is not extended over the federal boundary.

The planning and implementation of cross-boundary projects requires the cooperation of a number of landowners. Several obstacles can frustrate these collaborative efforts, including:

- The lack of financial assistance to private landowners to help them participate in a large-scale project that will result in greater public than personal benefit;
- The time-consuming consultation and public-involvement processes required of federal land managers;

- The absence of local or community incentives to encourage defensible space and fire safe development; and

- The lack of a trained and available workforce to carry out fuel reduction on a large number of acres.

The effectiveness of hazard mitigation in Colorado is also limited by the lack of a consistent statewide assessment of wildfire risk. The state's Red Zone map identifies high-risk areas through a combination of data on population, number of structures, vegetative fuel type, and history of fire starts. While useful, this map is ultimately limited by the accuracy, extent and scale of the data on which it is based. Federal land management agencies have also assessed selected portions of their land, but these efforts are generally focused on wildfire risks outside the WUI zone. No system or protocol exists to consistently assess, map and develop a response to WUI fire risk across the state.

B. Recommendations

❑ Establish a Statewide Wildland Fire Risk Assessment

- Facilitate the development of consistent risk assessment data and mapping in each county.
- Provide technical assistance to counties in the application of risk assessment data.

❑ Increase County-Level Fire Mitigation Plans

- Assist counties in using risk assessments to prioritize areas for hazard mitigation.
- Encourage counties and local governments to develop and implement programs that promote defensible space and the use of fire-resistant building and landscaping materials.
- Provide state-funded cost-sharing assistance to private landowners within county prioritized areas for fuel reduction on their lands.
- Convene a state-level dialogue with insurance industry representatives regarding the role of insurance carriers in reducing risks associated with homes in the WUI.

- **Encourage Community Solutions to Workforce and Utilization Challenges**
  - Assist counties in identifying opportunities for local economic benefit through the use of local workers and the development of uses for vegetative material removed in hazard reduction projects.

Public Awareness

A. Current Status

The public's level of awareness regarding the causes and impacts of wildland fire can have a tremendous influence on the ultimate success of both suppression and mitigation efforts. If a local community understands and supports the need to reduce hazardous fuels, for example, projects are more likely to go forward in a timely and successful manner.

Support from local residents and government leaders can also facilitate increased individual and community action such as: creating defensible space around homes and structures; ensuring safe access for fire apparatus; establishing, training, and/or equipping of local fire departments; installing dry hydrants in subdivisions; or promoting the use of fire resistant building materials. All of these actions increase the chances that firefighters can safely control a wildland fire through initial attack and thereby limit damage to property and resources.

The need for public awareness extends beyond local communities to Colorado's urban area, for whom the wildland-urban interface is primarily a recreation zone. Actions taken to reduce wildfire risk on public lands, whether federal or non-federal, must have general concurrence and support from the public. It is also important for the public to understand that although mitigation efforts such as prescribed burning may have short-term impacts on visibility and air quality, they are designed to prevent the large-scale impacts that can result from a catastrophic wildland fire.

Many land management, fire protection, and/or disaster preparedness agencies in Colorado deliver some kind of fire awareness message. These education programs are not generally coordinated between agencies or levels of government, however, and have the potential to generate more confusion than understanding.

The Firewise program, which is aimed at interface homeowners and communities, is an example of a successful, standardized program that could be delivered consistently across the state. A similar kind of program or message is needed for city dwellers and recreational users of wildland and WUI areas.

B. Recommendations

- **Increase Consistent Use of Firewise Program Across Government Entities**
  - Provide state lead in coordinating the use of Firewise among Land management agencies and government entities at all levels.

- **Implement a Professional Marketing Effort to Targeted Audiences Regarding the Role of Fire in Colorado's Forests**
  - Provide state seed money and seek matching funds for projects through new and existing partners.

Next Steps

The time is ripe for the State of Colorado to step forward and provide the kind of leadership and coordination needed to ensure the best possible wildfire protection for its citizens. Through their deliberations, the Governor's Interagency Wildland Urban Interface Working Group determined that, with regard to the interface, failure to effectively prepare, communicate and respond to wildland fire in an interagency manner could result in devastating – and unacceptable -- consequences. The recommendations in this report are intended to help the state avoid such a result.

Due to the urgent nature of the interface situation, the Working Group advises that the Governor begin immediately to pursue implementation of this report. Many recommendations need further development and will require the active involvement of local, state, and federal agencies, as well as individual landowners and the public at large.

Fire in the WUI threatens lives, livelihoods, and valuable natural resources. The State of Colorado must act quickly and effectively to mitigate this threat.

Glossary

Annual Operating Plan: An annually updated document authorized by the appropriate officials for implementing the Interagency Cooperative Fire Protection Agreement in their respective areas of responsibilities.

Backfill (a.k.a. Move-up and Cover): Identifies a relocation of fire suppression resources from their established location to a temporary location to provide fire protection coverage for an initial attack response area.

Cooperator: Organized fire forces of other agencies, paid or volunteers, public or private, at the local, municipal, state, or federal level.

County: Employees, elected officials, and appointed officers of a county.

Emergency Fire Fund (EFF): A fund established and maintained through voluntary participation by counties, governed by a task force of county commissioners, sheriffs, and fire chiefs, administered and managed by the Colorado State Forest Service. EFF is funded by annual assessments to the participating counties. The fund provides financial assistance to participating counties at times when qualifying wildfires exceed the counties capacity.

Defensible Space: An area around homes or structures, either man-made or natural, where the vegetation is modified and maintained to slow the rate and intensity of an advancing wildland fire. Provides room for firefighters to work and helps protect the forest from becoming involved should a structure fire occur.

Dry Hydrant: A non-pressurized hydrant that provides a water source to firefighters. Requires equipment capable of drafting from the hydrant.

Fire Management: Activities and programs that include: the use of fire as a resource management tool, and protection of values from unwanted, uncontrolled wildfire.

Fire Management Plan: Statement, for a specific area, of fire policy, objective, and prescribed action; may include maps, charts, tables, and statistical data.

Fuels: combustible plant material, both living and dead, and combustible construction material that is capable of burning in a wildland situation.

ICS (Incident Command System): The common emergency incident management system used on any incident or event and tailored to fit the specific management needs of the incident/event. Includes "Colorado Incident Command System" at the local level.

Initial Attack Forces: Wildfire suppression resources of agencies initially dispatched to a fire in accordance with a pre-existing annual operating plan or mobilization guide.

Initial Attack Zone: An identified area in which predetermined resources would normally be the initial resource to respond to an incident.

Ladder Fuels: Fuels which provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease.

Mitigation: Actions taken that lessen the risk to people, property, and resources from wildfire.

Mutual Aid: Assistance provided by a Supporting Agency at no cost to the Protecting Agency. Mutual aid is limited to those initial attack resources or move-up and cover assignments that have been determined to be appropriate and as each may be able to furnish and are documented in Annual Operating Plans. Sometimes called Reciprocal Fire Protection.

Preparedness: Activities before fire occurrence to ensure effective suppression action. Includes training, planning, procuring and maintaining equipment, development of fire defense improvements, and maintaining cooperative arrangements with other agencies.

Prescribed Fire: The planned and/or permitted use of fire to accomplish specific land management objectives.

Prevention: Activities directed at reducing the number of human-caused fires, including such items as public education, law enforcement, dissemination of information, engineering, and the reduction of hazards.

Protection Boundaries: Mutually agreed upon boundaries which identify areas of direct fire protection responsibility and are shown on maps in the annual operating plans.

Resources: All personnel, items of equipment and aircraft available for assignment of tasks.

Structure Protection: Protecting a structure from an advancing wildfire is usually through treatment or removal of fuels from around a structure but may include application of retardants, foams, cooling agents, wraps, etc. to the exterior of a structure. Specific direction for an incident comes from the agency administrator or line officer.

Suppression: All the work of confining and extinguishing a fire beginning with its discovery through the conclusion of the incident.

Thinning: A cultural treatment made to reduce stand density

Values-at-Risk: Includes property, structures, physical improvements, natural and cultural resources, community infrastructure, and economic, environmental, and social values.

Wildfire: Uncontrolled fire burning in forest, brush, prairie, or cropland fuels, or conflagrations involving such fuels and structures.

Wildland: Lands with few or no permanent improvements.

Wildland Fire: Any non-structural fire that occurs on wildland.

Wildland Urban Interface (WUI): Defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wildland fires southwest of Denver claim elderly couple, torch 4,500 acres

By Jordan Steffen, Kirk Mitchell, Joey Bunch and Kieran Nicholson The Denver Post The Denver Post
Posted: DenverPost.com

JEFFERSON COUNTY — An early-spring fire that burned through 4,500 acres and 23 homes and killed an elderly couple continued to rage almost at will across parched foothills late Tuesday, prompting officials to alert thousands more residents to prepare to join neighbors already forced to evacuate their homes.

Officials have identified the two victims of the Lower North Fork fire as Sam Lamar Lucas, 77, and his wife, Linda M. Lucas, 76. Authorities were also searching late Tuesday for a woman who is unaccounted for in the fire area.

Sam Lucas was found outside, and his wife inside, a home deep within the burned area. Fire officials said they didn't know whether the couple had tried to escape. Their deaths remain under investigation.

Despite the efforts of about 200 firefighters and the benefit of lighter winds, authorities failed to gain much, if any, control over the fast-moving fire Tuesday, said Jacki Kelley, a Jefferson County Sheriff's Office spokeswoman. Today, the firefighting team will grow to 400, with crews coming in from across the West.

"We're finally getting the resources we needed yesterday," Kelley said. "We're going to be fighting this fire 24 hours a day until we get containment."

Whipped by strong winds and fueled by unusually dry conditions, the fire roared across thousands of foothill acres southwest of Denver south and east of U.S. 285 starting Monday.

Jefferson County officials said they believe the fire began as a controlled burn set a week ago by the Colorado State Forest Service on land belonging to the Denver Water Board, and that it sprang back to life Monday. However, Joe Duda, deputy state forester, told Channel 4 News that the service is in no way taking responsibility for having anything to do with the current fire.

"I think it's fairly unusual for this to happen so long after the fact, and so we'll wait for the sheriff's report," he told the television station.

Tuesday afternoon, authorities alerted residents of an additional 6,500 homes that they should prepare to evacuate, after a spot fire flared 1 mile northwest of Waterton Canyon. About 2,500 homes had already been evacuated by that time.

The most recent areas under pre-evacuation notice include: Dear Creek Mesa, Deer Creek Canyon Park, Homewood Park, Hilldale Pines, South Murphy Gulch Road, Watson Gulch Road, an area southeast of South Turkey Creek Road, White Deer Valley and Jennings Road.

Tuesday afternoon, Jefferson County officials led reporters deep into the backcountry to scenes of Monday's devastation.

Tree stumps and the charred foundations of what were once homes still smoldered, marked by blackened concrete and molten metal. Flames still shot out of a gas line in one of the destroyed homes. The house numbers on a post near the driveway were melted into the wood.

Dan Hatlestad, public-information officer for the Jefferson County Incident Management Team, said it took only minutes for the fire, with temperatures above 1,000 degrees, to flatten the homes.

Twenty residents had to be pulled out of the area at the last minute by fire crews and emergency vehicles. The smoke was so thick that firefighters had to stick their heads out the windows as they drove in order to see the roadway.

One family became so disoriented that their two vehicles drove off the road, and fire crews had to save them and their pets, Hatlestad said.

David and Jill Owens, whose home was in the heart of the burn area, watched Monday as the smoke plume grew just miles from their driveway. The Owenses, their two young children, three dogs and two cats last saw their home at 5 p.m. Monday.

"It was clear we needed to go," David Owens said.

When they awoke Tuesday, they saw their home on a local TV newscast. It was, David Owens said, ashes. The only recognizable parts were boulders and concrete from the back patio.

About 25 evacuees spent Monday night at a shelter set up at Conifer High School. Some chose to spend the night in their vehicles in the school's parking lot to be with their pets.

Julie and Tim White spent an anxious night with their five dogs and three cats. The couple just finished building their home last May and were forced out Monday evening. Animal-rescue workers got into their home and brought their pets to them as they watched smoke billow from afar.

"We're waking up to the fact that we might lose our house," Tim White said Tuesday. "We're not really sure what we'll do next."

By Tuesday afternoon, amid fear that the ranks of evacuees had outgrown Conifer High, the evacuation center was moved to West Jefferson Middle School.

The Lower North Fork blaze may be the first in decades to claim the lives of nonfirefighters. Steve Segin, spokesman for the U.S. Forest Service, said that since he began working in 1999, he can't recall a single civilian killed in a wildfire in Colorado, although numerous firefighters have lost their lives. A search of Denver Post records going back to 1982 found no civilian deaths.

"It's pretty remarkable," Segin said. "We've been fairly lucky."

The terrain, dry conditions, abundant fuels for fire and winds on Monday were reminiscent of the 2002 Hayman fire, which burned 138,000 acres.

"It's a combination of problems for us," said Kelley, the Sheriff's Office spokeswoman.

The Federal Emergency Management Agency has authorized the use of federal funds to help with firefighting costs for the Lower North Fork fire in Jefferson County, according to Jerry DeFelice, FEMA spokesman.

FEMA funding pays 75 percent of the state's eligible firefighting costs. The money does not cover damage to homeowners or businesses and does not cover other infrastructure damage caused by the fire.

Staff writers Monte Whaley, Kieran Nicholson and Karen Augé contributed to this report.

"On to greener pastures"

At Conifer High School, Mark Sustek packed his lawn chair and cooler into the back of his overflowing Ford F-150 pickup Tuesday evening. "On to greener pastures," he joked. "you can't go home but you can't stay here. I just hope I eventually have a home to go back to."

Hayman survivor returns favor

Terry Neal, whose home is not in the fire zone, showed up at the The West Jefferson Middle School shelter to offer help. "During Hayman (fire), you would not believe the people who helped me and my family. I said then I'd always help anybody I can. I owe it. If you live up here you either owe it or you will, either your place has burned or it will someday."

Near-zero visibility

Visibility in some areas around the fire was so bad Monday that some fleeing residents drove their vehicles off dirt roads and into ditches because they couldn't see, said Claire Schmidt, who lives off North Tail Circle and spent Monday night in the shelter. "It's like in some places one home is there, and the next is gone."

Power's out, and they're out too

Cris Nowakoski and his wife put on headlamps and packed a few things from their Pleasant Park area home, after the power went out about 7 p.m. Monday. "It's a blur," he said. "I woke up this morning thinking it was a dream."

Safe but on edge

Maggie Whalen and her husband, Pete, fled their home off Gold Spur around 7:30 p.m. Monday with their two dogs, Sirius Black, 12, and Molly, 13. Their two horses were rescued by emergency workers. "The winds have just been crazy. But we got what we needed out of there and that's what matters." Sirius Black was a nervous wreck after the evacuation so Whalen was scrambling Tuesday to fill a veterinarian's prescription for Xanax. "Maybe I'll take some too."

Grabbing hold of important stuff

Christopher Prado was ordered to evacuate his Pleasant Park home about 8:15 p.m. He grabbed a guitar, some other musical instruments and a birth certificate. It took him about an hour to get ready to leave. He took comfort in knowing that there was still some snow on the ground around his home. "There's a lot of things that could be lost today. But at the same time, you have to grab hold of the important stuff."

"We all come together"

Lisa Paris has lived in the King Valley community long enough to have survived the Hayman fire, the Snaking Gulch fire and a few other less-legendary blazes. Back then, she didn't know many people, so she paid $1,500 a week to board the family dogs. Tuesday, she put out an offer to babysit her neighbors' kids or dogs, or even provide a couch or spare bed for anyone who needs one this week. "This is the kind of community where nobody ever makes a peep 'til you need it, then we all come together."

Compiled by Joey Bunch, Monte Whaley, Karen Augé, Jordan Steffen

Victims of Colorado wildlands fire say warning never came

By Kirk Mitchell, Carlos Illescas and Jordan Steffen The Denver Post The Denver Post
Posted:

DenverPost.com

JEFFERSON COUNTY — Families driven from their homes by a fast-moving wall of fire Monday evening said they stayed longer than was safe because authorities told them that the smoke they were smelling was from a controlled burn that was being monitored.

"I thought we weren't going to make it," said Kim Olson, who barely escaped the fire that killed her neighbors, Samuel, 77, and Linda "Moaneti" Lucas, 76. "I thought we were going to die right there."

On Wednesday afternoon, Colorado State Forest Service deputy forester Joe Duda said the Lower North Fork fire that has scorched more than 4,100 acres of land, burned 27 homes and killed the Lucases sparked from a controlled burn on Denver Water Board land last week.

"This is heartbreaking, and we are sorry," Duda said. "Despite the best efforts of the Colorado State Forest Service to prevent this very kind of tragic wildfire, we now join Colorado in hoping for the safety of those fighting a large fire and mourning the loss of life and property."

Duda said the controlled burn reignited in heavy winds Monday that fanned embers and blew them into an unburned area outside a containment line established on March 19.

The Lucases, like many of their neighbors, had reported seeing smoke from the burn throughout the weekend but were rebuffed, they said, by dispatchers. Several residents of the Pleasant Park Corridor subdivision, including Olson and her neighbor Dave Massa, said they received no emergency notification calls before the fire swept through the neighborhood.

Jefferson County sheriff's spokeswoman Jacki Kelley said Wednesday that she had heard no reports of residents who registered to receive an emergency notification not getting one.

Olson said she first called 911 about 2 p.m. Monday, around the time Duda said fire crews patrolling the controlled burn saw it flare up.

She told a dispatcher that she smelled smoke. She didn't know where it was coming from but was worried that the controlled burn was out of control. She said the dispatcher told her that there was nothing to worry about.

Olson went outside to look for the source of the smell and saw plumes of smoke rising from the area where the controlled burn had been. She returned to her house and called 911 again. She said a dispatcher told her not to call every time that she smelled smoke.

Three hours later, Olson, her husband, their three kids and the family pets made a dash for their lives.

"I saw flames at the top of the driveway. I was absolutely terrified," Olson said. "I felt hysterical."

Olson drove a Jeep ahead of her husband, who took the children in another car. One of her kids videotaped the harrowing passage down the hill. Flames were devouring tall pine trees on both sides of the road.

They had no idea whether the road ahead was cut off by fire because they had received no warning, Olson said.

Sam and Moaneti Lucas were making final preparations to leave their home when they were engulfed by fire, Moaneti's sister Mellissa Lucas of Bethlehem, Conn., said Wednesday.

Mellissa Lucas said the fire caught up to them as her sister waited in the driveway for Sam, who had gone back into the garage. "We'll never know why they didn't get away," she said. "It's such a sad thing to happen."

Sam may have gone back into the house to turn on a fire suppression system that would have sprayed foam on the building to protect it, Mellissa Lucas said.

The Lucases had noticed the flames from the controlled burn on Saturday. One neighbor said Sam called 911 that day to say the controlled burn had flared up again.

On Monday afternoon, Sam called his son-in-law to say he and Moaneti were were packing their belongings in a pickup truck because they spotted smoke only 2 miles from their home.

Mary Ann Ellis' home was spared, but she lost her good friends. She found little comfort in the apology offered by Duda.

"It was obvious. A 2-year-old would have known not to start that fire," Ellis said. "Someone made the wrong decision."

Ellis was shaking as she described the loss of her friends, the Lucases.

"We ran for our lives, and they just didn't make it," Ellis said.

Massa, who lives within a mile of the Lucas home, said he first called 911 about the controlled burn on Thursday afternoon. It appeared out of control and burned through the night, he said. He, too, reported smoke from the burn throughout the weekend.

He also said he did not receive an emergency call to evacuate, although he was signed up to get one.

Bill Suvada, who has lived on Broken Arrow Road since 1973, did receive automated emergency call. He loaded artwork and American Indian rugs in a pickup truck and drove his parents, Bill and Marge, who are in their 80s, down the mountain as they fretted about their home.

"We got the fear put into us," Suvada said.

Kirk Mitchell: 303-954-1206 or kmitchell@denverpost.com

Containment of blaze estimated at 15 percent

About 500 firefighters from several states turned their focus Wednesday to building containment lines around the wildfire. Up to now, the fire's erratic pattern has forced firefighters to focus on protecting homes, not stopping the burn. Crews had achieved 15 percent containment on the fire by late afternoon. The estimate of the affected area was updated to 4,140 acres. To contain the fire, officials estimate they will need a fire line that is 8½ miles long. Because of weather conditions, only minimal growth along the perimeter is expected today.

27 sites damaged or razed; 267 lack power

A total of 27 structures have been damaged or destroyed. The owners of all but one structure have been notified, officials said. Intermountain Rural Electric Association said 267 structures are without power and estimate that it must rebuild 2 to 3 miles of power line.

Over 53,000 gallons of retardant dropped

Tankers dropped more than 4,100 gallons of retardant on Wednesday and Air National Guard helicopters dropped 49,000 gallons of water. The two heavy air tankers are being transferred to fires in South Dakota,but a single-engine tanker remains here.

Crew digs in rubble of missing woman's home

A search team using dogs continued to look for a missing woman. Her home was among those destroyed. About 60

acres have been searched, and crews were digging in the rubble of the woman's home Wednesday evening.

Evacuees briefed, told return may take a week

Officials briefed about 90 people Wednesday evening at the evacuation center, and residents said it was the most informative session yet. But they were told it could be a week until they could get back into their homes and that upset some.

"We're tired of it," said evacuee Amanda Walker.

As for the news that governor has halted all prescribed burns, Walker said, "too little, too late."

Gov. Hickenlooper to tour fire area today

Colorado Gov. John Hickenlooper landed at Denver International Airport late Wednesday and said he would visit the fire crews in Jefferson County today. The governor was in Mexico on a trade mission, which ended Wednesday. He canceled plans to stay in Mexico for a brief family vacation. Hickenlooper, who while in Mexico ordered a halt to controlled burns, noted the state's hot, dry condition and urged the public to "pray for rain."

Donations sought to help fire victims

The Elk Creek Fire Protection District is joining with the Mountain Resource Center to collect cash donations to assist fire victims. Please send donation checks to:

Mountain Resource Center

Conifer, CO 80433

Write, "Lower North Fork Fire Fund" on the memo line of your check. For additional information, contact chaplain Beth Graham of the Elk Creek Fire Protection District at 303-816-9385, ext. 15, or the Mountain Resource Center at 303-838-7552.

TheDenverChannel.com

Governor Suspends Controlled Burns On State Land

Hickenlooper Calls For Independent Review On Start Of Lower North Fork Fire

Posted by Wayne Harrison, Web Editor

POSTED: 3:11 pm MDT March 28, 2012
UPDATED: 10:32 pm MDT March 28, 2012

Related To Story

Eric Hoffman
Gov. John Hickenlooper talks to reporters at DIA about the Lower North Fork Fire.

DENVER -- Gov. John Hickenlooper suspended further prescribed burns by state agencies on state land and asked for an independent review of the start of the Lower North Fork Fire.

The governor's action follows an admission by the Colorado Forest Service that the deadly fire in Jefferson County started from a prescribed burn they conducted.

"The loss of life and property this week is devastating and this fire is far from being contained. That's why our top priority remains working to control the blaze," Hickenlooper said. "We have made every resource available to firefighters and continue to coordinate the response with local and federal authorities.

"Our state's firefighters are doing very challenging work, often in the face of severe conditions and at great risk to their own safety. A complete and independent review into the cause will take place. There will be plenty of time to review what happened. Until then, we urge everyone to support the firefighting efforts and keep those directly affected by the fire in your thoughts and prayers."

Work is under way to assemble the independent review team, the governor's office said.

Hickenlooper's suspension order involves all state agencies on state lands – including state parks, refuges, State Land Board lands and any agency that manages lands – or under contract on non-state lands, such as by the Colorado State Forest Service. The suspension will be effective until a review of the protocols and procedures of prescribed burning is complete.

"We will conduct a thorough and comprehensive review of conditions across the state, as well as the protocols that have been utilized during the prescribed burns," Hickenlooper said. "We encourage any other land manager who uses prescribed fires as a tool to mitigate fire danger to review their procedures and protocols and carefully evaluate weather and landscape conditions."

Hickenlooper suggested that other non-state land agencies examine their own procedures for controlled burns and take appropriate steps.

This suspension does not involve campfires or other fire use on state lands. However, state officials will continue to review and monitor conditions to determine if a broader statewide suspension or ban of fire use is warranted.

"Through this suspension, we intend to make sure that we have the procedures and protocols in place so that prescribed fire conditions and management requirements are understood and strictly followed," Hickenlooper said.

The governor also authorized the use of two more UH-60 Blackhawk helicopters flown by the Colorado Army

National Guard to help battle the Lower North Fork Fire. Each helicopter is equipped with a 500-gallon bucket to drop water on the fire. Two other UH-60 Blackhawk helicopters began flying over the fire on Tuesday.

Hickenlooper talked to reporters at Denver International Airport Wednesday night upon his return from a trade mission in Mexico.

Previous Stories:

- March 28, 2012: Prescribed Burns Getting Out Of Control Not Unheard Of

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How To Get Emergency Alerts For Your County

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Many Counties Will Text, Call, E-Mail You

***Deb Stanley*, 7NEWS Producer**

UPDATED: 5:50 pm MDT March 28, 2012

DENVER -- If there was an emergency in your neighborhood, how would you find out?

Many cities and counties have a reverse notification system, sometimes called reverse 911, that calls your home phone when there is a fire, flood or other emergency situation. But did you know in many places you can also sign up to get those notifications on your cell phone, e-mail and by text?

Arapahoe County said it will send messages about a potential safety hazard or concern to all standard voice and text communication devices (land line, mobile, e-mail, instant messaging, text messaging, PDA, alpha or numeric pager, etc.) that you register in the system.

Aurora allows residents to sign up for text alerts, emails and/or phone calls in case of an emergency. Aurora said the emergency alert system may be used for natural disaster, a man-made disaster, a missing child or a public safety emergency.

Broomfield and Jefferson counties use the e911 system to send out emergency alerts.

Boulder County has a mass notification system that is used to notify residents about imminent threats to health and safety such as the need to evacuate due to a wildfire, or take other appropriate actions in the event of a flash flood or other critical police activity.

Denver & Denver County lets residents register cell phones and VoIP with its 911 emergency notification system.

Douglas County uses the Everbridge Aware mass notification system to alert residents about fires, floods, toxic environmental issues and other emergencies. Officials said messages can be sent to residents on any communication path desired – cell phone, home phone, email, text messaging, pager, PDA and more.

In Larimer County, visit the subscription services page. Click on "Emergency Information Updates." You may also want to sign up with the Larimer Emergency Telephone Authority for emergency alerts.

Weld County will let you sign up for several different alerts including a list of most wanted fugitives, recent arrests and EOC alerts. Signing up for the EOC alerts will get you updates when emergency and disasters are happening.

Adams County officials told 7NEWS they do not have a system yet to call cell phones in an emergency.

See a list of more counties throughout Colorado on the Colorado Emergency Management website.

If you live within city limits, you should sign up with your county and contact your local city to ask how you can register your cell phone for emergency alerts/calls.

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JeffCo changes evacuation policies after Lower North Fork Fire

By John Ingold The Denver Post The Denver Post
Posted:

DenverPost.com

Jefferson County officials today announced a new three-stage disaster evacuation process to give residents a better sense of when they need to be ready to leave their homes and when they need to flee immediately.

In the new system, public-safety officials will issue an escalating set of warnings to residents when the situation gives them time to do so. The first tier is a Level 1 evacuation, in which residents are urged to be ready to leave. At a Level 2 evacuation, residents are instructed to gather a handful of belongings and leave as soon as possible. At a Level 3 evacuations, residents are told to drop everything and leave immediately.

If the situation moves more quickly, county officials could jump straight to issuing a Level 2 or a Level 3 evacuation and skip over the lower levels.

Jefferson County Sheriff's spokeswoman Jacki Kelley said the warnings will provide a better way for officials to warn residents of danger while giving residents a better sense of the urgency needed.

Had such a system been in place during the Lower North Fork Fire, Kelley said officials could have better prepared residents to evacuate. The fire killed three people last month and resulted in many others escaping at the last minute, even though residents had begun calling 911 about smoke hours earlier.

"What we would like to do is have some sort of graduated process that allows people — if the incident allows it also — time," Kelley said. "... What people saw (in the Lower North Fork Fire) is we were saying 5 acres, 10 acres, 20 acres. And then it was, 'Get out.'"

The system has been adopted by the Jefferson County Sheriff's office and all the fire protection districts in unincorporated Jefferson County. Kelley said Jefferson County Sheriff Ted Mink will encourage departments across the metro area and statewide to adopt a similar process.

Kelley cautioned that the new system doesn't take the place of a resident's judgment. Any time residents feel threatened by a wildfire or other possible disaster, she said, they should play it safe and leave.

"Even though we have this three-tiered plan for evacuations, there is still the need for citizens to take ownership of their safety," she said.

John Ingold: 303-954-1068 or jingold@denverpost.com

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North Fork Fire Victim Demands Accountability

Related To Story

Says Forest Service Is 'Absolutely Negligent'

By Tyler Lopez, 7NEWS Reporter

POSTED: 7:09 pm MDT April 17, 2012
UPDATED: 8:58 pm MDT April 17, 2012

CONIFER, Colo. -- One victim of the Lower North Fork Fire wants accountability and state employees fired for what led to the blaze late last month that killed three people.

The Colorado State Forest Service conducted the prescribed burn in the foothills 25 miles southwest of Denver. Four days later, a fast-moving wildfire tore through a forested subdivision with spacious lots and narrow gravel roads. Three people were found dead at their homes.

The fire blackened 6 square miles, damaged or destroyed more than two dozen homes, and displaced hundreds of people.

David Cottrell lost his home, and during a visit at what remained Tuesday, Cottrell told 7NEWS he is angry about how officials reacted to the fire.

"I think it's absolutely negligent. I think it was negligent from the very start," said Cottrell, looking at the pile of ash from what's left of his Rocky Top Trail home. "These are the people we trust that they're supposed to know what they're doing? And they're doing this kind of reckless stuff? And it just smacks of someone who has no responsibility in the matter, can't be held accountable. So they're just going to do whatever they want."

The burn plan, obtained by 7NEWS, outlines the requirements for the "mop-up" phase of the prescribed fire. A team of experts, ordered by Gov. John Hickenlooper to review the burn, found that the "mop-up" phase requirements for similar burns in the future should be extended.

The review also found that the State Forest Service did not follow its own burn plan that requires three days of patrol following the first day of the burn. Instead the burn area was abandoned on Sunday.

By Monday, powerful and predicted winds would fan it into a raging inferno.

"They walked away from a fire that wasn't put out. Winds came, kicked it up, it burned my house down, killed three people and burned all my neighbors' houses. There you go. There's your report," Cottrell said. "Those people should be canned."

Cottrell said Hickenloper's press conference Monday was disappointing.

"You know, stand up for something," Cottrell said. "This is the time to really show a little strength. I can't express to you how angry and bitter I am right now."

Cottrell said he's unsure if he and his wife will rebuild but he is working with his insurance company now on their options.

He hopes future reports will be more conclusive and lead to discipline.

Previous Stories:

- April 17, 2012: LNFF Review: State Forest Service Violated Own Burn Plan
- April 15, 2012: Wildfire Within 3 Miles Of Homes Before Evacuations
- April 11, 2012: 'We're Losing Structures' Firefighter Radios During Jeffco Fire
- April 10, 2012: Sheriff's Office Unaware Firefighters Were Making Evacs
- April 10, 2012: Jeffco Fire Victim Was Told To Evacuate
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Fire Victims: From Fired-Up To Frustrated

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Residents Demanding Answers Leave Frustrated

***Amanda Kost*, Reporter**

POSTED: 12:59 am MDT April 19, 2012
UPDATED: 2:17 am MDT April 19, 2012

CONIFER, Colo. -- More than three weeks after the deadly Lower North Fork Fire, residents and fire victims came demanding answers when they packed an auditorium Wednesday evening at West Jefferson Middle School in Conifer.

Yet, angry residents who wanted Jefferson County leaders to hear their concerns, had to wait. It took two hours to get through officials' comments at the town hall gathering.

By the time residents thought they could ask questions, the microphone was turned off.

Residents had to take their questions to leaders on stage.

Coe Meyer lost everything in the fire. 7NEWS was there when he spoke up.

"I'm really happy that the state acquired all this knowledge from this fire, but we, me, and the people in this room paid the tuition and will for the next 25 years for some of us," Meyer told officials.

"I'm not hearing the word, 'liability,' and that's what everybody here has on their mind," Meyer stressed.

Another resident said the state shouldn't have done the prescribed burn in the first place.

"Should be a permanent ban in my opinion. That's the only answer. Don't have it (and) we would have three people alive and 27 houses, and it almost burned down my 360 acres," the man said.

Addressing Emergency Notification "Glitch"

"Certainly, the one hanging issue is the 911 system," Jefferson County Sheriff Ted Mink told the crowd.

During the Lower North Fork Fire, technical glitches prevented emergency notification calls and texts messages from reaching all the residents in the evacuation area.

Mink said the county has since tested the emergency notification system. He said the system is now operating, "under acceptable parameters."

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Legal Claims Filed Against State In Lower North Fork Fire

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Claim Accuses Colo. State Forest Service Of Negligence In Prescribed Burn That Ignited Wildfire

Alan Gathright, 7NEWS Content Producer & Marshall Zelinger, 7NEWS Content Producer/Presenter

POSTED: 4:03 pm MDT April 19, 2012
UPDATED: 8:34 pm MDT April 19, 2012

JEFFERSON COUNTY, Colo. -- Eight notice of intent to sue claims have been filed against the state of Colorado in the devastating Lower North Fork Fire, which killed three people, destroyed or damage 27 homes, and charred 6 square miles, 7NEWS learned Thursday.

Under Colorado law, a "notice of claim" is a required first step toward a lawsuit against a government agency.

The claims by a homeowner insurance company and an electrical utility were filed against Colorado State University, which oversees the Colorado State Forest Service.

The Forest Service has been the focus of criticism, because it conducted a prescribed burn in the Jefferson County foothills on March 22 that erupted four days later into the wildfire when high winds reignited embers.

Claim notices were also served on Denver Water, on whose property the controlled burn was conducted under an agreement with the Forest Service.

An independent review of the prescribed burn found that the Forest Service violated its own burn plan by failing to have its firefighters monitor the smoldering field the day before the fire broke out.

The Intermountain Rural Electric Association is seeking damages of more than $1.2 million, saying the fire destroyed its electrical transmission lines and other distribution facilities in the burn area.

The IREA claim says the Forest Service's "negligent and/or willful and wanton planning, initiation, conduct, oversight and attempted termination of the prescribed burn resulted in reignition of the burn beyond its containment boundaries."

"That reignition resulted in a catastrophic wildfire," the claim said.

IREA names nine Forest Service employees, from State Forester Jeff Jahnke down to firefighters directly involved in the prescribed burn.

The other seven claims were filed by American Family Insurance, seeking to recover money paid to Conifer-area clients whose homes or personal property were damaged or destroyed by the wildfire.

"American Family and other insurance companies use the process of subrogation to recover claim loss payments from the person or entity whose actions or negligence contributed to the incident," American Family Insurance spokesman Steve Witmer said in a statement to 7NEWS. Subrogation is a legal referring to an insurance firm taking legal action in place of its client.

"This benefits our customers in two ways -- our customers can be compensated for the sums they previously paid for deductibles, and it helps keep insurance affordable by reducing the costs that are used to calculate insurance rates," Witmer said.

7NEWS checked the addresses for the claims filed by American Family Insurance. Only one of the seven involves a home that was destroyed.

Three of the claims from American Family Insurance involve a residence which was reimbursed for losing power for four days and having freezers at the home turned off and thawed.

State Liable For No More Than $600,000

The Colorado Governmental Immunity Act limits the state's legal liability to $150,000 for an individual victim.

In the case of multiple victims, the state's total liability is $600,000 an incident. The money is divided among all the victims, legal experts say.

The insurance company cited three family members in one claim and two family members in another claim. All the other insurance claims named one victim.

Victims Have 6 Months To File "Notice Of Claim"

In order to be eligible for any monies that may be paid by the state, victims of the Lower North Fork fire must filed a claim with the state within 180 days of their loss. That puts the timeline in late September. It doesn't matter if the claim is filed first or last, every claim would have an equal shot at receiving a share.

"Just because they've made the first claims, they don't get the money," said University of Denver law professor Tom Russell. "Interestingly, the insurance companies seem to be filing claims here before any trial lawyer in the state is filing a claim."

Russell is well-versed in Governmental Immunity and 7NEWS asked him if it's possible for the insurance company and IREA to get compensation before anyone who lost loved ones or property.

"If you file a notice of claim, you're not guaranteed that you'll get anything," said Russell. "IREA and the insurance companies are trying to reach into that pot of money before anyone else in the state has tried to reach into that pot of money."

Residents Still Looking For Answers

At a Wednesday night meeting in Conifer where various officials briefed residents, legal action was on the minds of some angry, frustrated residents.

Coe Meyer lost everything in the fire.

"I'm really happy that the state acquired all this knowledge from this fire, but we, me, and the people in this room paid the tuition and will for the next 25 years for some of us," Meyer told officials.

"I'm not hearing the word, 'liability,' and that's what everybody here has on their mind," Meyer stressed.

Also on Wednesday, the Jefferson County Sheriff’s Office said its investigation into the cause and origin of the Lower North Fork Fire had determined that the Forest Service followed or exceeded the parameters set by its controlled burn plan, and that no criminal violation occurred.

Yet, Sheriff Ted Mink told 7NEWS he understands fire victims' cries for accountability.

"Well, I can understand -- and believe me I can understand – that when you lose a loved one and certainly when you lose everything that you probably value or have ever owned, you want something or somebody …to pay for that," Mink said. "I understand that."

"We're not saying that somebody should not be held accountable," Mink said. "All we're saying is there's no criminality that we have come up with."

The legal claims indicate that accountability could be decided in civil court.

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Sheriff: People Want 'Someone To Pay' For Deadly Wildfire

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But Sheriff Mink Says He Found No Criminal Wrongdoing In Lower North Fork Fire

Posted by Kim Nguyen, Web Editor

POSTED: 4:00 pm MDT April 18, 2012
UPDATED: 9:39 am MDT April 19, 2012

CONIFER, Colo. -- The Jefferson County Sheriff's Office on Wednesday said it has concluded its investigation on the cause and origin of the Lower North Fork Fire and has determined that the Colorado State Forest Service followed or exceeded the parameters set by its controlled burn plan, and that no criminal violation occurred.

During an interview with Jefferson County Sheriff Ted Mink, 7NEWS reporter Marshall Zelinger asked where's the accountability for a deadly wildfire that erupted from a prescribed burn.

"This fire was started by someone. Three people died, two dozen homes were destroyed or damaged. How is that not a crime?" Zelinger asked.

"Well, I can understand -- and believe me I can understand – that when you lose a loved one and certainly when you lose everything that you probably value or have ever owned, you want something or somebody …to pay for that," Mink replied. "I understand that."

"We're not saying that somebody should not be held accountable," Mink said. "All we're saying is there's no criminality that we have come up with."

The sheriff's office said it worked in conjunction with the U.S. Department of Interior -- Bureau of Land Management, and the U.S. Department of Agriculture -- and the U.S. Forest Service during its investigation.

This sheriff's investigation is separate from the prescribed fire review conducted through Gov. John Hickenlooper's office.

"The reports confirm previous assumptions that a prescribed burn conducted by the Colorado State Forest Service caused the fire. Based on the review of all available documents and witness interviews, it was determined that the CSFS followed or exceeded the parameters set by the Lower North Fork burn plan, and that no criminal violation of the Colorado Revised Statutes occurred," the Sheriff's Office report said.

However, a report by the governor's office, released on Monday, showed that the state forest service violated its own burn plan by not patrolling the area of the controlled burn on that third day -- Sunday -- the day before the controlled burn blew up into the Lower North Fork Fire.

"How can the Forest Service follow and exceed the burn plan and violate it at the same time?" Zelinger asked.

"All I know is they did not go out there on a Sunday," Mink replied. "The burn plan says periodic monitoring, and it doesn't give a prescribed day or time or day or whatever the case is. You can interpret it in different ways. We interpreted it that they did follow and exceed it in the criminal part of our investigation."

A federal official who investigated the controlled burn cited the decision to not patrol on Sunday as an error in an otherwise thorough plan.

"For the life of me, I've looked through this thing, and it was a professionally written plan, it was professionally implemented, albeit one mistake on a patrol on Sunday," said Bill Bass, the leader of the fact-finding team that reviewed the Lower North Fork prescribed fire.

"Their outlook was good, and they quite frankly did the burn very well," said Bass, who works as supervisor of the Bighorn National Forest in Wyoming. "It was a very well done, executed prescribed fire, up to the point when we get into patrol."

However, in the Jefferson County's report, the burn boss said they weren't going to patrol on Sunday because it wasn't necessary.

"(The engine boss) decided not to go up to Unit 4 (the area of the controlled burn) on Sunday, 03/25/12 because the site looked good the previous day, the weather prediction was favorable, and he intended to visit the site on Monday (03/26/12)," the JeffCo Sheriff's Office said in its report.

Bass said the absence on Sunday did not make a difference in how the fire grew.

"That would be speculation on my part, but I don't think it would have changed the outcome," Bass said.

In the governor's report Bass said the contributing factors that combined to create a "cascading effect" that caused the fire include limitations in the weather projection and fire behavior projection, unburned fuel, residual heat at the time of the "wind event" and operational actions.

"Without the wind, I think it would have just sat still and gone out," Bass said.

"You know the accuracy (of the weather forecast) that we usually can rely on, particularly this time of year, is about two-and-half, maybe, maybe three days (out)," he added. "You always err on the side of, if you have something dangerous predicted, it's a no go ... On Thursday, they did not have a no go."

The wildfire erupted March 26 when high winds fanned embers from a controlled burn conducted days earlier.

Three people died and hundreds were displaced. The fire blackened 6 square miles and damaged or destroyed more than two dozen homes.

Jefferson County residents living in the area will get a chance to voice their concerns with the sheriff and county commissioners. The fire is one of many items on the agenda at a town hall meeting which begins at 6:30 p.m. at West Jefferson Middle School.

Please refresh this page for more information.

If you have a news tip, or follow-up to this story, email Amanda Kost or Marshall Zelinger. You can also connect with Amanda on Facebook or through Twitter @amandakost. Marshall is available on Facebook and Twitter at @7Marshall.

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- April 5, 2012: Why Victim In Jefferson County Fire Never Got Evacuation Call
- April 4, 2012: Fire Victim Family: Ann Appel Never Got Reverse Notification
- April 3, 2012: 911 Told Fire Victim That Fire Was Controlled Burn
- April 3, 2012: Fire Chief Never Received Lower North Fork Burn Plan
- April 2, 2012: Lower North Fork Fire 100% Contained
- April 2, 2012: Lower North Fork Fire Evacuees Go Back Home
- April 2, 2012: Lower North Fork Fire 97% Contained; Evacuations To End Monday
- April 1, 2012: Remains Found In Missing Woman's Burned Home
- March 31, 2012: Lower North Fork Fire 90 Percent Contained
- March 30, 2012: 7NEWS Reviews State Forest Service Burn Plan
- March 30, 2012: Memorial Service Held For Couple Killed In Wildfire
- March 30, 2012: Firefighters Worry About Red Flag Warning On Fire Line
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- March 30, 2012: Sheriff Scrambling To Fix Evacuation Alert Glitch
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- March 29, 2012: Fire 45% Contained; 720 Families Allowed Home
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- March 29, 2012: Gov. Hickenlooper To Tour Fire Damage
- March 28, 2012: Fire Victim Loses Everything In Jeffco Fire
- March 28, 2012: Governor Suspends Controlled Burns On State Land
- March 28, 2012: Jeffco Fire Burns 4,140 Acres, 15% Containment
- March 28, 2012: Specialized Search, Rescue Team Looks For Missing Woman
- March 28, 2012: Prescribed Burns Getting Out Of Control Not Unheard Of
- March 28, 2012: Lower North Fork Fire: By The Numbers
- March 28, 2012: Deputy, Residents Made Frantic Calls For Help
- March 28, 2012: Animal Shelter Filling Up
- March 28, 2012: State Forest Service Admits Role In Jeffco Fire
- March 27, 2012: Air Tankers Take To Skies Over Jeffco Fire
- March 27, 2012: Couple ID'd As First Victims Of Lower North Fork Fire
- March 27, 2012: State's Potential Liability In JeffCo Fire Is $600K Max
- March 27, 2012: National Guard Activated; FEMA Funds OK'd
- March 27, 2012: Fire Bans Popping Up Along Front Range
- March 26, 2012: 1 Dead; Hundreds Evacuated In Path Of 3,000-Acre Jeffco Fire

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Colorado governor wants one agency to oversee disasters

By John Ingold The Denver Post The Denver Post
Posted:

DenverPost.com

Gov. John Hickenlooper proposed placing the state's management of wildfires and other disasters under a single command Monday, after nearly two decades of lobbying by an advocacy organization for such a change.

The proposal comes after the Lower North Fork fire in Jefferson County killed three people and burned nearly two dozen homes last month when the embers of a state-lit controlled burn flared March 26.

Hickenlooper said the shift — which would place the firefighting and controlled-burn responsibilities of the Colorado Forest Service, as well as the entire state Division of Emergency Management, under the command of the Colorado Department of Public Safety — would improve the state's response to events that threaten lives.

"We want to have it in one place, with an agency that is used to dealing with situations where minutes matter," Hickenlooper said.

The change would need legislative approval.

It was another deadly wildfire — 1994's South Canyon fire above Glenwood Springs, which killed 14 firefighters — that prompted the Colorado State Fire Chiefs Association to argue the state's wildfire response should be streamlined.

Paul Cooke, the organization's executive director, said the association two years later began pushing for a unified wildfire mobilization and command structure — something Hickenlooper said would have helped in the Lower North Fork fire response.

"There needs to be a single, statewide plan for emergency response, which is accepted by both state and local officials," the association wrote in a 1997 report. "... Colorado's fire service is less prepared and less able than it should be to respond to large-scale disasters."

Tony Frank — president of Colorado State University, which currently oversees the State Forest Service and its wildfire duties — said he supports the plan.

Cooke, who stood alongside Hickenlooper and Frank at a news conference announcing the proposal, said bureaucracy and lack of interest stopped the changes from being adopted earlier.

"We still, to this day, have separate systems for mobilization of resources," Cooke said. "If you have a tornado tomorrow, you have a different system than if you have a wildfire. We want one system."

Colorado AG opposes panel to compensate victims of fatal wildfire

By John Ingold The Denver Post The Denver Post
Posted:

DenverPost.com

Colorado Attorney General John Suthers said Wednesday he is opposed to creating a unique state commission to compensate victims of the Lower North Fork Fire.

Suthers said claims over the fire — which started from the embers of a state-set controlled burn and killed three people and burned 23 homes — should go through the normal process of lawsuits and settlements.

"I think it would be bad public policy to suggest that, in this case, we have some different manner of dealing with these claims," Suthers said. "In my mind, because this is a more high-profile event shouldn't cause it to be treated any differently."

Republicans in the state legislature on Tuesday proposed a special Lower North Fork Fire commission to review the blaze and approve payments to homeowners who suffered losses. The Republicans said the commission would be a more accountable way for the state to make amends to fire victims than through the courts.

Under state law, the most the state would have to pay out in lawsuits to all victims of the fire is $600,000 total — and that is only if the circumstances of the fire are found to fall within an exemption to the immunity the state usually enjoys from lawsuits. Though details of the proposed commission are still fluid, Republicans said it could pay out more to homeowners than lawsuits. Lawmakers would have to give the final OK to the pay-outs.

But Suthers, also a Republican, said it would be unfair to others who have legitimate claims against the state to allow only victims of the Lower North Fork Fire to receive more because the fire has received more public attention. Suthers sits on the state board that approves large lawsuit settlements and said there are many cases in which the state has made a mistake and the victims deserve to be compensated.

Suthers said it would be more appropriate for lawmakers to look at raising the compensation limits in lawsuits or expanding the list of claims exempt from immunity.

Creation of the special commission would require legislative approval. State House Speaker Frank McNulty, R-Highlands Ranch, said Tuesday that Republicans are finalizing details of the commission and working on a bill to implement it. A McNulty spokesman said today the bill could be introduced this week.

A spokesman for Gov. John Hickenlooper and Democratic legislative leaders at the Capitol have said they can't comment on the idea for a commission because they haven't seen details.

John Ingold: 303-954-1068 or jingold@denverpost.com

Lower North Fork fire ambushed crews, surprised residents

By John Ingold and Kirk Mitchell The Denver Post The Denver Post
Posted:

DenverPost.com

Outside the windows of Steve Foster's pickup, Armageddon was coming. A rampage of smoke — white and streaked with black — crested the ridge to his left and bore down. It began blocking the sun, turning daylight to twilight. Glowing, tracer-bullet embers zipped by on the road behind him. He could hear the fury inside the charging plume, and it reminded him of a jet engine gaining thrust. 600 yards away. Now 500. 400.

Driving out of the neighborhood, Foster convinced himself the fire would just scoot by. My house will be OK, he thought. My friends will be OK.

But, behind him, three of his friends were dying in what would come to be called the Lower North Fork fire. His neighbors' houses were burning. Soon, his would be too.

This was unimaginable just two hours before, when he drove into the valley below his house to investigate a small fire that the firefighter on scene insisted was manageable. Back at home, Foster told his wife not to worry.

"There was a sense of denial," he said. "I said, 'Honey, I was down there. There were crews arriving. It's going to be OK.'"

He pauses.

"How stupid."

What if you were in a race for your life, only you didn't know it?

When disaster strikes, you often hear that it happens all at once — that there is no time to know what is coming. But in the Lower North Fork fire, there was time — hours of it. What there wasn't was foresight.

A reassembling of the timeline for March 26, the day the fire ignited — pieced together from interviews, official documents and audio records — shows a repeated official underestimation of the fire's severity.

Emergency dispatchers often told residents calling about smoke that it was from a controlled burn started by the Colorado State Forest Service the week before, sometimes without adding that the burn had jumped containment.

Fire officials waited to order evacuations until the blaze crossed a certain point in the terrain, not realizing how quickly it would gallop across the space between that point and homes. Only 20 minutes before the fire began destroying homes, one fire chief estimated it would be two hours until structures would be threatened.

When the evacuation order finally came, it was too late for some. An entire neighborhood of families had to make a flames-at-their-backs escape.

"We weren't novices; we understood fires," said Andy Hoover, who was trapped in his house as the fire that killed his neighbors Sam and Linda Lucas and Ann Appel raged outside. "I guess I didn't think about it because it was a controlled burn and it was being monitored.

"We didn't sense the alarm that possibly we should have," he said.

Recognizing the problems in the fire response, Gov. John Hickenlooper has proposed consolidating fire and emergency management functions in a single state department to streamline the chain-of-command and quicken decisionmaking. Jefferson County authorities also have announced changes to evacuation procedures to give residents earlier warning when danger is looming.

"We know that not every fire will give us that opportunity," Jefferson County sheriff's spokeswoman Jacki Kelley

said. "There was that opportunity in the Lower North Fork fire."

A community on alert

Whoever named the neighborhood Pleasant Park knew what he was talking about. Sitting atop a ridgeline at about 8,000 feet, it looks down across a grand sweep of valleys and hills. Homes are spaced leisurely along the ridge, their big windows soaking in the views.

The focal point of the community along Kuehster Road — pronounced "Custer" by locals — was a red, single-room schoolhouse built in 1920. Foster and his neighbors worked to restore the schoolhouse, making it into a gathering spot for the Sampson Community Club.

One Fourth of July, Foster said, neighbors met outside the school for a cookout. But then the clouds grew dark and the winds blew up. When rain began to fall, the neighbors scampered into Foster's house a few yards away. And the party continued.

"I'm out there firing up my big grill, getting pelted by hail and cooking up 40 to 50 hamburgers and just having a great time," Foster remembers.

As soon as residents spotted smoke on March 26, at the site of a state-set controlled burn conducted days before, they began calling each other to share what they knew. Then they called 911.

Sam Lucas, who lived next to Hoover, was one of the first, at about 2:20 p.m.

"The Forest Service is out there," the dispatcher said.

Fifteen minutes later, Ann Appel called.

"They've got crews on the way," the dispatcher answered.

At another point, a dispatcher told a resident that the fire is, "a controlled burn that slightly got out of control."

It was 5 acres then, according to an investigative report. Firefighters had no containment, and the winds had begun to gust. Within an hour, winds were blowing at a steady 20 mph.

Evacuations put on hold

Once on scene, dispatch records and official reports show that firefighters ordered an increasing amount of resources to combat the growing blaze. The wind blew so hard that firefighters could barely keep their helmets on, according to statements made to a Jefferson County sheriff's investigator. Golf-ball-size embers flew around them.

About 3:30 p.m., the fire chiefs on scene decided to wait to order evacuations until the flames crossed a natural drainage point in the valley below Kuehster Road. The fire was about 10 to 15 acres in size but growing quickly.

It took another hour for the fire to cross that drainage, right around the time Eddie Schneider pulled into his driveway on the ridge above after hurrying home when he saw smoke during a round of golf.

Schneider had called 911 the week before after seeing smoke from the controlled burn. This time, he called 911 again and said he was told no evacuations were in place.

"Down there," Schneider said, "they knew they had a problem. But they weren't going to tell anybody because then they were in trouble."

Meanwhile, Inter-Canyon firefighter Dave Brutout was driving up and down Kuehster Road urging residents to leave, even though an official order was still several minutes away. The winds were roaring atop the ridge, a sustained 60 mph, Brutout told investigators, according to a report. He couldn't hold his helmet on his head.

Brutout said he spoke with Sam Lucas, who said he was packed up but wanted to turn on his home's fire-suppression system before leaving. Brutout tried to talk to Appel. But there was a chain across her driveway, and he moved on. By the time the firefighter reached Schneider's house — Schneider estimated it to be about 5 p.m. — the moment to evacuate safely had already passed, unbeknown to everyone.

Down below, the first formal request for evacuations came at 4:41 p.m., according to an investigative report. The emergency notification system, which a glitch prevented from going to all residents in the evacuation zone, came just after 5 p.m. At 5:12, North Fork Fire Chief Curt Rogers estimated the blaze would reach the homes above within two hours, according to the report.

It reached Andy Hoover's back door in 13 minutes.

Hoover was racing around in his home, pulling furniture away from windows, when the light outside went black. Then, his windows glowed orange. Heat filled the home. Flames were lapping at his house, and there was no place for him to go.

"I could just feel radiated heat," Hoover said. "It was just like in front of an open oven."

"I sort of understood that I might not make it out of this mess."

Down the road, Eddie Schneider was having the same thought.

He and his wife had left their house about 5:15 p.m. — less than 15 minutes after receiving the evacuation call — but went back to get one last thing. Leaving again, the fire closed around them.

Smoke enveloped their vehicle. The only way Schneider could see where he was going was to look down at the ditch beside the road and make sure not to drive into it. Embers flew by. Trees lit up like torches beside the road.

His neighbors — Kim Olson and Doug Gulick, who videotaped their escape — were just in front of him to start. Foster was a couple minutes up ahead.

"You had to leave with the clothes on your back, and that was it," Schneider said.

Schneider and his wife drove anxiously until they burst out of the plume and into the sunlight.

Meanwhile, Hoover was desperately fighting to save his house. The front of flames outside the home had passed, but a residual fire burned on his deck. The inner panes of windows were broken.

He called his wife, Jeanie.

"I don't know what the hell's going on," he said, "but there's sparks everywhere; there are flames; it's hot."

He tried to douse the deck fire, but it was too hot outside. The power was out. He went down to the garage, climbed into his pickup and smashed straight through the garage door.

Outside, he drove until he found a safe spot in an open area and watched as his house burned.

"I think I'm going to hang out here until I know a better idea," he told a dispatcher in a 911 call. "It seems like a dumb idea to move."

A long way from closure

There are multiple ongoing investigations into the causes of the Lower North Fork fire and the response to it.

Exactly when the fire reached Ann Appel's and the Lucases' homes has not been determined, nor have their causes of

death. Throughout the day, neighbors had been in regular contact with the three. Appel and the Lucases had said as late as 5 p.m. that they were on the verge of evacuating.

That they didn't survive the panicked escape that their neighbors did has only stirred the community's anger over the fire. Elk Creek Fire Chief Bill McLaughlin's admission that evacuations should have come at least an hour earlier hasn't soothed, either.

Instead, residents say they hope officials will be held accountable, that amends will be made. Only that — and time — can piece the community back together.

"I still have a nice view, for 70 miles around," said Schneider, whose house was the only on his street to survive. "But when I look down, I'm living in a little piece of hell. It's black. And that will take a while."

John Ingold: 303-954-1068 or jingold@denverpost.com

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Ann Appel's Husband: 'She Should Still Be Here'

Related To Story

Scott Appel Remembers His Wife Of 22 Years

Marshall Zelinger, 7NEWS Content Producer/Presenter

POSTED: 9:04 pm MDT April 29, 2012
UPDATED: 11:09 pm MDT April 30, 2012

JEFFERSON COUNTY, Colo. -- There are few images of the Lower North Fork prescribed burn that started on Thursday, March 22.

One of those few was captured by Ann Appel.

She took the photo from her home. It showed heavy white and dark smoke from a 50-acre prescribed burn.

Four days later, that burn would re-ignite, escape and kill her.

"It's just hard to imagine, it really is. She all just swept away in a moment of time and -- there's nothing you can do about it," Ann's husband Scott told 7NEWS. "I don't have anything that records her voice or -- nothing."

Scott has spent the last few weeks talking with 7NEWS reporter Marshall Zelinger. The focus has always been on Ann.

"If anybody said anything that brought attention to her, she would just shy right away from that. Just a wonderful lady," said Scott.

"She'd be embarrassed for what we're doing right now?" asked Zelinger.

"Absolutely, she would be so embarrassed about this whole thing and the attention that's been drawn to her that she wouldn't believe it," said Scott. "(She was a) beautiful person, really unselfish and just always in the background. Never would draw attention to herself."

Ann Appel Designed Mountain Home

Ann and Scott bought the land they would live on ever since, the same year they got married 22 years ago.

"When we bought the property, I think back in 1989, we were struck with the beauty of the area down here," said Scott.

"You guys designed it yourself?" asked Zelinger.

"Ann did," said Scott. "The reason we chose this spot to build our house on was because of the view looking down over the South Platte River that comes down through here. It's the North Fork of the South Platte," said Scott.

Scott described a woman who loved her sun room; someone who had a list a mile long each day.

"She was up early in the morning and she had her tea. You know, she'd have the same kind of Celestial Seasonings tea every morning just like clockwork and then she usually got on the treadmill and would walk 2 or 3

miles," said Scott.

Ann Called 911 Concerned About Smoke Monday Afternoon

In the early afternoon on Monday, March 26, Ann called Scott, concerned about smoke from the burn area.

"As the day progressed, she said, 'This smoke is kind of just blowing up this way like it has before, so what should I do?' And I said well, 'As soon as we get off the phone, call 911 and figure out what's going on with it,'" said Scott.

At 2:34 p.m., Ann called 911.

DISPATCH: "Jefferson County 911, what are you reporting?"

ANN APPEL: "A fire."

DISPATCH: "Where at?"

APPEL: "It's down along Foxton, by the Platte River."

DISPATCH: "OK, they do have crews on the way down there."

APPEL: "OK. It's blowing smoke right over my house."

DISPATCH: "Yeah, it's about 5 acres and growing, so they've got crews on the way."

APPEL: "OK. Thank you."

DISPATCH: "You're welcome."

APPEL: "Bye."

7NEWS later discovered, the Colorado State Forest Service determined that the fire had escaped at 2:30 p.m.

"You have to realize that nobody knew that the fire was out of control right down there for over two hours in these kind of huge winds," said Scott. "That's another big question that I have. How could that happen and nobody warn people up this way? It must have raced unbelievably fast up here and come up over the top of this hill, and no way out."

Ann Prepared To Leave Before Fire Danger Truly Known

After speaking with a 911 dispatcher on Monday afternoon, Ann called her husband again.

"I talked to her later on in the afternoon and she just said, 'It's getting more and more windy, we've got the same smoke that we had before.' And so I said, 'Just get things ready and just leave,'" said Scott. "I know that she was getting ready to go because we talked about that. She had all her photos, all the things that were really valuable, she was getting those together and getting ready to head out. Unfortunately I wasn't here, (but) she was plenty capable of doing anything on her own. That was not an issue at all."

Fire crews finally called for reverse notifications at 4:57 p.m. The Appel household never got one. The notification company had their home mapped in the wrong area. Neighbors told Scott, by the time the call went out, they believe the Appel property was on fire.

"People don't leave every time there's smoke. And I don't think that's reasonable to expect people to do that

either," said Scott. "If anybody would have known the magnitude of what was happening here, they'd all been gone for a good long while. There's no doubt in my mind that something totally unexpected came up over that hill."

Search For Ann Took Days

Scott was out of state when the fire destroyed his home. After the first night, no one knew if Ann had made it out or not.

Family, friends and neighbors searched for days.

Search crews went methodically through the Appel property. She was found in the home she helped design.

"I'm grateful that we had the time we did, but she should still be here and there's no good reason that she isn't," said Scott. "When you talk about losing everything, we did. The only thing left of Ann, unfortunately, is a pair of sunglasses that she bought the last time we went to Florida, and she left them on the dash of the Bronco that the boys took off in when they went to go to Moab that day."

Before their sons, Evan and Austin, left for a Spring Break trip to Moab, Scott said his wife was up before dawn preparing food for the road trip.

"They're college kids, so they don't know what five or six o'clock in the morning looks like; they were sleeping in. She was up early, and I know she was baking oatmeal raisin cookies and these granola bars that the boys liked," said Scott. "Hard to image that this could all happen in the space of a few hours."

Home Destroyed, Land Charred

"When you look at this, what stands out the most to you?" asked Zelinger.

"The devastation is kind of beyond description," said Scott. "It does look like a bomb went off, I mean there's just literally nothing left."

The Appels owned 40 acres of land, most of which are now burned and charred trees.

"This can't be fixed by insurance and people don't seem to understand the difference there. You can't insure land. You can't insure the beauty of the property," said Scott. "So, when that's gone and that's erased, even if you build a brand new home here with full replacement insurance, it wouldn't be worth what you just built it for because nobody would buy it with these trees on here."

Scott and his neighbors wonder why the prescribed burn had to happen at all. Residents told 7NEWS that they pick up dry bark and branches by hand, not by lighting them on fire.

"I've never agreed with the policy, but it's not up to me to make that decision to start a controlled burn anywhere near this close, that's even given ideal conditions," said Scott. "We never know. We never have a notice. Nobody up here knows what's happening (regarding prescribed burns)."

North Fork Fire Chief Curt Rogers estimated for 7NEWS that the nearest homes to the prescribed burn escape were within three miles away.

"This wasn't a lightning strike or something out there, it was something that was controlled that people were supposed to know what they were doing, were doing, and so people have a certain degree of trust in that," said Scott. "Legal or illegal is one thing, right and wrong is a different thing. This is either right or it's wrong. That's what I want to hear an answer to."

Questions For Governor Hickenlooper

"If you could ask Governor (John) Hickenlooper anything, what would you ask him?" asked Zelinger.

"I guess the question I would have is -- for the Governor or anybody that was involved in this thing is -- if I had done exactly what they did; if that was my ground down there and I did what they did on that day, everything being identical. Does anybody think for a minute that I could take the position that the state has taken with immunity?"

Because of the Colorado Governmental Immunity Act, the state may only be liable for $600,000 total damage to be split amongst all victims.

Lawmakers are considering a legislative commission to potentially offer more money to victims.

An investigation by the Jefferson County Sheriff's Office found no criminal liability. An independent investigation called for by the Governor into prescribed burns found no blame in the fire, but recommended changes before other prescribed burns take place.

"It's one thing to fix it for the future so it doesn't happen again; there's a whole string of people here and families and lives that have been absolutely shattered; lives lost. We need to fix that first before we fix the future in my opinion," said Scott.

Report a typo or inaccuracy

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Guest Commentary: What is Colorado's responsibility in the Lower North Fork fire?

By Scott Appel and Tom Scanlan The Denver Post
Posted:

DenverPost.com

Two months ago, a wildfire set by the Colorado State Forest Service burned 23 homes to the ground and tragically killed three of our loved ones, friends and neighbors. A so-called "controlled burn" quickly flared out of control, and within hours on a Monday afternoon, destroyed everything our families built up over a lifetime.

The physical decimation of our personal items and property pales in comparison to the loss of the lives of Ann Appel and Sam and Linda Lucas to their families and our community. Their deaths and the fire's total devastation is horrific — and was completely avoidable. As residents of the now-ashen Kuehster Road community, we are grateful that Gov. John Hickenlooper and the state legislature acted to amend the Colorado Governmental Immunity Act to include a waiver for prescribed burns, which was signed Monday. This is a common-sense amendment and a step toward justice, not only for the victims of the Lower North Fork fire but also for all Colorado citizens who may in the future be similarly impacted.

However, the signing of this bill is only a preliminary action toward the state taking full responsibility for the devastation it has wreaked. This legislation is imperfect because it promises nothing more than an "avenue to seek compensation," lacking any assurances that we will be compensated for our losses not covered by insurance. The legislation says only what the state can do, but does not say what the state will do.

We know exactly how this tragedy was brought upon us, yet we are faced with the feeling that the burden of proof is on us, having to endure a complex governmental review process before recommendations are made for restitution. The amendment makes no promises for the time frame of this process, or that any reasonable compensation will be awarded to victims. In the meantime, our bills and obligations continue.

We have spent the last two months sifting through ashes, testifying before the state legislature, working with our elected representatives to get the state to take responsibility for its actions. Serious questions remain surrounding why this fire was set under dangerously dry conditions when weather reports predicted high winds; why the state ignored its own protocols by leaving the burn unattended; why an evacuation wasn't ordered earlier when it was already known the fire was out of control; and why the reverse 911 call system failed to warn people in harm's way.

Moreover, the state's own review of the fire failed to consult any of the families that lost their homes or numerous witnesses of the fire.

The Kuehster Road community is made up of responsible citizens who pay our taxes and look out for ourselves and our neighbors. We practice fire mitigation through state-recommended guidance to minimize the possibility of forest fires. It's a far cry from justice when the state Forest Service runs away from taking responsibility for its actions.

We have never asked the state of Colorado for anything. We are not asking for a handout now, but we shouldn't have to continue to fight for justice as we try to rebuild our lives from this tragedy. Coloradans understand fairness, and what it means to correct a horrible injustice. We sincerely appreciate the outpouring of sympathy from our fellow citizens, who instinctively know how wrong this was.

We are grateful to the governor and our other elected leaders for putting forth this legislation. The governor has personally promised us that this process would not get bogged down in a partisan politics, and we hope and trust that he can prevent it.

We call upon all our elected officials and state agencies to ensure that with the signing of this legislation, they too are fully committed to a quick and just resolution of this tragedy. We ask the state to act as expeditiously and fairly as the state insurance commission would require of any private party who had caused similar harm.

Scott Appel is the husband of Ann Appel, who died in the Lower North Fork Fire. Tom Scanlan is retired from the U.S. Air Force. They wrote this piece on behalf of the residents of the Kuehster Road community.

STATE OF COLORADO

OFFICE OF THE GOVERNOR

136 State Capitol Building
Denver, Colorado 80203
Phone (303) 866 - 2471
Fax (303) 866 - 2003

John W. Hickenlooper
Governor

D 2012-005

E X E C U T I V E O R D E R

Activating the National Guard for the Purpose of Firefighting Assistance regarding the Lower North Fork Fire and Activating the State Emergency Operations Plan

Pursuant to the authority vested in the Governor of the State of Colorado and, in particular, pursuant to Colorado Constitution, article IV, sections 5 and 13 and C.R.S. § 28-3-104, Joseph A. Garcia, Lieutenant Governor of the State of Colorado, hereby issues this Executive Order activating the National Guard for the purposes of protecting life and property and public health and safety.

I. Declaration and Directives

A. On March 27, 2012, it was brought to the attention of the administration that a fire was threatening homes and property southwest of Denver in forested mountain terrain south of Aspen Park, Colorado. The Jefferson County Sheriff's Office requested the firefighting assistance of the State. The National Guard possesses equipment and personnel to provide such assistance. Pursuant to C.R.S. § 28-3-104, I verbally authorized the activation of the National Guard to assist in fighting this fire. This Executive Order memorializes my verbal order.

B. The State Emergency Operations Plan is hereby activated pursuant to C.R.S. § 24-32-2502. All State departments and agencies shall take whatever actions may be required and requested by the Director of the Division of Emergency Management or the Colorado State Forest Service, including provision of appropriate staff and equipment as necessary.

II. Duration

This Executive Order shall expire thirty days from March 27, 2012 unless extended further by Executive Order.

III. Lieutenant Governor

I am executing this Executive Order pursuant to the Colorado Constitution, article IV, section 13(5) as Governor John W. Hickenlooper is currently traveling outside of the State of Colorado.

GIVEN under my hand and the Executive Seal of the State of Colorado this twenty-seventh day of March, 2012.

Joseph A. Garcia
Lieutenant Governor

STATE OF COLORADO

OFFICE OF THE GOVERNOR

136 State Capitol Building
Denver, Colorado 80203
Phone (303) 866 - 2471
Fax (303) 866 - 2003

John W. Hickenlooper
Governor

D 2012-006

EXECUTIVE ORDER

Suspending Prescribed or Controlled Fire Pending Review of Protocols

Pursuant to the authority vested in the Governor of the State of Colorado and, in particular, pursuant to Colorado Constitution, article IV, section 13 and C.R.S. § 23-31-308, Joseph A. Garcia, Lieutenant Governor of the State of Colorado, hereby issues this Executive Order suspending prescribed or controlled fire by State agencies pending review of agency protocols for prescribed or controlled fire.

I. Background and Purpose

Many areas of Colorado have been experiencing above average temperatures and dry conditions. As a result, the National Weather Service has issued a number of Red Flag warnings for the Front Range and other portions of the state. Already this year, Colorado has experienced several wildfires.

On March 25, 2012, the Lower North Fork Fire may have been started by a prescribed or controlled fire. As of this issuance of this order, the Lower North Fork Fire had burned approximately several thousand acres, resulted in the deaths of two people, and destroyed several homes.

To help respond to the Lower North Fork Fire, on March 27, Lt. Governor Joseph Garcia issued Executive Oder D 2012-005 that activated the National Guard and activated the State Emergency Operations Plan.

Prescribed or controlled fire is a tool used to reduce the overabundance of vegetation and dense stands of trees—in other words, the fuels—that can lead to intense, catastrophic wildfires. However, it must only be used under the right conditions and under responsible management.

As a result, given that a prescribed or controlled fire may have been the cause of the Lower North Fork Fire, the State should suspend further use of this land and fire management tool to make sure that we have the procedures and protocols in place so that these conditions and management requirements are understood and strictly followed.

II. Declaration and Directives

A. I hearby order all State agencies to suspend prescribed or controlled fire on State or private lands pending review of agency protocols for prescribed or controlled fire. This suspension applies to all State lands as well as State agencies that apply prescribed or controlled fire on non-State lands under contracts or agreements with other entities.

B. For purposes of this order, "prescribed or controlled fire" is defined as the controlled application of fire in accordance with a written plan for wildland fuels under specified environmental conditions while following appropriate precautionary measures that ensure that the fire is confined to a predetermined area to accomplish planned fire or land-management objectives.

C. For purposes of this order, "prescribed or controlled fire" does not apply to agricultural burning, however, extreme care and caution in agricultural burning is strongly encouraged. For purposes of this order, "agricultural burning" is defined as open burning of cover vegetation for the purposes of preparing the soil for crop production, weed control, maintenance of water conveyance structures related to agricultural operations, and other agricultural cultivation purposes.

III. Duration

This Executive Order shall expire upon review of State agencies' prescribed or controlled fire protocols or upon rescission by subsequent Executive Order.

IV. Lieutenant Governor

I am executing this Executive Order pursuant to the Colorado Constitution, article IV, section 13(5) as Governor John W. Hickenlooper is currently traveling outside of the State of Colorado.

GIVEN under my hand and the Executive Seal of the State of Colorado this twenty-eighth day of March, 2012.

Joseph A. Garcia
Lieutenant Governor

STATE OF COLORADO

OFFICE OF THE GOVERNOR

136 State Capitol Building
Denver, Colorado 80203
Phone (303) 866 - 2471
Fax (303) 866 - 2003

John W. Hickenlooper
Governor

D 2012-007

EXECUTIVE ORDER

Declaring a Disaster Emergency Due to the Lower North Fork Fire

Pursuant to the authority vested in the Governor of the State of Colorado and, in particular, pursuant to Colorado Constitution, article IV, section 13 and relevant portions of the Colorado Disaster Emergency Act of 1992, C.R.S. § 24-32-2100, *et seq.*, Governor John W. Hickenlooper, Governor of the State of Colorado, hereby issues this Executive Order declaring a state of disaster emergency due to the wildfire in Jefferson County, Colorado.

I. Background and Purpose

On March 26, 2012 it was brought to the attention of the administration that a fire was threatening homes and property southwest of Denver in forested mountain terrain south of Aspen Park, Colorado. The wildfire was being driven by high winds causing spot fires to occur in front of the main fire. Direction of spread was generally to the north northeast. Local and state resources on scene took immediate aggressive suppression action. At approximately 1745 hours a request for a Federal Emergency Management Assistance (FEMA) Fire Management Assistance Grant was submitted. FEMA notified the state at 2100 hours that the Lower North Fork Fire was accepted as a qualifying fire.

At approximately 2100 hours the Colorado State Forest Service received a request from the Jefferson County Sheriff to assume charge of the Lower North Fork Fire in accord with the Emergency Fire Fund Agreement. The State accepted the Lower North Fork Fire as an Emergency Fire Fund designated fire and verbally notified the Jefferson County Sheriff at 2215 hours. With the disaster declaration made in this executive order, the State is accepting the Lower North Fork Fire as a Disaster Emergency Fund designated fire.

The Governor is responsible for meeting the dangers to the state and people presented by disasters. The Colorado Disaster Emergency Act of 1992, defines a disaster as "the occurrence or imminent threat of widespread or severe damages, injury or loss of life or property resulting from any natural cause or cause of human origin, including but not limited to... fire." C.R.S. § 24-32-2103(1.5). The Lower North Fork Fire's proximity to numerous homes and

property poses an imminent danger to life and property and, therefore, constitutes a disaster for the purposes of the Act. On March 27, 2012, Lieutenant Governor Joseph A. Garcia activated the National Guard and the State Emergency Operations Plan to assist in fighting the fire. *See* Executive Order D 2012-005. On March 28, 2012, Lieutenant Governor Joseph A. Garcia suspended prescribed or controlled fire pending review of protocols. *See* Executive Order D 2012-006.

II. Declaration and Directives

A. The Lower North Fork Fire hereby constitutes a disaster emergency for purposes of C.R.S. § 24-32-2103. My verbal order of March 29, 2012, declaring a state disaster emergency is hereby memorialized by this Executive Order and shall have the full force and effect of law as if it were contained within this Executive Order.

B. The State Emergency Operations Plan initially activated pursuant to Executive Order D 2012-005 is hereby activated anew. All State departments and agencies shall continue to take whatever actions may be required and requested by the Director of the Division of Emergency Management or the Colorado State Forest Service including provision of appropriate staff and equipment as necessary.

C. Pursuant to C.R.S. § 24-32-2106, $3.5 million in the Disaster Emergency Fund is encumbered to pay for fire suppression efforts related to the Lower North Fork Fire since its inception. The $3.5 million exists in the Disaster Emergency Fund from unexpended funds for the Four Mile Fire previously encumbered in Executive Orders D 2010-012, D 2011-034, and D 2012-004. The Colorado State Forester working in conjunction with the Director of Colorado Division of Emergency Management is hereby authorized and directed to allocate the funding to the appropriate government agencies. These funds shall remain available for this purpose for one year from the date of this Executive Order, and any unexpended funds shall remain in the Disaster Emergency Fund.

D. The Director of the Colorado Division of Emergency Management and the Colorado State Forest Service are authorized and directed to coordinate application to the federal government for funds available for reimbursement and to coordinate application for any other funds available related to this disaster emergency.

III. Duration

This Executive Order shall expire thirty days from its date of signature unless extended further by Executive Order, except that the funds described in paragraph II(C) above shall remain available for the described purposes for one year from the date of this Executive Order.

GIVEN under my hand and the Executive Seal of the State of Colorado this thirtieth day of March, 2012.

John W. Hickenlooper
Governor

STATE OF COLORADO

OFFICE OF THE GOVERNOR

136 State Capitol Building
Denver, Colorado 80203
Phone (303) 866 - 2471
Fax (303) 866 - 2003

John W. Hickenlooper
Governor

D 2012-008

EXECUTIVE ORDER

Reaffirming the Declaration of Disaster Emergency Due to the Lower North Fork Fire in Jefferson County and Making Additional Funds Available for Fire Response and Recovery

Pursuant to the authority vested in the Governor of the State of Colorado and, in particular, pursuant to Colorado Constitution, article IV, section 13 and relevant portions of the Colorado Disaster Emergency Act of 1992, C.R.S. § 24-32-2100, *et seq.*, I, Governor John W. Hickenlooper, Governor of the State of Colorado, hereby issue this Executive Order reaffirming my earlier declaration of a state of disaster emergency due to the wildfire in Jefferson County, Colorado, and making additional resources available for the response and recovery efforts necessitated by the fire.

I. Background and Purpose

On March 26, 2012 it was brought to the attention of the administration that a fire was threatening homes and property southwest of Denver in forested mountain terrain south of Aspen Park, Colorado. The wildfire was being driven by high winds causing spot fires to occur in front of the main fire. Direction of spread was generally to the north northeast. Local and state resources on scene took immediate aggressive suppression action. At approximately 1745 hours a request for a Federal Emergency Management Assistance (FEMA) Fire Management Assistance Grant was submitted. FEMA notified the state at 2100 hours that the Lower North Fork Fire was accepted as a qualifying fire.

At approximately 2100 hours the Colorado State Forest Service received a request from the Jefferson County Sheriff to assume charge of the Lower North Fork Fire in accord with the Emergency Fire Fund Agreement. The State accepted the Lower North Fork Fire as an Emergency Fire Fund designated fire and verbally notified the Jefferson County Sheriff at 2215 hours.

The Governor is responsible for meeting the dangers to the state and people presented by disasters. The Colorado Disaster Emergency Act of 1992, defines a disaster as "the occurrence or imminent threat of widespread or severe damages, injury or loss of life or property resulting from any natural cause or cause of human origin, including but not limited to . . . fire." C.R.S. § 24-32-2103(1.5). The Lower North Fork Fire's proximity to numerous homes and property posed imminent danger to life and property and, therefore, constituted a disaster for

the purposes of the Act. On March 27, 2012, Lieutenant Governor Joseph A. Garcia activated the National Guard and the State Emergency Operations Plan to assist in fighting the fire. See Executive Order D 2012-005. On March 28, 2012, Lieutenant Governor Joseph A. Garcia suspended prescribed or controlled fire pending review of protocols. *See* Executive Order D 2012-006. On March 30, 2012, I issued Executive Order D 2012-007 providing $3.5 million in funding for fire suppression. The response and now the recovery efforts necessitated by the fire continue and require additional funding and expansion of the purpose of the Executive Order to encompass the ongoing recovery efforts.

II. Declaration and Directives

A. I hereby declare that the Lower North Fork Fire continues to constitute a disaster emergency for purposes of C.R.S. § 24-32-2103.

B. In addition to the funds encumbered pursuant to Executive Order D 2012-007 for the purpose of fighting the Lower North Fork Fire, I order the encumbrance of an additional $365,000 from the Disaster Emergency Fund to pay for the response ($169,000 for Urban Search and Rescue Team if not reimbursed by other funding sources and $1,000 for the 2-1-1 information line) and recovery ($195,000) effort related to this disaster. These funds may be used to pay for resources as requested for reimbursement by Jefferson County or appropriate state agencies and as approved by the Director of the Division of Emergency Management to assist with government costs incurred during the current disaster emergency by government entities, including costs incurred by non-profit organizations on behalf of government entities. The Director of the Colorado Division of Emergency Management is hereby authorized and directed to determine proper and necessary extraordinary costs, as envisioned in the Disaster Emergency Act, to be reimbursed by the funds authorized herein and to allocate the funding to the appropriate agencies. These funds shall remain available for this purpose for eighteen months from the date of this Executive Order and any unexpended funds shall remain in the Disaster Emergency Fund.

C. In addition to the directive in paragraph II(D) of Executive Order D 2012-007 to apply for federal funds, the Director of the Colorado Division of Emergency Management is hereby authorized and directed to coordinate application for any federal assistance or low-interest loans that may be available to assist the affected communities and residents with responding to and recovering from the disaster including but not limited to Stafford Act grants, Small Business Administration loans, Community Development Block Grants, and Community Service Block Grants.

D. Pursuant to C.R.S. § 24-32-2104(7), I hereby authorize the Department of Human Services, at its discretion, to expend Temporary Assistance to Needy Families (TANF) funds in excess of the funds allocated to Jefferson County in order to assist those impacted by the disaster, and I authorize the use of Department of Human Services appropriated funds to help provide emergency housing to those displaced by the disaster. I also authorize the Department of Human Services, at its discretion and where necessary, to waive any identification requirements that may impede the rapid delivery of assistance under the TANF program to disaster victims in Jefferson County.

E. I authorize the Department of Local Affairs to grant funding to Jefferson County for rental assistance, security and utility deposits to qualified individuals displaced by the Lower North Fork Fire. Pursuant to C.R.S. § 24-32-2104(7), I authorize the Department of Local Affairs and the Department of Personnel and Administration, at their discretion, to suspend in whole or in-part state purchasing and contracting laws and regulations in order to facilitate making temporary housing available on an expedited basis to those displaced by the Lower North Fork Fire.

F. The Department of Local Affairs is hereby authorized and directed to use appropriated funds and grant money that may be available from other sources to assist in the repair and reconstruction of publicly owned facilities and infrastructure.

III. Duration

This Executive Order shall expire thirty days from its date of signature unless extended further by Executive Order, except that the funds described in paragraph II(B) above shall remain available for the described purposes for eighteen months from the date of this Executive Order and in all other respects Executive Order D 2012-007 shall remain in full force and effect as originally promulgated.

GIVEN under my hand and the Executive Seal of the State of Colorado this nineteenth day of April, 2012.

John W. Hickenlooper
Governor

STATE OF COLORADO

OFFICE OF THE GOVERNOR

136 State Capitol Building
Denver, Colorado 80203
Phone (303) 866 - 2471
Fax (303) 866 - 2003

John W. Hickenlooper
Governor

D 2012-015

EXECUTIVE ORDER

Ban on Open Burning in the State of Colorado

Pursuant to the authority vested in the Governor of the State of Colorado and, in particular, pursuant to Article IV, Section 2 of the Colorado Constitution and C.R.S. § 23-31-308, I, John W. Hickenlooper, Governor of the State of Colorado, hereby issue this Executive Order banning open burning in the State of Colorado.

I. Background and Need

High temperatures and dry conditions have resulted in high fire danger throughout much of Colorado. Already this year, 344 wildfires have been reported in the state. These wildfires have burned over 120,000 acres in areas across the state. These weather conditions and circumstances attest to the continuing threat to life, health and property posed by wildfires on Colorado's public and private lands. As of the date of this Executive Order, the High Park Fire in Larimer County is not contained and has burned over 49,000 acres and destroyed or damaged well over 120 structures. And various types of fire bans are currently in place in at least 57 of Colorado's 64 counties.

Given the high fire danger throughout the state, the Colorado State Forest Service, in consultation with federal land management agencies, has requested an immediate ban on open burning in Colorado. The Larimer County Commissioners have requested a fireworks ban in parts of Northern Colorado where extreme fire danger exists. In response to these and other requests for an effective, uniform response to the high fire danger across the state, this Executive Order bans open burning in the State of Colorado.

Our staff has been working with County Sheriffs, Colorado Counties, Inc., the Colorado Municipal League, and the Colorado State Fire Chiefs Association to ensure the appropriate application and the proper implementation of this Executive Order.

II. Directive

A. Open burning is hereby prohibited in all counties in the State of Colorado.

B. For purposes of this order, "open burning" means any outdoor fire, including but not limited to campfires, warming fires, charcoal grill fires, fused explosives, fireworks, and any other activity that poses a significant risk of starting a fire.

C. For purposes of this order, "open burning" does not include fires in:

i. liquid-fueled or gas-fueled stoves;

ii. fireplaces contained within buildings;

iii. charcoal grills at private residences;

iv. constructed, permanent fire pits or fire grates within developed camp and picnic grounds or recreation sites;

v. commercial, professional and municipal fireworks displays where specific written approval has been granted by the sheriff of the county in which the fireworks display is to occur; and

vi. connection with prescribed or controlled burns for agricultural or irrigation purposes along ditches located within and completely surrounded by irrigated farmlands where such burning is necessary for crop survival and specific written approval has been granted by the sheriff of the county in which the prescribed burn is to occur.

D. Pursuant to C.R.S. § 23-31-306, this Executive Order shall be enforced by county sheriffs or by the administering agencies of the federal lands located within the state. This Executive Order is not intended to supersede more comprehensive or inclusive open burning restrictions that have been or may be established by Colorado counties, municipalities and/or other political subdivisions of the state. Where permitted by law, counties and other local governments may ban any or all of the open burning exemptions listed in section II.C. when local officials determine that a more restrictive ban is appropriate and warranted given fire danger conditions in their localities. An exemption to the opening burning restrictions set forth in this order may be granted only by county sheriffs or, within federal lands, by the administering federal agency, and only if the proposed burn is deemed by said sheriff or agency to be safe and subject to mitigation. Should a wildfire occur as the

result of the granting of an exemption to this order, the State of Colorado may, and likely would, deny access to state funds to pay for the costs of such a wildfire.

III. Duration

This Executive Order shall be effective at 2:00 PM on June 14, 2012, and shall remain in effect until amended or rescinded by Executive Order.

GIVEN under my hand and the Executive Seal of the State of Colorado this fourteenth day of June, 2012.

John W. Hickenlooper
Governor

NOTE: The governor signed this measure on 6/4/2012.

An Act

HOUSE BILL 12-1352

BY REPRESENTATIVE(S) Gardner B. and Gerou, Baumgardner, Beezley, Bradford, Holbert, Joshi, Kerr J., Liston, Looper, Miklosi, Murray, Nikkel, Pace, Priola, Ramirez, Scott, Stephens, Summers, Szabo, McNulty, Ferrandino, Kerr A., Peniston, Schafer S., Todd, Young;
also SENATOR(S) Cadman, Boyd, Foster, Giron, Heath, Jahn, King K., Lambert, Lundberg, Morse, Neville, Nicholson, Schwartz, Williams S.

CONCERNING THE CREATION OF A STATE COMMISSION TO ADDRESS MATTERS ARISING OUT OF THE LOWER NORTH FORK WILDFIRE.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. In Colorado Revised Statutes, **add** part 17 to article 2 of title 2 as follows:

PART 17
LOWER NORTH FORK WILDFIRE COMMISSION

2-2-1701. Legislative declaration. (1) THE GENERAL ASSEMBLY HEREBY FINDS, DETERMINES, AND DECLARES THAT:

(a) IN MARCH 2012, A CONTROLLED BURN CONDUCTED BY THE COLORADO STATE FOREST SERVICE IN THE LOWER NORTH FORK AREA OF

Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

JEFFERSON COUNTY, COLORADO, RESULTED IN A WILDFIRE ON MARCH 26, 2012, THAT KILLED THREE PEOPLE, DESTROYED HOMES AND OTHER STRUCTURES RESULTING IN EXTENSIVE PROPERTY DAMAGE, AND BURNED MORE THAN ONE THOUSAND FOUR HUNDRED ACRES SOUTH OF CONIFER, COLORADO. THE LOWER NORTH FORK WILDFIRE OCCURRING ON MARCH 26, 2012, IS REFERRED TO IN THIS PART 17 AS THE "WILDFIRE".

(b) THE IMPACT ON THE AFFECTED COMMUNITY RESULTING FROM THE WILDFIRE INCLUDES NOT ONLY LOSS OF LIFE AND FINANCIAL DEVASTATION BUT ALSO A LOSS OF CONFIDENCE BY PERSONS AFFECTED IN THE ABILITY OF THE STATE AND OTHER EMERGENCY RESPONDERS TO RESPOND TO THIS OR OTHER DISASTERS THAT MAY OCCUR IN THE FUTURE. ACCORDINGLY, IT IS AN APPROPRIATE USE OF THE PLENARY POWER OF THE GENERAL ASSEMBLY TO EMPOWER A BODY SUCH AS THE COMMISSION CREATED UNDER THIS PART 17 TO INVESTIGATE THE CAUSES OF THE WILDFIRE AND TO MAKE RECOMMENDATIONS FOR LEGISLATIVE OR OTHER ACTION THAT WOULD PREVENT THE OCCURRENCE OF A SIMILAR TRAGEDY.

2-2-1702. Lower north fork wildfire commission - created - membership - chair - meetings - quorum - reimbursement of expenses - staff assistance - public meetings. (1) THE LOWER NORTH FORK WILDFIRE COMMISSION, REFERRED TO IN THIS PART 17 AS THE "COMMISSION", IS HEREBY CREATED. THE COMMISSION IS COMPRISED OF THE FOLLOWING FIVE MEMBERS:

(a) TWO MEMBERS OF THE HOUSE OF REPRESENTATIVES, ONE EACH APPOINTED BY THE SPEAKER OF THE HOUSE OF REPRESENTATIVES AND THE MINORITY LEADER OF THE HOUSE OF REPRESENTATIVES;

(b) TWO MEMBERS OF THE SENATE, ONE EACH APPOINTED BY THE PRESIDENT OF THE SENATE AND THE MINORITY LEADER OF THE SENATE; AND

(c) THE EXECUTIVE DIRECTOR OF THE DEPARTMENT OF PUBLIC SAFETY CREATED IN SECTION 24-33.5-103 (1), C.R.S., OR HIS OR HER DESIGNEE.

(2) THE COMMISSION SHALL SELECT A CHAIR FROM AMONG ITS MEMBERS. THE COMMISSION SHALL MEET AT SUCH TIME AND SUCH PLACE AS DESIGNATED BY THE CHAIR; EXCEPT THAT THE FIRST MEETING OF THE COMMISSION SHALL TAKE PLACE NOT LATER THAN JULY 1, 2012. A

MAJORITY OF THE MEMBERS OF THE COMMISSION CONSTITUTE A QUORUM.

(3) MEMBERS OF THE COMMISSION SHALL RECEIVE NO COMPENSATION FOR SERVING ON THE COMMISSION; EXCEPT THAT COMMISSION MEMBERS ARE ENTITLED TO REIMBURSEMENT FOR THEIR ACTUAL AND NECESSARY EXPENSES INCURRED IN THE PERFORMANCE OF THEIR OFFICIAL DUTIES. IN THE CASE OF THE LEGISLATIVE MEMBERS OF THE COMMISSION, IN CONNECTION WITH THEIR NECESSARY ATTENDANCE AT MEETINGS OF THE COMMISSION, SUCH MEMBERS ARE ENTITLED TO RECEIVE THE AMOUNT SPECIFIED IN SECTION 2-2-307 (3) (a) (I) FOR NECESSARY ATTENDANCE AT A MEETING OF AN INTERIM COMMITTEE.

(4) SUBJECT TO THE PROVISIONS OF PART 4 OF ARTICLE 6 OF TITLE 24, C.R.S., MEETINGS OF THE COMMISSION ARE PUBLIC MEETINGS.

(5) ANY STAFF ASSISTANCE REQUIRED BY THE COMMISSION SHALL BE PERFORMED BY EXISTING EMPLOYEES OF THE LEGISLATIVE STAFF AGENCIES OF THE GENERAL ASSEMBLY OR THE DEPARTMENT OF PUBLIC SAFETY WITHIN EXISTING APPROPRIATIONS.

2-2-1703. Investigation of causes of wildfire - recommendations for legislative or other action - report to general assembly. (1) DURING THE 2012 LEGISLATIVE INTERIM THE COMMISSION SHALL INVESTIGATE, REPORT ITS FINDINGS, AND MAKE RECOMMENDATIONS FOR LEGISLATIVE OR OTHER ACTION ON ALL MATTERS RELATING TO THE WILDFIRE, INCLUDING, WITHOUT LIMITATION, CAUSES OF THE WILDFIRE, THE IMPACT ON THE AFFECTED COMMUNITY CAUSED BY THE WILDFIRE, THE LOSS OF LIFE AND FINANCIAL DEVASTATION INCURRED BY THE COMMUNITY, THE LOSS OF CONFIDENCE BY THE COMMUNITY IN THE RESPONSE TO THE EMERGENCY BY GOVERNMENTAL BODIES AT ALL LEVELS, AND MEASURES TO PREVENT THE OCCURRENCE OF A SIMILAR TRAGEDY. IN CONNECTION WITH THIS DUTY, THE COMMISSION SHALL SOLICIT AND ACCEPT REPORTS AND TAKE TESTIMONY AT ONE OR MORE PUBLIC HEARINGS HELD FOR SUCH PURPOSES. THE COMMISSION MAY SOLICIT OTHER SOURCES, INCLUDING, WITHOUT LIMITATION, REPRESENTATIVES FROM STATE AND LOCAL GOVERNMENTS AND ORGANIZATIONS OF CITIZENS, TO PROVIDE TESTIMONY, WRITTEN COMMENTS, AND OTHER RELEVANT INFORMATION.

(2) NOT LATER THAN DECEMBER 31, 2012, THE COMMISSION SHALL SUBMIT A WRITTEN REPORT OF ITS FINDINGS AND ANY RECOMMENDATIONS

MADE PURSUANT TO THIS SECTION FOR LEGISLATIVE OR OTHER ACTION TO THE JUDICIARY AND LOCAL GOVERNMENT COMMITTEES OF THE SENATE AND THE HOUSE OF REPRESENTATIVES. UPON THE REQUEST OF ANY MEMBER OF THE COMMISSION, SUMMARIES OF DISSENTING OPINIONS SHALL BE PREPARED AND ATTACHED TO THE FINAL REPORT OF THE COMMISSION'S FINDINGS AND RECOMMENDATIONS. THE FINAL REPORT REQUIRED BY THIS SUBSECTION (2) IS SUBJECT TO THE REQUIREMENTS OF SECTION 24-1-136 (9), C.R.S.

2-2-1704. Repeal of part. THIS PART 17 IS REPEALED, EFFECTIVE JULY 1, 2014.

SECTION 2. Safety clause. The general assembly hereby finds,

determines, and declares that this act is necessary for the immediate preservation of the public peace, health, and safety.

_____	_____
Frank McNulty	Brandon C. Shaffer
SPEAKER OF THE HOUSE	PRESIDENT OF
OF REPRESENTATIVES	THE SENATE
_____	_____
Marilyn Eddins	Cindi L. Markwell
CHIEF CLERK OF THE HOUSE	SECRETARY OF
OF REPRESENTATIVES	THE SENATE

APPROVED_____

_____
John W. Hickenlooper
GOVERNOR OF THE STATE OF COLORADO

NOTE: The governor signed this measure on 6/4/2012.

An Act

HOUSE BILL 12-1361

BY REPRESENTATIVE(S) Gardner B. and Gerou, Barker, Casso, Ferrandino, Fischer, Hamner, Hullinghorst, Kagan, Kefalas, Kerr A., Kerr J., Looper, Pabon, Pace, Peniston, Priola, Scott, Solano, Summers, Todd, Williams A., Young;
also SENATOR(S) Cadman and Nicholson, Neville, Boyd, Heath, Jahn, Lambert, Lundberg, Morse, Newell, Schwartz.

CONCERNING CLAIMS AGAINST THE STATE ARISING UNDER THE "COLORADO GOVERNMENTAL IMMUNITY ACT".

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. In Colorado Revised Statutes, 24-10-103, **amend** (1); and **add** (1.3), (3.5), and (7) as follows:

24-10-103. Definitions. As used in this article, unless the context otherwise requires:

(1) ~~"Dangerous condition" means a physical condition of a facility or the use thereof that constitutes an unreasonable risk to the health or safety of the public, which is known to exist or which in the exercise of reasonable care should have been known to exist and which condition is proximately caused by the negligent act or omission of the public entity or~~

Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

~~public employee in constructing or maintaining such facility. For the purposes of this subsection (1), a dangerous condition should have been known to exist if it is established that the condition had existed for such a period and was of such a nature that, in the exercise of reasonable care, such condition and its dangerous character should have been discovered. A dangerous condition shall not exist solely because the design of any facility is inadequate. The mere existence of wind, water, snow, ice, or temperature shall not, by itself, constitute a dangerous condition~~ "CONTROLLED AGRICULTURAL BURN" MEANS A TECHNIQUE USED IN FARMING TO CLEAR THE LAND OF ANY EXISTING CROP RESIDUE, KILL WEEDS AND WEED SEEDS, OR TO REDUCE FUEL BUILDUP AND DECREASE THE LIKELIHOOD OF A FUTURE FIRE.

(1.3) "DANGEROUS CONDITION" MEANS EITHER A PHYSICAL CONDITION OF A FACILITY OR THE USE THEREOF THAT CONSTITUTES AN UNREASONABLE RISK TO THE HEALTH OR SAFETY OF THE PUBLIC, WHICH IS KNOWN TO EXIST OR WHICH IN THE EXERCISE OF REASONABLE CARE SHOULD HAVE BEEN KNOWN TO EXIST AND WHICH CONDITION IS PROXIMATELY CAUSED BY THE NEGLIGENT ACT OR OMISSION OF THE PUBLIC ENTITY OR PUBLIC EMPLOYEE IN CONSTRUCTING OR MAINTAINING SUCH FACILITY. FOR THE PURPOSES OF THIS SUBSECTION (1.3), A DANGEROUS CONDITION SHOULD HAVE BEEN KNOWN TO EXIST IF IT IS ESTABLISHED THAT THE CONDITION HAD EXISTED FOR SUCH A PERIOD AND WAS OF SUCH A NATURE THAT, IN THE EXERCISE OF REASONABLE CARE, SUCH CONDITION AND ITS DANGEROUS CHARACTER SHOULD HAVE BEEN DISCOVERED. A DANGEROUS CONDITION SHALL NOT EXIST SOLELY BECAUSE THE DESIGN OF ANY FACILITY IS INADEQUATE. THE MERE EXISTENCE OF WIND, WATER, SNOW, ICE, OR TEMPERATURE SHALL NOT, BY ITSELF, CONSTITUTE A DANGEROUS CONDITION.

(3.5) "PRESCRIBED FIRE" MEANS THE APPLICATION OF FIRE IN ACCORDANCE WITH A WRITTEN PRESCRIPTION FOR VEGETATIVE FUELS AND EXCLUDES A CONTROLLED AGRICULTURAL BURN.

(7) "STATE" MEANS THE GOVERNMENT OF THE STATE; EVERY EXECUTIVE DEPARTMENT, BOARD, COMMISSION, COMMITTEE, BUREAU, AND OFFICE; AND EVERY STATE INSTITUTION OF HIGHER EDUCATION, WHETHER ESTABLISHED BY THE STATE CONSTITUTION OR BY LAW, AND EVERY GOVERNING BOARD THEREOF. "STATE" DOES NOT INCLUDE THE JUDICIAL DEPARTMENT, A COUNTY, MUNICIPALITY, CITY AND COUNTY, SCHOOL DISTRICT, SPECIAL DISTRICT, OR ANY OTHER KIND OF DISTRICT,

INSTRUMENTALITY, POLITICAL SUBDIVISION, OR PUBLIC CORPORATION ORGANIZED PURSUANT TO LAW.

SECTION 2. In Colorado Revised Statutes, **add** 24-10-106.1 as follows:

24-10-106.1. Immunity and partial waiver - claims against the state - injuries from prescribed fire - on or after January 1, 2012. (1) NOTWITHSTANDING ANY OTHER PROVISION OF THIS ARTICLE, THE STATE SHALL BE IMMUNE FROM LIABILITY IN ALL CLAIMS FOR INJURY THAT LIE IN TORT OR COULD LIE IN TORT REGARDLESS OF WHETHER THAT MAY BE THE TYPE OF ACTION OR THE FORM OF RELIEF CHOSEN BY THE CLAIMANT EXCEPT AS PROVIDED OTHERWISE IN THIS SECTION OR SECTION 24-10-106. IN ADDITION TO ANY OTHER CLAIMS FOR WHICH THE STATE WAIVES IMMUNITY UNDER THIS ARTICLE, SOVEREIGN IMMUNITY IS WAIVED BY THE STATE IN AN ACTION FOR INJURIES RESULTING FROM A PRESCRIBED FIRE STARTED OR MAINTAINED BY THE STATE OR ANY OF ITS EMPLOYEES ON OR AFTER JANUARY 1, 2012.

(2) NOTHING IN THIS SECTION SHALL BE CONSTRUED TO CONSTITUTE A WAIVER OF SOVEREIGN IMMUNITY IF THE INJURY ARISES FROM ANY ACT, OR FAILURE TO ACT, OF A STATE EMPLOYEE IF THE ACT IS THE TYPE OF ACT FOR WHICH THE STATE EMPLOYEE WOULD BE OR HERETOFORE HAS BEEN PERSONALLY IMMUNE FROM LIABILITY.

(3) IN ADDITION TO THE IMMUNITY PROVIDED UNDER SUBSECTION (1) OF THIS SECTION, THE STATE SHALL ALSO HAVE THE SAME IMMUNITY AS A STATE EMPLOYEE FOR ANY ACT OR FAILURE TO ACT FOR WHICH A STATE EMPLOYEE WOULD BE OR HERETOFORE HAS BEEN PERSONALLY IMMUNE FROM LIABILITY.

(4) NO RULE OF LAW IMPOSING ABSOLUTE OR STRICT LIABILITY SHALL BE APPLIED IN ANY ACTION AGAINST THE STATE FOR AN INJURY RESULTING FROM A PRESCRIBED FIRE STARTED OR MAINTAINED BY THE STATE OR ANY OF ITS EMPLOYEES. NO LIABILITY SHALL BE IMPOSED IN ANY SUCH ACTION UNLESS NEGLIGENCE IS PROVEN.

SECTION 3. In Colorado Revised Statutes, 24-10-114, **amend** (5) as follows:

24-10-114. Limitations on judgments - recommendation to general assembly - authorization of additional payment. (5) Notwithstanding the maximum amounts that may be recovered from a public entity set forth in subsection (1) of this section, ~~a judgment or judgments may be claimed and rendered against the state~~ AN AMOUNT MAY BE RECOVERED FROM THE STATE UNDER THIS ARTICLE in excess of the maximum amounts only if PARAGRAPH (a) OR (b) OF THIS SUBSECTION (5) APPLIES:

(a) The general assembly acting by bill authorizes payment of all or a portion of ~~the~~ ANY judgment ~~which~~ AGAINST THE STATE THAT exceeds the maximum amount. Any claimant may present proof of judgment to the general assembly and request payment of that portion of the judgment which exceeds the maximum amount. Any portion of a judgment approved for payment by the general assembly shall be paid from the general fund.

(b) THE STATE CLAIMS BOARD CREATED IN SECTION 24-30-1508 (1), ACTING IN ACCORDANCE WITH ITS AUTHORITY UNDER SECTION 24-30-1515, COMPROMISES OR SETTLES A CLAIM ON BEHALF OF THE STATE FOR THE MAXIMUM LIABILITY LIMITS UNDER THIS ARTICLE AND DETERMINES, IN ITS SOLE DISCRETION, TO RECOMMEND TO THE GENERAL ASSEMBLY THAT THE GENERAL ASSEMBLY, BY BILL, AUTHORIZE ALL OR ANY PORTION OF AN ADDITIONAL PAYMENT. IN DETERMINING WHETHER TO MAKE SUCH RECOMMENDATION, THE CLAIMS BOARD SHALL CONSIDER INTERESTS OF FAIRNESS, THE PUBLIC INTEREST, AND THE INTERESTS OF THE STATE. A RECOMMENDATION MADE UNDER THIS PARAGRAPH (b) SHALL NOT INCLUDE PAYMENT FOR NONECONOMIC LOSS OR INJURY AND SHALL BE REDUCED TO THE EXTENT THE CLAIMANT'S LOSS IS OR WILL BE COVERED BY ANOTHER SOURCE, INCLUDING, WITHOUT LIMITATION, ANY INSURANCE PROCEEDS THAT HAVE BEEN PAID OR WILL BE PAID, AND NO INSURER SHALL HAVE A RIGHT OF SUBROGATION, ASSIGNMENT, OR ANY OTHER RIGHT AGAINST THE CLAIMANT OR THE STATE FOR ANY ADDITIONAL PAYMENT OR ANY PORTION OF SUCH PAYMENT THAT IS APPROVED BY THE GENERAL ASSEMBLY. ANY ADDITIONAL PAYMENT OR ANY PORTION OF SUCH PAYMENT APPROVED BY THE GENERAL ASSEMBLY SHALL BE PAID FROM THE GENERAL FUND.

SECTION 4. In Colorado Revised Statutes, 24-30-1509, **add** (1) (d) as follows:

24-30-1509. Powers and duties of the board. (1) The board shall

have the following powers and duties:

(d) TO DETERMINE WHETHER TO RECOMMEND TO THE GENERAL ASSEMBLY THAT THE GENERAL ASSEMBLY, BY BILL, AUTHORIZE ALL OR ANY PORTION OF AN ADDITIONAL PAYMENT TO A CLAIMANT IN ACCORDANCE WITH THE PROVISIONS OF SECTION 24-10-114 (5) (b).

SECTION 5. Applicability. The provisions of this act apply to claims asserted against the state on or after January 1, 2012.

SECTION 6. Safety clause. The general assembly hereby finds, determines, and declares that this act is necessary for the immediate preservation of the public peace, health, and safety.

Frank McNulty SPEAKER OF THE HOUSE OF REPRESENTATIVES	Brandon C. Shaffer PRESIDENT OF THE SENATE
Marilyn Eddins CHIEF CLERK OF THE HOUSE OF REPRESENTATIVES	Cindi L. Markwell SECRETARY OF THE SENATE

APPROVED_____

John W. Hickenlooper
GOVERNOR OF THE STATE OF COLORADO

JOHN W. SUTHERS
Attorney General

CYNTHIA H. COFFMAN
Chief Deputy Attorney General

DANIEL D. DOMENICO
Solicitor General

STATE OF COLORADO
DEPARTMENT OF LAW

OFFICE OF THE ATTORNEY GENERAL

STATE SERVICES BUILDING
1525 Sherman Street - 7th Floor
Denver, Colorado 80203
Phone (303) 866-4500

May 1, 2012

MEMORANDUM

TO: John W. Suthers, Attorney General; Daniel D. Domenico, Solicitor General; David C. Blake, Deputy Attorney General

FROM: Frederick R. Yarger
Assistant Solicitor General

RE: House Bill 12-1352: Potential Constitutional Issue Under Colo. Const. Art. V, Sec. 25, Prohibiting Special Legislation

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Executive Summary

The General Assembly is currently considering House Bill 12-1352, which would create a legislative commission to investigate the causes of the Lower North Fork Wildfire and to hear claims of individuals who suffered "injury to person or property or loss of life asserted against the state arising out of the wildfire." HB 12-1352, § 2-2-1705. This commission, after considering each claim against the state arising out of the fire, would be required to submit a report to the Joint Budget Committee that contains "a plan for the payment of claims." *Id.* § 2-2-1706(2)–(6). The Joint Budget Committee would then, "subject to available appropriations" and subject to modification of the plan, refer the plan to the General Assembly for authorization to pay compensation to the claimants. *Id.* § 2-2-1706(6)–(7).

Because HB 12-1352 applies only to victims of the Lower North Fork Wildfire and by its terms cannot possibly be applied to any other class of individuals, there is a significant risk that the bill violates Article V, Section 25 of the Colorado Constitution. That constitutional provision prohibits the General Assembly from passing a law "granting to any . . . individual any special or exclusive privilege, immunity, or franchise whatever," and commands that "where a general law can be made applicable no special law shall be enacted." Case law explains that this provision "bars laws targeted at specific parties and incapable of more general application." *Vitetta v. Corrigan*, 240 P.3d 322, 328 (Colo. App. 2009).

Several passages in HB 12-1352 make clear that the bill is intended to benefit only a specific class of individuals. Most significantly, the commission created by the bill is granted jurisdiction

only over claims arising out of the Lower North Fork Fire, and that jurisdiction "does not extend to *any other claim*." HB 12-1352, § 2-2-1705 (emphasis added). Because the bill is "logically and factually restricted," *People v. Canister*, 110 P.3d 380, 385 (Colo. 2005), and applies only to those individuals affected by the Lower North Fork Fire, it presents a significant risk of violating Article V, Section 25 of the Colorado Constitution.[1]

Analysis

The ban on "special legislation" articulated in Article V, Section 25 of the Colorado Constitution was "intended to curb favoritism on the part of the General Assembly, prevent the state government from interfering with local affairs, and preclude the legislature from passing unnecessary laws to fit limited circumstances." *Canister*, 110 P.3d at 382–83. To this end, it "creates a strong preference for the enactment of general legislation" and, "[m]ost importantly, the provision acts as a limitation on the power of the legislature." *Id.* at 383.

So, for example, the Colorado Supreme Court, applying Section 25, struck down a law that was drafted specifically to allow the annexation of the Town of Glendale into the City of Denver. *In re Senate Bill No. 95*, 361 P.2d 350 (Colo. 1961). In that case, there already was "a general law presently in force dealing with the subject of annexation of towns." *Id.* at 353. But the General Assembly attempted to make an exception to this generally-applicable law that was "unquestionably conceived, cut, tailored and amended to accomplish a particular purpose with reference to a particular area." *Id.* at 354. The Court held that "[t]he limitations upon the power entrusted to those in positions of authority" could not be "brushed aside" in those circumstances. *Id.*

In another case, the Colorado Supreme Court invalidated a statutory provision that the General Assembly enacted in response to a decision by the United States Supreme Court. The offending provision established death penalty sentencing procedures that could only have applied to two criminal defendants. *Canister*, 110 P.3d 380. Although other portions of the law were prospective, were generally applicable, and presumptively complied with Section 25, the portions governing procedures for the two targeted individuals created "a class that is drawn so that it will never have any members other than those targeted by the legislation," and it was therefore "unconstitutional special legislation." *Id.* at 384.

In other cases, where laws are upheld against Section 25 challenges, there is at least "the *potential* for broader applicability." *Vitetta*, 240 P.3d at 328 (emphasis in original). Although the General Assembly may pass legislation in response to a specific dispute or circumstance, the

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[1] In addition to establishing a claims resolution process for the victims of the Lower North Fork Fire, House Bill 12-1352 also requires the commission to "make recommendations for legislative or other action on *all matters relating to causes of the wildfire*," including "measures to prevent the occurrence of a similar tragedy," HB 12-1352, § 2-2-1704(1) (emphasis added). In this respect, the bill does not appear to violate Article V, Section 25. This particular function of the commission is designed to inform the General Assembly of facts relevant to its policy-making duties, and those facts may be used to draft generally-applicable legislation.

legislation may not be "impermissibly singular in its application." *City of Greenwood Vill. v. Pet'rs for Proposed City of Centennial*, 3 P.3d 427, 444 (Colo. 2000). Therefore, to "pass[] constitutional muster under Article V, Section 25," a law must be "generic in its application," it must be "applicable to other foreseeable situations," and it must "not deal with a class of one." *Id.* at 442.

So, for example, a law designed to promote business development and improve the statewide aviation system, which was drafted specifically to attract United Airlines to build and operate a maintenance facility in Colorado, was not "special legislation." *In re House Bill 91S-1005*, 814 P.2d 875 (Colo. 1991). The Colorado Supreme Court held that because "we cannot say . . . that no entity other than United Airlines will *ever* meet the statutory criteria" the law did not violate Section 25. *Id.* at 887 (emphasis added). Similarly, the Colorado Court of Appeals upheld a law that allowed medical malpractice plaintiffs, who were minors, to take a lump sum rather than periodic damages payments. The court concluded that "by covering all minor and incapacitated persons who receive large medical malpractice verdicts, it plainly has general future applicability." *Vitetta*, 240 P.3d at 328.

In contrast to these valid laws, House Bill 12-1352 is "logically and factually limited" to only those individuals affected by the Lower North Fork Fire. It contains numerous provisions that limit its applicability to only those individuals:

- The legislative declaration explicitly states that the bill would apply only to the Lower North Fork Wildfire and individuals affected by it, describing the fire by location and date: "In March 2012, a controlled burn conducted by the Colorado State Forest Service in the Lower North Fork Area of Jefferson County, Colorado, resulted in a wildfire on March 26, 2012 . . . ." HB 12-1352, § 2-2-1701(1)(a).

- The legislative declaration further states that the committee would be formed specifically to hear claims from those who were injured by the Lower North Fork Wildfire, and only those individuals: "it is appropriate that a mechanism be created whereby timely evaluation may be made of potential claims against the state for injury to persons or property or loss of life arising out of *the wildfire*." *Id.* § 2-2-1701(1)(b) (emphasis added).

- The bill also acknowledges that it was drafted to address a unique situation, a single event, and a single class of individuals: "[t]he wildfire presents a *unique situation requiring special consideration*." *Id.* § 2-2-1701(1)(c) (emphasis added).

- The commission's formal title, the "Lower North Fork Wildfire Commission," reflects its narrow aim. *Id.* § 2-2-1703.

- The jurisdiction of the commission to hear claims for reimbursement is limited to "claims for injury to person or property or loss of life asserted against the state

> arising out of *the wildfire*" and "does not extend to *any other claim*." *Id.* § 2-2-1705 (emphasis added).

Moreover, the bill creates a special procedure for victims of the Lower North Fork Fire, despite the fact that there already is a general law in place—the Colorado Governmental Immunity Act—that defines the rules under which claimants may attempt seek relief from the state. *Cf. In re Senate Bill No. 95*, 361 P.2d at 353 (the fact that a general law was already in effect implied that the special legislation at issue was invalid). House Bill 12-1352 states that "it is not at all clear that [the Colorado Governmental Immunity Act] would permit claims for injury to persons or property or loss of life asserted against the state arising from the wildfire." HB 12-1352 § 12-2-1701(1)(b). Yet the Colorado Governmental Immunity has been in place for over forty years, despite the fact that governmental immunity "is, in some instances, an inequitable doctrine." C.R.S. § 24-10-102. This potential inequity does not relieve House Bill 12-1352 of the requirements of Article V, Section 25 of the Colorado Constitution.

In light of the language of Section 25 and the case law interpreting it, House Bill 12-1352, on its face, presents a significant risk of violating Article V, Section 25 of the Colorado Constitution.

Colorado
Legislative
Council
Staff

Room 029 State Capitol, Denver, CO 80203-1784
(303) 866-3521 FAX: 866-3855 TDD: 866-3472

MEMORANDUM

Pursuant to section 24-72-202(6.5)(b), research memoranda and other final products of Legislative Council Staff research that are not related to proposed or pending legislation are considered public records and are subject to public inspection. If you think additional research is required and this memorandum is not a final product, please call the Legislative Council Librarian at (303) 866-4011 by July 6, 2012.

June 29, 2012

TO: Members of the Lower North Fork Wildfire Commission

FROM: Raegan Robb, Senior Researcher, 303-866-4364

SUBJECT: Legislation Concerning Forest Health and Wildfire Preparedness Considered by the Colorado General Assembly from 2005 to 2012

This memorandum provides an eight-year history of legislation concerning forest health and wildfire preparedness considered by the Colorado General Assembly from 2005 to 2012. During this time, the General Assembly passed 25 bills and adopted 8 resolutions related to various forest health and wildfire preparedness issues in the state. Five bills were postponed indefinitely. Table 1 summarizes this legislation and identifies those bills which were signed into law or postponed indefinitely for each year. The table also identifies the resolutions that were adopted for each year.

Table 1
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2012 Legislation (Enacted)	
Bill Number: House Bill 12-1283	**Short Title:** Consolidate Homeland Security Functions Under CDPS
Sponsors: *Rep. Barker* *Sen. Giron*	**Status:** Signed into Law
The act consolidates Colorado's homeland security functions, personnel, and resources, into a new Division of Homeland Security and Emergency Management (DHSEM) within the Department of Public Safety (DPS). The new division includes the existing, but renamed Office of Prevention and Security; the newly created Office of Preparedness; and emergency management functions transferred by the Department of Local Affairs. A new 21-member Homeland Security and All-Hazards Senior Advisory Committee is created to guide the division's efforts, provide advice, and review homeland security grant applications. The act also reestablishes the Office of Fire Safety as the Division of Fire Safety within DPS, which transfers the wildfire-related powers and duties of the state forester within Colorado State University into the new division. DPS is authorized to accept and expend gifts, grants, and donations to fund emergency responses to wildfires from the existing Emergency Fire Fund. The act also adds two members to the Fire Service Training and Certification Advisory Board, restoring it to its original composition.	**Appropriations:** The act requires several appropriations and transfers from the Departments of Local Affairs, Public Health and Environment, and Public Safety; Colorado State University; and the Governor's Office. However, despite the multiple budget adjustments and transfers, there is no net change to the FY 2012-13 appropriations for the new DHSEM and the Division of Fire Safety.
Bill Number: House Bill 12-1285	**Short Title:** Intergovernmental Cooperation Wildland Fire Mitigation
Sponsors: *Rep. Gerou* *Sen. Jahn*	**Status:** Signed into Law
The act requires a municipality that owns land inside a county for utility purposes to enter into an intergovernmental agreement (IGA). The act requires a municipality to either enter into an IGA with the county or the state forester by July 1, 2012, to mitigate forest land or wildland fires affecting the contiguous land areas. The act also clarifies that municipal property used for utility purposes is reasonably related to providing electric, natural gas, water, wastewater, and telecommunication services.	**Appropriations:** No new state appropriations are required in FY 2012-13. However, the act will create administrative costs for local governments where an IGA must be established. The state could incur costs for forest and wildland mitigation efforts for utility easements on lands owned by the Division of Parks and Wildlife and the State Land Board in the Department of Natural Resources.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2012 Legislation (Enacted)	
Bill Number: House Bill 12-1352	**Short Title:** Lower North Fork Wildfire Commission
Sponsors: *Reps. Gardner and Gerou* *Sen. Cadman*	**Status:** Signed into Law
The act creates the five-member Lower North Fork Wildfire Commission, comprised of two Senators, two Representatives, and the executive director of DPS. The commission is charged with investigating the causes of the 2012 Lower North Fork Wildfire and recommending legislative or other action that would prevent a similar occurrence. Specifically, the commission must meet to organize, investigate the causes and impacts of the wildfire, hold at least one public hearing during the 2012 interim, and prepare a report for the General Assembly on any findings, policy recommendations, or compensatory recommendations.	**Appropriations:** No new state appropriations are required in FY 2012-13 since the commission was prioritized by the Legislative Council and included as part of the Legislative Branch budget for FY 2012-13.
2012 Legislation (Postponed Indefinitely)	
Bill Number: House Bill 12-1004	**Short Title:** Colorado Timber Act
Sponsors: *Rep. Bradford* *Sen. King S.*	**Status:** Postponed Indefinitely
The bill, which was postponed indefinitely by the House Agriculture, Livestock and Natural Resources Committee, would have required county and municipal building codes to allow and encourage the use of lumber milled from lodgepole pine or Engelmann spruce trees having a grade of "stud" or better for the framing of buildings. The bill declared that lumber from these trees cannot be used in Colorado, but is shipped for sale outside of the state due, in part, because it is prohibited by local building codes. These types of trees have been particularly damaged by the bark beetle infestation, but the bill claimed that using lumber that had been damaged by beetles but that is still structurally sound for building in Colorado would benefit the state.	**Appropriations:** No new state appropriations were required in FY 2012-13.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2011 Legislation (Enacted)	
Bill Number: Senate Bill 11-110 **Sponsors:** *Sen. Nicholson* *Rep. Coram*	**Short Title:** County Open Burning Slash Permit Program **Status:** Signed into Law
The act required counties with substantial forested area to develop an open burning permit system for unincorporated areas of the county that addressed the disposal of slash. Specifically, the act required affected county governments to collaborate with local jurisdictions, sheriffs, and other agencies to develop an education plan concerning slash pile burning. Counties developing a permit system must consider existing laws and scientific and applied knowledge of safe burning conditions, and include mechanisms to notify neighbors and individuals with respiratory conditions of permitted burns. Counties with an existing open burning permit system were exempt from the requirements of the act until the board of county commissioners altered the existing permit system. The act also exempted prescribed burns that follow federal and state guidelines and preserved the existing rights of agricultural producers to conduct open burning on their private property.	**Appropriations:** No new state appropriations were required in FY 2011-12 or FY 2012-13.
Bill Number: Senate Bill 11-238 **Sponsors:** *Sen. Nicholson* *Reps. Coram and Wilson*	**Short Title:** Extend Wildfire Preparedness Funding **Status:** Signed into Law
The act extended the annual $3.25 million transfer to the Wildfire Preparedness Fund of federal mineral leasing revenue by the Department of Local Affairs from the Local Government Impact Fund, for two years beginning on July 1, 2012. The Wildlife Preparedness Fund was created in 2006 by Senate Bill 06-096, which required funding to be transferred through FY 2010-11. The funding was used by the State Forest Service for wildfire preparedness activities including funding for firefighting resources, agreements, and plans. The act also required the State Forest Service to annually report on the use of these revenues to the Department of Local Affairs, the Office of State Planning and Budgeting, and the General Assembly.	**Appropriations:** The act required $3.25 million to be transferred for FY 2012-13 and FY 2013-14, for a cumulative total of $6.5 million from the Local Government Impact Fund, administered by the Department of Local Affairs, to the Wildfire Preparedness Fund, administered by the State Forest Service.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2011 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 11-267 **Sponsors:** *Sen. Schwartz* *Reps. Coram and Hamner*	**Short Title:** Forest Health Act Of 2011 **Status:** Signed into Law
The act created a 14-member work group to identify market-based models for forest management, including: • methods to promote biomass to reduce insect infestation; • air quality improvement using biomass as a fuel mitigation strategy; and • funding sources for the development of biomass. The working group was also charged to identify ways to improve information concerning the use of biomass for energy and other land management issues, including the use of federal initiatives, and examine ways to generate power using locally produced biomass at public facilities. The group was required to report initial findings to certain legislative committees by November 1, 2011, and final findings, which include specific legislative recommendations, by January 1, 2012. The act also required the State Board of Land Commissioners to direct the State Forest Service on the appropriate use of pine beetle infested timber and otherwise declining forest area when it contracts with the service. Finally, it encouraged the Public Utilities Commission to explore all aspects of biomass energy production, as well as assist the working group.	**Appropriations:** No new state appropriations were required in FY 2012-13, but expenditures could be incurred by state agencies supporting the work group. Funds for the work group must be derived from gifts, grants, and donations, and will be credited to the Healthy Forests and Vibrant Communities Fund. Any costs not paid from gifts, grants, and donations require another funding source.
Bill Number: House Bill 11-1317 **Sponsors:** *Rep. Gerou* *Sens. Foster and Roberts*	**Short Title:** Intergovernmental Cooperation Wildland Fire Mitigation **Status:** Signed into Law
The act extended to July 1, 2012, the deadline for a county or municipality that owns any land area located either entirely or partially inside the boundaries of another county with at least 50 percent forest land (or land that constitutes a wildland area) to enter into an intergovernmental agreement (IGA).	**Appropriations:** No new state appropriations were required in FY 2012-13.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness
from 2005 to 2012

2010 Legislation (Enacted)	
Bill Number: Senate Bill 10-102	**Short Title:** State Forester Prescribed Fire Certification Standard
Sponsors: *Sen. Gibbs* *Rep. Fischer*	**Status:** Signed into Law
The act required the state forester to establish standards for training and certification for anyone who uses prescribed fires. Specifically, the act required the state forester to develop training criteria, identify best practices for prescribed fires, and establish the parameters of certified and noncertified burner designations. The certification standards were required to include the following: • a certified and noncertified burner designation; • requirements, processes, and procedures for certified burners to follow when conducting a prescribed fire; and • recommended organizational structures for prescribed fire operations.	**Appropriations:** No new state appropriations were required in FY 2011-12.
Bill Number: House Bill 10-1095	**Short Title:** Fire Protection District Accident Fees
Sponsors: *Rep. Gerou* *Sen. Kopp*	**Status:** Signed into Law
This act clarified that a fire protection district can only charge for rescue or extraction services provided at the scene of a motor vehicle accident.	**Appropriations:** No new state appropriations were required in FY 2011-12.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness
from 2005 to 2012

2010 Legislation (Adopted)	
Bill Number: House Joint Resolution 10-1024	**Short Title:** Bark Beetle Wood Industry Incentives
Sponsors: *Rep. Scanlan* *Sen. Gibbs*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning the Colorado bark beetle epidemic: • to support the efforts of all collaboratives to work with public and private interests to seek ways to responsibly balance the need to protect the environment from further encroachment by the bark beetle and to increase Colorado's "rural wealth" through increased capital investment, jobs creation, and economic diversity; • encourage local governments to create incentives and develop markets for timber and other biomass that will help reduce fire fuels and remove dead trees, which will protect natural resource values, communities, lives, and property; and • encourage industries to establish operations in local communities in Colorado where they can process timber and biomass at a much lower cost than if the wood were shipped to existing facilities.	**Appropriations:** Not applicable

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted)	
Bill Number: Senate Bill 09-001	**Short Title:** Community Wildfire Protection Plans
Sponsors: *Reps. King and Scanlan* *Sens. Gibbs and Penry*	**Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act required the state forester, in collaboration with representatives of the U.S. Forest Service, the Colorado Department of Natural Resources, county governments, municipal governments, local fire departments or fire protection districts, electric, gas, and water utility providers in the subject area, and state and local law enforcement agencies, to establish guidelines for Community Wildfire Protection Plans (CWPPs) by November 15, 2009. CWPPs are plans to identify and mitigate fire hazards that are developed with input from state, local, federal government bodies, and other interested parties. The act required the state forester to establish guidelines and criteria counties must consider when developing their own CWPPs. The act also required each county, with the assistance of the state forester, to determine whether there are fire hazard areas within the unincorporated portion of the county by January 1, 2011. Counties were required to develop a CWPP within 180 days of identifying fire hazard areas.	**Appropriations:** No new state appropriations are required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-013	**Short Title:** Good Samaritan Law for Volunteer Firefighters
Sponsors: *Sen. Gibbs* *Rep. Levy*	**Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act provides limited civil immunity for fire departments or other entities that donate surplus firefighting equipment. The act also exempts volunteer firefighters and their volunteer organizations from civil liability resulting from any action taken or not taken during firefighting efforts or other emergency services, except in cases of gross negligence or willful or wanton acts or omissions. The act also provides that state, county, or municipal agency, and other local entities that are engaged in emergency or disaster planning, training, or response activities shall not be liable for the death of or injury to any person or loss of or damage to property, except in cases of gross negligence or willful or wanton acts or omissions. A person may sue and recover civil damages based upon the negligent operation of a motor vehicle, but damages shall be limited to the amount of insurance coverage maintained by the person or entity.	**Appropriations:** No state appropriations were required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-020	**Short Title:** Wild Land-Urban Fire Chain of Command
Sponsors: *Sen. Gibbs* *Rep. Scanlan*	**Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act, provided for a unified command structure for the management of wildland fires in the state and the primary responsibilities of local and state entities. The act also addressed the adoption of a county wildfire preparedness plan for the unincorporated area of the county and urges cooperation between the sheriff, the fire chiefs, and the board of county commissioners. Under the act, the first emergency response agency to arrive at the scene of a wildland fire, regardless of whether the incident occurs within its jurisdiction, must act as incident commander and be responsible for the initial emergency action necessary to control the wildland fire or to protect life or property until the emergency response agency that has jurisdiction over the incident site arrives. The act provided that fire department chiefs in each fire protection district in the state have the authority to supervise all fires within their district and the authority to utilize mutual aid agreements with neighboring districts to suppress and control fires that cross or threaten to cross the district boundaries. Under the act, county sheriffs are responsible for the planning and coordination of fire suppression efforts that occur in unincorporated areas of the county outside the boundaries of a fire protection district, or that exceed the capabilities of a fire protection district to control or extinguish.	**Appropriations:** No new state appropriations were required in FY 2009-10. However, the Governor's Emergency Fund, or other funds available to the State Forest Service, may be used for the purpose of preventing and suppressing forest and wildland fires in the state. Additionally, a board of county commissioners may make an appropriation for the purpose of controlling fires in its county and even levy a special property tax subject to approval of the voters to prevent, control, or extinguish such fires anywhere in the county. The act limited the amount raised from the levy to 1 mill or $500,000 per year, whichever is less.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-020 (Cont.)	**Short Title:** Wildland-Urban Fire Chain of Command
Sponsors: *Sen. Gibbs* *Rep. Scanlan*	**Status:** Signed into Law
The act allowed the authority of a fire chief to be transferred to the county sheriff to coordinate fire suppression efforts for any prairie, forest, or wild land fire that exceeds the capabilities of the district. A county sheriff must appoint a local incident management team to provide the command and control infrastructure to manage wildfires that exceed the capabilities of a fire protection district, and that require mutual aid and outside resources. The sheriff assumes financial responsibility on behalf of the county and a fire protection district for fire fighting efforts that require mutual aid and outside resources. In the case of a wildfire that exceeds the capability of the county, the sheriff is responsible for seeking the assistance from the State Forest Service through an agreement concerning the transfer of authority, responsibility for fire suppression, and the retention of responsibilities under a unified command structure. The act also addressed county wildfire preparedness plans and the ability for county voters to approve a special tax for the purpose of controlling wildfires within the county. The act provided that county sheriffs can develop and update a wildfire preparedness plan for the unincorporated area of the county in cooperation with any fire district with jurisdiction over such unincorporated area. A county sheriff can also request the State Forest Service to assist in the development or modification of a county wildfire preparedness plan.	

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness
from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-021 **Sponsors:** *Sen. Kopp* *Rep. Scanlan*	**Short Title:** Incentives For Volunteer Firefighters **Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act created the Volunteer Firefighter Tuition Voucher Fund to provide volunteer firefighters with college tuition vouchers up to three credits per academic year for attendance at a college within the state system of community and technical colleges or at a local community college. In order to be considered for a voucher, a volunteer firefighter must be a full- or part-time student, complete at least 36 hours of training each year, and agree to serve as a volunteer firefighter for at least 4 years after completing their education.	**Appropriations:** The Division of Fire Safety, Department of Public Safety (DPS), was authorized to seek gifts, grants, and donations for the volunteer firefighter voucher program and to issue vouchers. At the time, none had been identified. A voucher program of up to $100,000 would generate a workload in the DPS equivalent to 0.1 FTE to oversee the distribution of the tuition vouchers and to work with the community colleges to develop the grant program.
Bill Number: Senate Bill 09-105 **Sponsors:** *Sen. Gibbs* *Rep. Scanlan*	**Short Title:** Forest Health and Cost of Firefighting **Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. This act removed a statutory limit on the amount that a county can raise by a special property tax for the purpose of fighting both forest and prairie fires. The limit on the amount that may be raised was 1 mill or $500,000 per year, whichever is less. Under the act, voters could approve a higher tax rate.	**Appropriations:** No new state appropriations were required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: House Bill 09-1041 **Sponsors:** *Rep. Gerou* *Sen. Gibbs*	**Short Title:** Fire Protection District Board Authority **Status:** Signed into Law
The act allowed a fire protection district board to charge fees for certain emergency safety services provided when assisting emergency medical services. Under the act, fire protection districts were authorized to change a fee for the following services: • services provided prior to the arrival of an ambulance; • rescue or extrication of trapped or injured parties; and • lane safety or blocking provided by district equipment.	**Appropriations:** No new state appropriations were required in FY 2009-10.
Bill Number: House Bill 09-1162 **Sponsors:** *Rep. Gerou* *Sen. Kopp*	**Short Title:** Intergovernmental Cooperation For Wildfire Mitigation **Status:** Signed into Law
The act required an intergovernmental agreement (IGA) between a local government and a county to mitigate wildland fires in areas owned by the local government that are located either entirely or partially outside its own boundaries and inside the boundaries of a county. An IGA was required on or before July 1, 2011, for any local government that owns land inside the territorial boundaries of a county that is at least 50 percent forest land, or land that constitutes a wildland area. However, local governments are not required to enter into a new agreement if an existing agreement, including a mutual aid agreement, satisfies the requirements of the act and was in place when the act went into effect on August 4, 2009.	**Appropriations:** No new state appropriations were required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: House Bill 09-1162 (Cont.) **Sponsors:** *Rep. Gerou* *Sen. Kopp*	**Short Title:** Intergovernmental Cooperation For Wildfire Mitigation **Status:** Signed into Law
The act required an IGA to address the following issues: • the roles and responsibilities of each party to the agreement with respect to the mitigation of forest land and wildland fires; • procedures for cooperation and coordination among the parties; • management objectives for forest land and wildland fire prevention, preparedness, mitigation, suppression, reclamation, or rehabilitation and designation of the local government with fiscal and operational authority for each objective; • a description of available emergency or mutual aid resources; • specification of reimbursement and billing procedures; and • actions that may be taken by one party if another party to the agreement fails to satisfy its duties or responsibilities. Additionally, the act allowed the Division of Parks and Outdoor Recreation in the Department of Natural Resources and any other state agency to enter into a contract, intergovernmental agreement, or memorandum of understanding to allow fire mitigation on state property with personnel and equipment under the control of a fire department. The act defined "fire department" to include the duly authorized fire protection organization of a local government, a fire protection district, other special districts providing fire protection, and a not-for-profit, nongovernmental entity that is organized to provide firefighting services. Activities to be undertaken by a fire department may include prescribed burning as a component of wildfire mitigation and exercises to promote the training of firefighting personnel.	

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)

Bill Number: House Bill 09-1199

Short Title: Healthy Forests Vibrant Communities Act

Sponsors: *Rep. Scanlan*
Sen. Gibbs

Status: Signed into Law

Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas.

The act created the Colorado Healthy Forests and Vibrant Communities Act of 2009 and the Healthy Forests and Vibrant Communities Fund for the purposes of the act.

The act addressed the risk of wildfire in Colorado and the development of community wildfire protection plans (CWPPs) to bring together federal, state, and local interests, including nongovernmental entities, to address the risk of wildfire to life, property, and infrastructure in the state.

The act directed the Colorado State Forest Service to:

- ensure that communities and firefighters have sufficient resources, technical support, and training to adequately implement CWPPs for communities seeking to prepare, update, or implement a CWPP;
- support communities in reducing wildfire risks by implementing risk mitigation treatments that focus on protecting lives, homes, and essential community infrastructure, and by improving inventory and monitoring of forest conditions through the implementation of cost-sharing grants in the wildland-urban interface;
- support long-term ecological restoration to support the public water supply and high-quality wildlife habitats through the implementation and monitoring of Forest Restoration Pilot Program grants;
- support local business development and job creation by administering a revolving loan fund to support woody biomass utilization, marketing timber products, and supporting the increased use of woody biomass in bio-heating;

Appropriations:

The act transferred $1.95 million from the operational account of the Severance Tax Trust Fund to the Healthy Forests and Vibrant Communities Fund and $50,000 from the operational account to the Wildland-Urban Interface Training Fund for FY 2009-10 through FY 2011-12. The act also allowed the State Forest Service to use up to $1 million dollars annually from the Forest Restoration Pilot Program Cash Fund until July 1, 2012, to mitigate community wildfire risks.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: House Bill 09-1199 (Cont.) **Sponsors:** *Rep. Scanlan* *Sen. Gibbs*	**Short Title:** Healthy Forests Vibrant Communities Act **Status:** Signed into Law
• work with the Governor's Energy Office and the Air Quality Control Commission to support the appropriately increased use of woody biomass in bio-heating; and • issue a statewide request for proposals for the Wildfire Risk Mitigation Loan Program to assist businesses with loans to provide start-up capital for new facilities or equipment to harvest, remove, use, and market beetle-killed or other timber taken from private, federal, state, county, or municipal forest lands as part of a wildfire risk reduction or fuels mitigation treatment.	
2009 Legislation (Adopted)	
Bill Number: Senate Joint Resolution 09-015 **Sponsors:** *Sen. Gibbs* *Rep. Scanlan*	**Short Title:** Forest Health Stewardship Contracting **Status:** Adopted
The resolution provided the following directives from the General Assembly concerning stewardship contracting for forest health: • that the U.S. Forest Service (USFS) Regional Forester for the Rocky Mountain Region and the Bureau of Land Management (BLM) Colorado State Director collaborate with the Colorado State Forester and key stakeholders to identify and obtain the necessary funding to implement up to three long-term (ten-year) stewardship contracts in Colorado; • that these stewardship contracts address forest conditions in Colorado's Front Range, High Country, and Southwest regions in a way that emphasizes community protection, provides for improved forest resilience, and offers locally-based economic opportunities; and • that the Governor and Colorado's Congressional delegation work with the U.S. Department of Agriculture's (USDA) Undersecretary for Natural Resources and the Environment and the USFS Washington, D.C. office to facilitate the implementation of such stewardship contracts in Colorado.	**Appropriations:** Not applicable

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Postponed Indefinitely)	
Bill Number: Senate Bill 09-016	**Short Title:** Incentives to Harvest Bark Beetle Timber
Sponsors: *Sens. Kopp and Penry* *Reps. King S. and Scanlan*	**Status:** Postponed Indefinitely
The bill, which was postponed indefinitely by the House Appropriations Committee, would have provided a five-year property tax exemption for business personal property used to harvest, transport, process, or market timber killed by bark beetles. The bill would have also established the continuously appropriated Bark-beetle Mitigation Revolving Fund for a new revolving loan program. The loan program would have provided start-up capital to businesses that purchase facilities or equipment used for the harvest, removal, or use of beetle-killed timber. Loans would have been granted by the State Forest Service based on the extent the applicant would help with the job opportunities and prosperity of the area, the expertise of the applicant, and the applicant's ability to promote bark-beetle mitigation efforts and the business community. The bill would have also required the state forester to identify areas in Colorado where the bark beetle infestation has resulted in imminent fire danger. The State Forest Service would have provided a designated staff member to act as an ombudsman to aid property owners and businesses in navigating obstacles faced when harvesting beetle-killed timber in different jurisdictions.	**Appropriations:** No state appropriations were required for FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Postponed Indefinitely) (Cont.)	
Bill Number: Senate Bill 09-018	**Short Title:** High Risk Wildfire Mitigation Grants
Sponsors: *Reps. King and Scanlan* *Sens. Gibbs and Kopp*	**Status:** Postponed Indefinitely
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The reengrossed bill would have required the State Forest Service to develop and implement the High-risk Communities Wildfire Mitigation Grant Program for the purpose of mitigating wildfires. Grants would have been available to local governments, the state, the federal government, fire protection districts, and homeowner's associations. Eligible projects were required to be in a wildland-urban interface areas that have been identified in the community wildfire protection plan adopted by a local government. Grant recipients were required to cover at least 40 percent of the total cost of the wildfire protection measures. The State Forest Service could have used up to 2 percent of each annual appropriation to share in the costs of developing community wildfire protection plans with local governments and up to 3 percent of each annual appropriation could have been used for the cost of administering grants. The bill also required the State Forest Service to report annually on the grant program and would have required grant recipients to contract with the Colorado youth corps association or an accredited Colorado youth corps to provide labor for the wildlife mitigation measures whenever feasible.	**Appropriations:** The bill would have transferred $180,000 from the Operational Account of the Severance Tax Trust Fund to the High-risk Communities Wildfire Mitigation Grant Program Fund for FY 2009-10 through FY 2012-13.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Postponed Indefinitely) (Cont.)	
Bill Number: House Bill 09-1031 **Sponsors:** *Rep. King* *Sens. Gibbs and Penry*	**Short Title:** State Match For County Outlays From Wildfire **Status:** Postponed Indefinitely
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The bill would have required an annual appropriation from the General Fund, beginning with FY 2009-10, to the Colorado State Forest Service to be dispersed to the Emergency Fire Fund (EFF). The EFF is set up and managed by counties and the Denver Water Board to pay for emergency responses to wildfires. The annual appropriation would have been equal to the amount of voluntary contributions provided by counties, the Denver Water Board, and any other contributing entities to the EFF during the prior fiscal year.	**Appropriations:** The bill was estimated to increase state General Fund expenditures by the Colorado State Forest Service by $1 million per year beginning in FY 2009-10. Assuming local government contributions to the fund remain constant, the state matching funds would have provided an additional $1 million per year. However, the bill does not specify a maximum amount for the state match and future General Fund appropriations could increase or decrease based on changes in the amount of local government contributions to the fund.
Bill Number: House Bill 09-1131 **Sponsors:** *Rep. Gerou* *Sen. (None)*	**Short Title:** Fund Training for Fire Protection District Directors **Status:** Postponed Indefinitely
As introduced, the bill would have required an appropriation of at least $8,000 from the General Fund each year to the Wildland-Urban Interface (WUI) Training Fund. The WUI Training Fund was created by Senate Bill 08-039 to implement a pilot program to train directors of fire protection districts in WUI areas.	**Appropriations:** The bill would have required a General Fund appropriation of $8,000 to the Division of Fire Safety in the Department of Public Safety in FY 2010-11.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Enacted)	
Bill Number: Senate Bill 08-116	**Short Title:** Volunteer Firefighters Job Security
Sponsors: *Sen. Kester* *Rep. Looper*	**Status:** Signed Into Law
The act prohibited an employer from terminating a volunteer firefighter for leaving work to respond to an emergency if all of the following conditions are met: • the employer does not deem the employee to be essential to the operation of the employer's daily enterprise; • the fire chief has previously provided the employer with documentation of the employee's status as a volunteer firefighter; • the emergency is within the response area of the employee's fire department and is of such magnitude as to require all firefighters; and • the fire chief provides the employer with a written statement verifying time, date and duration of the employee's response.	**Appropriations:** No state appropriations were required in FY 2008-09.
Bill Number: Senate Bill 08-039	**Short Title:** Training Directors of Fire Protection Districts
Sponsors: *Sen. Kopp* *Sen. Witwer*	**Status:** Signed into Law
The act required the Division of Fire Safety, withing the Department of Public Safety, to establish a pilot program to offer courses to train fire protection district directors whose districts include wildland-urban interface areas. The act directed that the courses include, but not be limited to, instruction on strategic planning and community outreach on wildland-urban interface issues. This training is intended to address the continuing need for training on wildland-urban interface fire safety because of turnover on fire protection boards and for new fire protection district directors. The act also established the Wildland-Urban Interface Training Fund to fund the pilot program and the Wildland-Urban Interface Training Advisory Board for the purpose of advising the division on the content of the courses offered and the implementation of the pilot program.	**Appropriations:** To implement this act, the Department of Public Safety, Division of Fire Safety required $12,400 in FY 2008-09 and $4,900 in FY 2009-10 from the Training Fund. The expenditures and timing to implement the pilot program were contingent upon the receipt of gifts, grants, and donations in the Training Fund.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Enacted) (Cont.)

Bill Number: Senate Bill 08-071

Short Title: Extend Forest Restoration Pilot Program

Sponsors: *Sen. Gibbs*
Rep. Scanlan

Status: Signed into Law

The act extended the repeal date for the Forest Restoration Pilot Program, created by House Bill 07-1130, and its related technical advisory panel from July 1, 2008, to September 1, 2012.

Appropriations:

The act appropriated $1.0 million from the operational account of the Severance Tax Trust Fund for four consecutive fiscal years beginning in FY 2008-09. In years where insufficient funds existed to appropriate the $1.0 million, the appropriation was to be prorated to accommodate the demands on the fund.

Bill Number: Senate Bill 08-221

Short Title: Bonds Forest Health Watershed Projects

Sponsors: *Sen. Romer*
Rep. Scanlan

Status: Signed into Law

The act authorized the Colorado Water Resources and Power Development Authority (authority) to issue up to $50 million in bonds for the purposes of funding watershed protection and forest health projects. Loans would be made from bond proceeds to governmental agencies that have an agreement with either the Colorado Clean Energy Development Authority or the State Forest Service. Governmental agencies including cities, counties, water conservation and conservancy districts, special districts with at least 500,000 registered voters, municipal utilities, state agencies, the U.S. Forest Service and the BLM, and enterprises established through an interstate compact may be awarded the loans. The act required the State Forest Service to collaborate with federal, state, and local water providers to recommend the use of available resources for high priority areas and projects on state and federal lands that serve as the primary source of water for communities and municipalities.

Consideration for funding must be given to agencies that effectively use available resources by applying the principles of the Colorado Good Neighbor Authority program, which helps implement forest management projects between bordering properties that share similar objectives for forest management and protection. Consideration for funding must also be given to agencies that combine resources with any available federal grant money, and agencies that partner with land management agencies with jurisdiction for community and municipal watersheds. A memorandum of understanding between governmental agencies and the authority must specify how the moneys should be allocated with the following distribution restrictions:

- up to 20 percent may be distributed to the Clean Energy Development Authority for watershed protection, forest health projects, and incentives for the use of beetle infested lumber; and
- the remainder shall be distributed for watershed protection and forest health projects identified by the State Forest Service.

Appropriations:

No state appropriations were required in FY 2008-09.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Adopted)	
Bill Number: House Joint Resolution 08-1033	**Short Title:** Colorado Forest Health
Sponsors: *Rep. Lundberg* *Sen. Gibbs*	**Status:** Adopted
The General Assembly requested proactive forest management responses to the bark beetle epidemics in the state's national forests. Specifically, House Joint Resolution 08-1033 requested the support from the USFS, USDA, and the U.S. Congress for proactive management of Colorado forests and new funding mechanisms to reduce the likelihood of catastrophic fires due to the bark beetle epidemic. The resolution also conveys the General Assembly's aggressive support of implementing the recently passed federal law entitled the "Healthy Forests Restoration Act" and its community wildfire protection plans that involve at-risk communities.	**Appropriations:** Not applicable
Bill Number: Senate Joint Resolution 08-010	**Short Title:** Stewardship Contracting Forest Health
Sponsors: *Sen. Gibbs* *Rep. Scanlan*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning forest health stewardship: • that the U.S. Forest Service regional forester for the Rocky Mountain Region and the BLM Colorado State Director collaborate with the Colorado State Forester and key stakeholders to identify and obtain the necessary funding to implement up to three long-term (ten-year) stewardship contracts in Colorado; • that these stewardship contracts address forest conditions in Colorado's Front Range, High Country, and Southwest regions in a way that emphasizes community protection, provides for improved forest resilience, and offers locally based economic opportunities; and • that the Governor and Colorado's Congressional delegation work with the U.S. Department of Agriculture Undersecretary for Natural Resources and the Environment and the USFS Washington, D.C., office to facilitate the implementation of such stewardship contracts in Colorado.	**Appropriations:** Not applicable

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Adopted) (Cont.)			
Bill Number:	Senate Joint Resolution 08-025	**Short Title:** Create Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas	
Sponsors:	*Sen. Kopp* *Rep. Witwer*	**Status:** Adopted	
This resolution created an eight-member committee, comprised of four senators and four representatives, to study wildfire issues in wildland-urban interface areas, to meet during the 2008 interim. The committee leveraged existing studies and analyses relating to wildfire in wildland-urban interface areas in order to develop a series of legislative recommendations to present to the General Assembly.		**Appropriations:** Not applicable	

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2007 Legislation (Enacted)	
Bill Number: House Bill 07-1130	**Short Title:** Forest Restoration Pilot Program
Sponsors: *Rep. Gibbs* *Sen. Fitz-Gerald*	**Status:** Signed into Law
The act created the Forest Restoration Pilot Program as part of the Colorado Forest Restoration Act. It directed the State Forest Service and the Division of Forestry within the Department of Natural Resources (DNR), to solicit proposals for experimental forest restoration projects that protect water supplies. Proposals were required to be collaborative, to be community-based, and to include cost-sharing elements. The state's share on any given project could not exceed 60 percent, and no more than 3 percent of the funds could be used for administrative expenses. Projects may be located on public or private land, but they must be located in an area with an approved community wildfire protection plan. The act also created a technical advisory panel of 7 to 11 members, appointed by the executive director of DNR, to assist the State Forest Service in the proposal selection process. The program was to be repealed and a report on the program was to be submitted to the Governor by July 1, 2008.	**Appropriations:** The act did not specify any appropriations for FY 2007-08. However, Senate Bill 07-122, *Concerning the Funding of Colorado Water Conservation Board Projects*, provided $1 million from the perpetual base account of the Severance Tax Trust Fund to the DNR for allocation to the Division of Forestry to implement the grant activities authorized in House Bill 07-1130.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2007 Legislation (Enacted) (Cont.)

Bill Number: House Bill 07-1168

Short Title: Forest Improvement Districts

Sponsors: *Rep. White*
Sen. Fitz-Gerald

Status: Signed into Law

The act added forest improvement districts to the types of special districts authorized in law. This allows a municipality or county to create or join a forest improvement district, subject to voter approval, to protect communities from wildfires and improve forest conditions. Forest improvement districts are authorized to seek voter approval to levy a sales tax and use such revenue to:

- plan and implement forest improvement projects in wildland-urban interface areas to reduce hazardous fuels and protect communities;
- establish financial incentives for private landowners to mitigate wildfire risks on their property;
- establish incentives for local wood products industries to improve the use of or add value to small-diameter or beetle-infested trees;
- match state and federal grants for bioheating conversion and infrastructure support for biomass collection and delivery; and
- assist the State Forest Service in ensuring that all communities at risk of wildfire within the district have adopted a community wildfire protection plan and are using appropriate planning, education, and outreach tools.

A landowner who performs wildfire mitigation measures can request reimbursement from the district, if the wildfire mitigation measures are performed in a wildland-urban interface area within the district boundary, authorized by a local government community wildfire protection plan, and approved by the district board. A landowner who qualifies for reimbursement from a district must file an application with the district board for reimbursement up to $10,000 or 50 percent of the landowner's direct costs of performing wildfire mitigation measures in a single year, whichever is less.

Appropriations:

No state appropriations were required in FY 2007-08.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2007 Legislation (Adopted)	
Bill Number: Senate Joint Resolution 07-006	**Short Title:** Stewardship Contracting Forest Health
Sponsors: *Sen. Fitz-Gerald* *Rep. Gibbs*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning stewardship contracting for forest health: • that the U.S. Forest Service regional forester for the Rocky Mountain Region and the BLM Colorado State Director collaborate with the state forester and key stakeholders to identify and obtain the necessary funding to implement up to three long-term (ten-year) stewardship contracts in Colorado; • that these stewardship contracts address forest conditions in Colorado's Front Range, High Country, and Southwest regions in a way that emphasizes community protection, provides for improved forest resilience, and offers locally-based economic opportunities; and • that the Governor and Colorado's Congressional delegation work with the U.S. Department of Agriculture's Undersecretary for Natural Resources and the Environment and the USFS Washington, D.C. office to facilitate the implementation of such stewardship contracts in Colorado.	**Appropriations:** No state appropriations were required in FY 2007-08.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2006 Legislation (Enacted)

Bill Number: Senate Bill 06-096

Short Title: Resources To Fight Wildfires

Sponsors: *Sen. Taylor*
Rep. Butcher

Status: Signed Into Law

The act created the Wildfire Preparedness Fund and expanded the purposes for which the Wildfire Emergency Response Fund can be used. Pursuant to this act, the Wildfire Emergency Response Fund may be used to cover the costs of employing crews to fight a wildfire for the first two days of a wildfire, if the crew is requested by a county sheriff, municipal fire department, or fire protection district.

The act also required that $3.25 million in severance tax revenues be continuously appropriated from the Local Government Mineral Impact Fund to the Wildfire Preparedness Fund for FY 2006-07 through FY 2010-11. Moneys in the Wildfire Preparedness Fund are for wildfire preparedness activities and can be accessed by the State Forest Service for limited uses or upon executive order or proclamation of the Governor.

The act also authorized the Governor to enter into an interstate compact for the prevention and control of forest fires and also required that an annual state wildfire preparedness plan and a report on the use of money in the Wildfire Preparedness Fund be submitted to the Governor and the members of the General Assembly.

Appropriations:

The act required that $3.25 million be transferred annually from the Local Government Mineral Impact Fund to the Wildfire Preparedness Fund for FY 2006-07 through FY 2010-11. The Wildfire Preparedness Fund received transfers for FY 2006-07 and FY 2007-08.

2006 Legislation (Adopted)

Bill Number: House Joint Resolution 06-1021

Short Title: Colorado Forest Health

Sponsors: *Rep. Rose*
Sen. Isgar

Status: Adopted

This resolution commended the Forest Advisory Board and the Division of Forestry, and urged increased and equitable federal funding for forest management, fuels treatment, and insect and disease response in Colorado. Specifically, the resolution:

- commended the Forestry Advisory Board and Division of Forestry for their important work in highlighting the issues of concern and related opportunities for improvement of our state's forests and woodlands;
- expressed its support for management efforts that reduce wildfire and insect and disease risks to communities and natural resources and restore more resilient and sustainable conditions to Colorado forests; and
- urged the Colorado congressional delegation and federal land management agencies to secure increased and equitable federal funding for forest management, fuels treatment, and insect and disease response in Colorado.

Appropriations:

Not applicable

Table 1
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012 (Cont.)

2005 Legislation (Enacted)	
Bill Number: House Bill 05-1067	**Short Title:** County Fire Protection
Sponsors: *Rep. Buescher* *Sen. Teck*	**Status:** Signed into Law
The act authorized boards of county commissioners to erect firehouses, provide fire equipment and provide for the use and management of such firehouses and equipment. The act also specifically authorized the creation of public improvement districts (PIDs) within a county to construct, install, acquire, operate, maintain or provide fire protection. Creation of such a district would require approval through an election, including stipulations for increasing property taxes to cover the formation and operational costs of the district. A county fire protection PID would have the authority to levy property taxes, and fix rates, tolls and charges as other PIDs for the purpose of fire protection.	**Appropriations:** No state appropriations were required in FY 2005-06.

2005 Legislation (Adopted)	
Bill Number: House Joint Resolution 05-1039	**Short Title:** The Fiftieth Anniversary of the Colorado State Forest Service
Sponsors: *Rep. Hoppe* *Sen. Isgar*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning the Colorado State Forest Service: • to recognize and celebrate the 50th anniversary of the Colorado State Forest Service and thank the many people who have generously served in this organization over the years; • renew our commitment to the health and sustainability of our state's valuable forest resources; and • encourage the Colorado State Forest Service to continue providing the quality service it is known for in protecting and enhancing the forests of Colorado.	**Appropriations:** No state appropriations were required in FY 2005-06.

Colorado
Legislative
Council
Staff

Room 029 State Capitol, Denver, CO 80203-1784
(303) 866-3521 FAX: 866-3855 TDD: 866-3472

MEMORANDUM

Pursuant to section 24-72-202(6.5)(b), research memoranda and other final products of Legislative Council Staff research that are not related to proposed or pending legislation are considered public records and are subject to public inspection. If you think additional research is required and this memorandum is not a final product, please call the Legislative Council Librarian at (303) 866-4011 by July 6, 2012.

June 29, 2012

TO: Members of the Lower North Fork Wildfire Commission

FROM: Raegan Robb, Senior Researcher, 303-866-4364

SUBJECT: Legislation Concerning Forest Health and Wildfire Preparedness Considered by the Colorado General Assembly from 2005 to 2012

This memorandum provides an eight-year history of legislation concerning forest health and wildfire preparedness considered by the Colorado General Assembly from 2005 to 2012. During this time, the General Assembly passed 25 bills and adopted 8 resolutions related to various forest health and wildfire preparedness issues in the state. Five bills were postponed indefinitely. Table 1 summarizes this legislation and identifies those bills which were signed into law or postponed indefinitely for each year. The table also identifies the resolutions that were adopted for each year.

Table 1
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2012 Legislation (Enacted)	
Bill Number: House Bill 12-1283	**Short Title:** Consolidate Homeland Security Functions Under CDPS
Sponsors: *Rep. Barker* *Sen. Giron*	**Status:** Signed into Law
The act consolidates Colorado's homeland security functions, personnel, and resources, into a new Division of Homeland Security and Emergency Management (DHSEM) within the Department of Public Safety (DPS). The new division includes the existing, but renamed Office of Prevention and Security; the newly created Office of Preparedness; and emergency management functions transferred by the Department of Local Affairs. A new 21-member Homeland Security and All-Hazards Senior Advisory Committee is created to guide the division's efforts, provide advice, and review homeland security grant applications. The act also reestablishes the Office of Fire Safety as the Division of Fire Safety within DPS, which transfers the wildfire-related powers and duties of the state forester within Colorado State University into the new division. DPS is authorized to accept and expend gifts, grants, and donations to fund emergency responses to wildfires from the existing Emergency Fire Fund. The act also adds two members to the Fire Service Training and Certification Advisory Board, restoring it to its original composition.	**Appropriations:** The act requires several appropriations and transfers from the Departments of Local Affairs, Public Health and Environment, and Public Safety; Colorado State University; and the Governor's Office. However, despite the multiple budget adjustments and transfers, there is no net change to the FY 2012-13 appropriations for the new DHSEM and the Division of Fire Safety.
Bill Number: House Bill 12-1285	**Short Title:** Intergovernmental Cooperation Wildland Fire Mitigation
Sponsors: *Rep. Gerou* *Sen. Jahn*	**Status:** Signed into Law
The act requires a municipality that owns land inside a county for utility purposes to enter into an intergovernmental agreement (IGA). The act requires a municipality to either enter into an IGA with the county or the state forester by July 1, 2012, to mitigate forest land or wildland fires affecting the contiguous land areas. The act also clarifies that municipal property used for utility purposes is reasonably related to providing electric, natural gas, water, wastewater, and telecommunication services.	**Appropriations:** No new state appropriations are required in FY 2012-13. However, the act will create administrative costs for local governments where an IGA must be established. The state could incur costs for forest and wildland mitigation efforts for utility easements on lands owned by the Division of Parks and Wildlife and the State Land Board in the Department of Natural Resources.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2012 Legislation (Enacted)	
Bill Number: House Bill 12-1352	**Short Title:** Lower North Fork Wildfire Commission
Sponsors: *Reps. Gardner and Gerou* *Sen. Cadman*	**Status:** Signed into Law
The act creates the five-member Lower North Fork Wildfire Commission, comprised of two Senators, two Representatives, and the executive director of DPS. The commission is charged with investigating the causes of the 2012 Lower North Fork Wildfire and recommending legislative or other action that would prevent a similar occurrence. Specifically, the commission must meet to organize, investigate the causes and impacts of the wildfire, hold at least one public hearing during the 2012 interim, and prepare a report for the General Assembly on any findings, policy recommendations, or compensatory recommendations.	**Appropriations:** No new state appropriations are required in FY 2012-13 since the commission was prioritized by the Legislative Council and included as part of the Legislative Branch budget for FY 2012-13.
2012 Legislation (Postponed Indefinitely)	
Bill Number: House Bill 12-1004	**Short Title:** Colorado Timber Act
Sponsors: *Rep. Bradford* *Sen. King S.*	**Status:** Postponed Indefinitely
The bill, which was postponed indefinitely by the House Agriculture, Livestock and Natural Resources Committee, would have required county and municipal building codes to allow and encourage the use of lumber milled from lodgepole pine or Engelmann spruce trees having a grade of "stud" or better for the framing of buildings. The bill declared that lumber from these trees cannot be used in Colorado, but is shipped for sale outside of the state due, in part, because it is prohibited by local building codes. These types of trees have been particularly damaged by the bark beetle infestation, but the bill claimed that using lumber that had been damaged by beetles but that is still structurally sound for building in Colorado would benefit the state.	**Appropriations:** No new state appropriations were required in FY 2012-13.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2011 Legislation (Enacted)	
Bill Number: Senate Bill 11-110 **Sponsors:** *Sen. Nicholson* *Rep. Coram*	**Short Title:** County Open Burning Slash Permit Program **Status:** Signed into Law
The act required counties with substantial forested area to develop an open burning permit system for unincorporated areas of the county that addressed the disposal of slash. Specifically, the act required affected county governments to collaborate with local jurisdictions, sheriffs, and other agencies to develop an education plan concerning slash pile burning. Counties developing a permit system must consider existing laws and scientific and applied knowledge of safe burning conditions, and include mechanisms to notify neighbors and individuals with respiratory conditions of permitted burns. Counties with an existing open burning permit system were exempt from the requirements of the act until the board of county commissioners altered the existing permit system. The act also exempted prescribed burns that follow federal and state guidelines and preserved the existing rights of agricultural producers to conduct open burning on their private property.	**Appropriations:** No new state appropriations were required in FY 2011-12 or FY 2012-13.
Bill Number: Senate Bill 11-238 **Sponsors:** *Sen. Nicholson* *Reps. Coram and Wilson*	**Short Title:** Extend Wildfire Preparedness Funding **Status:** Signed into Law
The act extended the annual $3.25 million transfer to the Wildfire Preparedness Fund of federal mineral leasing revenue by the Department of Local Affairs from the Local Government Impact Fund, for two years beginning on July 1, 2012. The Wildlife Preparedness Fund was created in 2006 by Senate Bill 06-096, which required funding to be transferred through FY 2010-11. The funding was used by the State Forest Service for wildfire preparedness activities including funding for firefighting resources, agreements, and plans. The act also required the State Forest Service to annually report on the use of these revenues to the Department of Local Affairs, the Office of State Planning and Budgeting, and the General Assembly.	**Appropriations:** The act required $3.25 million to be transferred for FY 2012-13 and FY 2013-14, for a cumulative total of $6.5 million from the Local Government Impact Fund, administered by the Department of Local Affairs, to the Wildfire Preparedness Fund, administered by the State Forest Service.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2011 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 11-267 **Sponsors:** *Sen. Schwartz* *Reps. Coram and Hamner*	**Short Title:** Forest Health Act Of 2011 **Status:** Signed into Law
The act created a 14-member work group to identify market-based models for forest management, including: • methods to promote biomass to reduce insect infestation; • air quality improvement using biomass as a fuel mitigation strategy; and • funding sources for the development of biomass. The working group was also charged to identify ways to improve information concerning the use of biomass for energy and other land management issues, including the use of federal initiatives, and examine ways to generate power using locally produced biomass at public facilities. The group was required to report initial findings to certain legislative committees by November 1, 2011, and final findings, which include specific legislative recommendations, by January 1, 2012. The act also required the State Board of Land Commissioners to direct the State Forest Service on the appropriate use of pine beetle infested timber and otherwise declining forest area when it contracts with the service. Finally, it encouraged the Public Utilities Commission to explore all aspects of biomass energy production, as well as assist the working group.	**Appropriations:** No new state appropriations were required in FY 2012-13, but expenditures could be incurred by state agencies supporting the work group. Funds for the work group must be derived from gifts, grants, and donations, and will be credited to the Healthy Forests and Vibrant Communities Fund. Any costs not paid from gifts, grants, and donations require another funding source.
Bill Number: House Bill 11-1317 **Sponsors:** *Rep. Gerou* *Sens. Foster and Roberts*	**Short Title:** Intergovernmental Cooperation Wildland Fire Mitigation **Status:** Signed into Law
The act extended to July 1, 2012, the deadline for a county or municipality that owns any land area located either entirely or partially inside the boundaries of another county with at least 50 percent forest land (or land that constitutes a wildland area) to enter into an intergovernmental agreement (IGA).	**Appropriations:** No new state appropriations were required in FY 2012-13.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness
from 2005 to 2012

2010 Legislation (Enacted)	
Bill Number: Senate Bill 10-102	**Short Title:** State Forester Prescribed Fire Certification Standard
Sponsors: *Sen. Gibbs* *Rep. Fischer*	**Status:** Signed into Law
The act required the state forester to establish standards for training and certification for anyone who uses prescribed fires. Specifically, the act required the state forester to develop training criteria, identify best practices for prescribed fires, and establish the parameters of certified and noncertified burner designations. The certification standards were required to include the following: • a certified and noncertified burner designation; • requirements, processes, and procedures for certified burners to follow when conducting a prescribed fire; and • recommended organizational structures for prescribed fire operations.	**Appropriations:** No new state appropriations were required in FY 2011-12.
Bill Number: House Bill 10-1095	**Short Title:** Fire Protection District Accident Fees
Sponsors: *Rep. Gerou* *Sen. Kopp*	**Status:** Signed into Law
This act clarified that a fire protection district can only charge for rescue or extraction services provided at the scene of a motor vehicle accident.	**Appropriations:** No new state appropriations were required in FY 2011-12.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness
from 2005 to 2012

2010 Legislation (Adopted)	
Bill Number: House Joint Resolution 10-1024	**Short Title:** Bark Beetle Wood Industry Incentives
Sponsors: *Rep. Scanlan* *Sen. Gibbs*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning the Colorado bark beetle epidemic: • to support the efforts of all collaboratives to work with public and private interests to seek ways to responsibly balance the need to protect the environment from further encroachment by the bark beetle and to increase Colorado's "rural wealth" through increased capital investment, jobs creation, and economic diversity; • encourage local governments to create incentives and develop markets for timber and other biomass that will help reduce fire fuels and remove dead trees, which will protect natural resource values, communities, lives, and property; and • encourage industries to establish operations in local communities in Colorado where they can process timber and biomass at a much lower cost than if the wood were shipped to existing facilities.	**Appropriations:** Not applicable

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted)	
Bill Number: Senate Bill 09-001	**Short Title:** Community Wildfire Protection Plans
Sponsors: *Reps. King and Scanlan* *Sens. Gibbs and Penry*	**Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act required the state forester, in collaboration with representatives of the U.S. Forest Service, the Colorado Department of Natural Resources, county governments, municipal governments, local fire departments or fire protection districts, electric, gas, and water utility providers in the subject area, and state and local law enforcement agencies, to establish guidelines for Community Wildfire Protection Plans (CWPPs) by November 15, 2009. CWPPs are plans to identify and mitigate fire hazards that are developed with input from state, local, federal government bodies, and other interested parties. The act required the state forester to establish guidelines and criteria counties must consider when developing their own CWPPs. The act also required each county, with the assistance of the state forester, to determine whether there are fire hazard areas within the unincorporated portion of the county by January 1, 2011. Counties were required to develop a CWPP within 180 days of identifying fire hazard areas.	**Appropriations:** No new state appropriations are required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-013	**Short Title:** Good Samaritan Law for Volunteer Firefighters
Sponsors: *Sen. Gibbs* *Rep. Levy*	**Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act provides limited civil immunity for fire departments or other entities that donate surplus firefighting equipment. The act also exempts volunteer firefighters and their volunteer organizations from civil liability resulting from any action taken or not taken during firefighting efforts or other emergency services, except in cases of gross negligence or willful or wanton acts or omissions. The act also provides that state, county, or municipal agency, and other local entities that are engaged in emergency or disaster planning, training, or response activities shall not be liable for the death of or injury to any person or loss of or damage to property, except in cases of gross negligence or willful or wanton acts or omissions. A person may sue and recover civil damages based upon the negligent operation of a motor vehicle, but damages shall be limited to the amount of insurance coverage maintained by the person or entity.	**Appropriations:** No state appropriations were required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-020	**Short Title:** Wild Land-Urban Fire Chain of Command
Sponsors: *Sen. Gibbs* *Rep. Scanlan*	**Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act, provided for a unified command structure for the management of wildland fires in the state and the primary responsibilities of local and state entities. The act also addressed the adoption of a county wildfire preparedness plan for the unincorporated area of the county and urges cooperation between the sheriff, the fire chiefs, and the board of county commissioners. Under the act, the first emergency response agency to arrive at the scene of a wildland fire, regardless of whether the incident occurs within its jurisdiction, must act as incident commander and be responsible for the initial emergency action necessary to control the wildland fire or to protect life or property until the emergency response agency that has jurisdiction over the incident site arrives. The act provided that fire department chiefs in each fire protection district in the state have the authority to supervise all fires within their district and the authority to utilize mutual aid agreements with neighboring districts to suppress and control fires that cross or threaten to cross the district boundaries. Under the act, county sheriffs are responsible for the planning and coordination of fire suppression efforts that occur in unincorporated areas of the county outside the boundaries of a fire protection district, or that exceed the capabilities of a fire protection district to control or extinguish.	**Appropriations:** No new state appropriations were required in FY 2009-10. However, the Governor's Emergency Fund, or other funds available to the State Forest Service, may be used for the purpose of preventing and suppressing forest and wildland fires in the state. Additionally, a board of county commissioners may make an appropriation for the purpose of controlling fires in its county and even levy a special property tax subject to approval of the voters to prevent, control, or extinguish such fires anywhere in the county. The act limited the amount raised from the levy to 1 mill or $500,000 per year, whichever is less.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-020 (Cont.)	**Short Title:** Wildland-Urban Fire Chain of Command
Sponsors: *Sen. Gibbs* *Rep. Scanlan*	**Status:** Signed into Law
The act allowed the authority of a fire chief to be transferred to the county sheriff to coordinate fire suppression efforts for any prairie, forest, or wild land fire that exceeds the capabilities of the district. A county sheriff must appoint a local incident management team to provide the command and control infrastructure to manage wildfires that exceed the capabilities of a fire protection district, and that require mutual aid and outside resources. The sheriff assumes financial responsibility on behalf of the county and a fire protection district for fire fighting efforts that require mutual aid and outside resources. In the case of a wildfire that exceeds the capability of the county, the sheriff is responsible for seeking the assistance from the State Forest Service through an agreement concerning the transfer of authority, responsibility for fire suppression, and the retention of responsibilities under a unified command structure. The act also addressed county wildfire preparedness plans and the ability for county voters to approve a special tax for the purpose of controlling wildfires within the county. The act provided that county sheriffs can develop and update a wildfire preparedness plan for the unincorporated area of the county in cooperation with any fire district with jurisdiction over such unincorporated area. A county sheriff can also request the State Forest Service to assist in the development or modification of a county wildfire preparedness plan.	

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness
from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: Senate Bill 09-021 **Sponsors:** *Sen. Kopp* *Rep. Scanlan*	**Short Title:** Incentives For Volunteer Firefighters **Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The act created the Volunteer Firefighter Tuition Voucher Fund to provide volunteer firefighters with college tuition vouchers up to three credits per academic year for attendance at a college within the state system of community and technical colleges or at a local community college. In order to be considered for a voucher, a volunteer firefighter must be a full- or part-time student, complete at least 36 hours of training each year, and agree to serve as a volunteer firefighter for at least 4 years after completing their education.	**Appropriations:** The Division of Fire Safety, Department of Public Safety (DPS), was authorized to seek gifts, grants, and donations for the volunteer firefighter voucher program and to issue vouchers. At the time, none had been identified. A voucher program of up to $100,000 would generate a workload in the DPS equivalent to 0.1 FTE to oversee the distribution of the tuition vouchers and to work with the community colleges to develop the grant program.
Bill Number: Senate Bill 09-105 **Sponsors:** *Sen. Gibbs* *Rep. Scanlan*	**Short Title:** Forest Health and Cost of Firefighting **Status:** Signed into Law
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. This act removed a statutory limit on the amount that a county can raise by a special property tax for the purpose of fighting both forest and prairie fires. The limit on the amount that may be raised was 1 mill or $500,000 per year, whichever is less. Under the act, voters could approve a higher tax rate.	**Appropriations:** No new state appropriations were required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: House Bill 09-1041 **Sponsors:** *Rep. Gerou* *Sen. Gibbs*	**Short Title:** Fire Protection District Board Authority **Status:** Signed into Law
The act allowed a fire protection district board to charge fees for certain emergency safety services provided when assisting emergency medical services. Under the act, fire protection districts were authorized to change a fee for the following services: • services provided prior to the arrival of an ambulance; • rescue or extrication of trapped or injured parties; and • lane safety or blocking provided by district equipment.	**Appropriations:** No new state appropriations were required in FY 2009-10.
Bill Number: House Bill 09-1162 **Sponsors:** *Rep. Gerou* *Sen. Kopp*	**Short Title:** Intergovernmental Cooperation For Wildfire Mitigation **Status:** Signed into Law
The act required an intergovernmental agreement (IGA) between a local government and a county to mitigate wildland fires in areas owned by the local government that are located either entirely or partially outside its own boundaries and inside the boundaries of a county. An IGA was required on or before July 1, 2011, for any local government that owns land inside the territorial boundaries of a county that is at least 50 percent forest land, or land that constitutes a wildland area. However, local governments are not required to enter into a new agreement if an existing agreement, including a mutual aid agreement, satisfies the requirements of the act and was in place when the act went into effect on August 4, 2009.	**Appropriations:** No new state appropriations were required in FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: House Bill 09-1162 (Cont.) **Sponsors:** *Rep. Gerou* *Sen. Kopp*	**Short Title:** Intergovernmental Cooperation For Wildfire Mitigation **Status:** Signed into Law
The act required an IGA to address the following issues: • the roles and responsibilities of each party to the agreement with respect to the mitigation of forest land and wildland fires; • procedures for cooperation and coordination among the parties; • management objectives for forest land and wildland fire prevention, preparedness, mitigation, suppression, reclamation, or rehabilitation and designation of the local government with fiscal and operational authority for each objective; • a description of available emergency or mutual aid resources; • specification of reimbursement and billing procedures; and • actions that may be taken by one party if another party to the agreement fails to satisfy its duties or responsibilities. Additionally, the act allowed the Division of Parks and Outdoor Recreation in the Department of Natural Resources and any other state agency to enter into a contract, intergovernmental agreement, or memorandum of understanding to allow fire mitigation on state property with personnel and equipment under the control of a fire department. The act defined "fire department" to include the duly authorized fire protection organization of a local government, a fire protection district, other special districts providing fire protection, and a not-for-profit, nongovernmental entity that is organized to provide firefighting services. Activities to be undertaken by a fire department may include prescribed burning as a component of wildfire mitigation and exercises to promote the training of firefighting personnel.	

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)

Bill Number: House Bill 09-1199

Short Title: Healthy Forests Vibrant Communities Act

Sponsors: *Rep. Scanlan*
Sen. Gibbs

Status: Signed into Law

Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas.

The act created the Colorado Healthy Forests and Vibrant Communities Act of 2009 and the Healthy Forests and Vibrant Communities Fund for the purposes of the act.

The act addressed the risk of wildfire in Colorado and the development of community wildfire protection plans (CWPPs) to bring together federal, state, and local interests, including nongovernmental entities, to address the risk of wildfire to life, property, and infrastructure in the state.

The act directed the Colorado State Forest Service to:

- ensure that communities and firefighters have sufficient resources, technical support, and training to adequately implement CWPPs for communities seeking to prepare, update, or implement a CWPP;
- support communities in reducing wildfire risks by implementing risk mitigation treatments that focus on protecting lives, homes, and essential community infrastructure, and by improving inventory and monitoring of forest conditions through the implementation of cost-sharing grants in the wildland-urban interface;
- support long-term ecological restoration to support the public water supply and high-quality wildlife habitats through the implementation and monitoring of Forest Restoration Pilot Program grants;
- support local business development and job creation by administering a revolving loan fund to support woody biomass utilization, marketing timber products, and supporting the increased use of woody biomass in bio-heating;

Appropriations:

The act transferred $1.95 million from the operational account of the Severance Tax Trust Fund to the Healthy Forests and Vibrant Communities Fund and $50,000 from the operational account to the Wildland-Urban Interface Training Fund for FY 2009-10 through FY 2011-12. The act also allowed the State Forest Service to use up to $1 million dollars annually from the Forest Restoration Pilot Program Cash Fund until July 1, 2012, to mitigate community wildfire risks.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Enacted) (Cont.)	
Bill Number: House Bill 09-1199 (Cont.) **Sponsors:** *Rep. Scanlan* *Sen. Gibbs*	**Short Title:** Healthy Forests Vibrant Communities Act **Status:** Signed into Law
• work with the Governor's Energy Office and the Air Quality Control Commission to support the appropriately increased use of woody biomass in bio-heating; and • issue a statewide request for proposals for the Wildfire Risk Mitigation Loan Program to assist businesses with loans to provide start-up capital for new facilities or equipment to harvest, remove, use, and market beetle-killed or other timber taken from private, federal, state, county, or municipal forest lands as part of a wildfire risk reduction or fuels mitigation treatment.	
2009 Legislation (Adopted)	
Bill Number: Senate Joint Resolution 09-015 **Sponsors:** *Sen. Gibbs* *Rep. Scanlan*	**Short Title:** Forest Health Stewardship Contracting **Status:** Adopted
The resolution provided the following directives from the General Assembly concerning stewardship contracting for forest health: • that the U.S. Forest Service (USFS) Regional Forester for the Rocky Mountain Region and the Bureau of Land Management (BLM) Colorado State Director collaborate with the Colorado State Forester and key stakeholders to identify and obtain the necessary funding to implement up to three long-term (ten-year) stewardship contracts in Colorado; • that these stewardship contracts address forest conditions in Colorado's Front Range, High Country, and Southwest regions in a way that emphasizes community protection, provides for improved forest resilience, and offers locally-based economic opportunities; and • that the Governor and Colorado's Congressional delegation work with the U.S. Department of Agriculture's (USDA) Undersecretary for Natural Resources and the Environment and the USFS Washington, D.C. office to facilitate the implementation of such stewardship contracts in Colorado.	**Appropriations:** Not applicable

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Postponed Indefinitely)	
Bill Number: Senate Bill 09-016	**Short Title:** Incentives to Harvest Bark Beetle Timber
Sponsors: *Sens. Kopp and Penry* *Reps. King S. and Scanlan*	**Status:** Postponed Indefinitely
The bill, which was postponed indefinitely by the House Appropriations Committee, would have provided a five-year property tax exemption for business personal property used to harvest, transport, process, or market timber killed by bark beetles. The bill would have also established the continuously appropriated Bark-beetle Mitigation Revolving Fund for a new revolving loan program. The loan program would have provided start-up capital to businesses that purchase facilities or equipment used for the harvest, removal, or use of beetle-killed timber. Loans would have been granted by the State Forest Service based on the extent the applicant would help with the job opportunities and prosperity of the area, the expertise of the applicant, and the applicant's ability to promote bark-beetle mitigation efforts and the business community. The bill would have also required the state forester to identify areas in Colorado where the bark beetle infestation has resulted in imminent fire danger. The State Forest Service would have provided a designated staff member to act as an ombudsman to aid property owners and businesses in navigating obstacles faced when harvesting beetle-killed timber in different jurisdictions.	**Appropriations:** No state appropriations were required for FY 2009-10.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Postponed Indefinitely) (Cont.)	
Bill Number: Senate Bill 09-018	**Short Title:** High Risk Wildfire Mitigation Grants
Sponsors: *Reps. King and Scanlan* *Sens. Gibbs and Kopp*	**Status:** Postponed Indefinitely
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The reengrossed bill would have required the State Forest Service to develop and implement the High-risk Communities Wildfire Mitigation Grant Program for the purpose of mitigating wildfires. Grants would have been available to local governments, the state, the federal government, fire protection districts, and homeowner's associations. Eligible projects were required to be in a wildland-urban interface areas that have been identified in the community wildfire protection plan adopted by a local government. Grant recipients were required to cover at least 40 percent of the total cost of the wildfire protection measures. The State Forest Service could have used up to 2 percent of each annual appropriation to share in the costs of developing community wildfire protection plans with local governments and up to 3 percent of each annual appropriation could have been used for the cost of administering grants. The bill also required the State Forest Service to report annually on the grant program and would have required grant recipients to contract with the Colorado youth corps association or an accredited Colorado youth corps to provide labor for the wildlife mitigation measures whenever feasible.	**Appropriations:** The bill would have transferred $180,000 from the Operational Account of the Severance Tax Trust Fund to the High-risk Communities Wildfire Mitigation Grant Program Fund for FY 2009-10 through FY 2012-13.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2009 Legislation (Postponed Indefinitely) (Cont.)	
Bill Number: House Bill 09-1031 **Sponsors:** *Rep. King* *Sens. Gibbs and Penry*	**Short Title:** State Match For County Outlays From Wildfire **Status:** Postponed Indefinitely
Recommended by the 2008 Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas. The bill would have required an annual appropriation from the General Fund, beginning with FY 2009-10, to the Colorado State Forest Service to be dispersed to the Emergency Fire Fund (EFF). The EFF is set up and managed by counties and the Denver Water Board to pay for emergency responses to wildfires. The annual appropriation would have been equal to the amount of voluntary contributions provided by counties, the Denver Water Board, and any other contributing entities to the EFF during the prior fiscal year.	**Appropriations:** The bill was estimated to increase state General Fund expenditures by the Colorado State Forest Service by $1 million per year beginning in FY 2009-10. Assuming local government contributions to the fund remain constant, the state matching funds would have provided an additional $1 million per year. However, the bill does not specify a maximum amount for the state match and future General Fund appropriations could increase or decrease based on changes in the amount of local government contributions to the fund.
Bill Number: House Bill 09-1131 **Sponsors:** *Rep. Gerou* *Sen. (None)*	**Short Title:** Fund Training for Fire Protection District Directors **Status:** Postponed Indefinitely
As introduced, the bill would have required an appropriation of at least $8,000 from the General Fund each year to the Wildland-Urban Interface (WUI) Training Fund. The WUI Training Fund was created by Senate Bill 08-039 to implement a pilot program to train directors of fire protection districts in WUI areas.	**Appropriations:** The bill would have required a General Fund appropriation of $8,000 to the Division of Fire Safety in the Department of Public Safety in FY 2010-11.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Enacted)	
Bill Number: Senate Bill 08-116	**Short Title:** Volunteer Firefighters Job Security
Sponsors: *Sen. Kester* *Rep. Looper*	**Status:** Signed Into Law
The act prohibited an employer from terminating a volunteer firefighter for leaving work to respond to an emergency if all of the following conditions are met: • the employer does not deem the employee to be essential to the operation of the employer's daily enterprise; • the fire chief has previously provided the employer with documentation of the employee's status as a volunteer firefighter; • the emergency is within the response area of the employee's fire department and is of such magnitude as to require all firefighters; and • the fire chief provides the employer with a written statement verifying time, date and duration of the employee's response.	**Appropriations:** No state appropriations were required in FY 2008-09.
Bill Number: Senate Bill 08-039	**Short Title:** Training Directors of Fire Protection Districts
Sponsors: *Sen. Kopp* *Sen. Witwer*	**Status:** Signed into Law
The act required the Division of Fire Safety, withing the Department of Public Safety, to establish a pilot program to offer courses to train fire protection district directors whose districts include wildland-urban interface areas. The act directed that the courses include, but not be limited to, instruction on strategic planning and community outreach on wildland-urban interface issues. This training is intended to address the continuing need for training on wildland-urban interface fire safety because of turnover on fire protection boards and for new fire protection district directors. The act also established the Wildland-Urban Interface Training Fund to fund the pilot program and the Wildland-Urban Interface Training Advisory Board for the purpose of advising the division on the content of the courses offered and the implementation of the pilot program.	**Appropriations:** To implement this act, the Department of Public Safety, Division of Fire Safety required $12,400 in FY 2008-09 and $4,900 in FY 2009-10 from the Training Fund. The expenditures and timing to implement the pilot program were contingent upon the receipt of gifts, grants, and donations in the Training Fund.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Enacted) (Cont.)

Bill Number: Senate Bill 08-071

Short Title: Extend Forest Restoration Pilot Program

Sponsors: *Sen. Gibbs*
Rep. Scanlan

Status: Signed into Law

The act extended the repeal date for the Forest Restoration Pilot Program, created by House Bill 07-1130, and its related technical advisory panel from July 1, 2008, to September 1, 2012.

Appropriations:

The act appropriated $1.0 million from the operational account of the Severance Tax Trust Fund for four consecutive fiscal years beginning in FY 2008-09. In years where insufficient funds existed to appropriate the $1.0 million, the appropriation was to be prorated to accommodate the demands on the fund.

Bill Number: Senate Bill 08-221

Short Title: Bonds Forest Health Watershed Projects

Sponsors: *Sen. Romer*
Rep. Scanlan

Status: Signed into Law

The act authorized the Colorado Water Resources and Power Development Authority (authority) to issue up to $50 million in bonds for the purposes of funding watershed protection and forest health projects. Loans would be made from bond proceeds to governmental agencies that have an agreement with either the Colorado Clean Energy Development Authority or the State Forest Service. Governmental agencies including cities, counties, water conservation and conservancy districts, special districts with at least 500,000 registered voters, municipal utilities, state agencies, the U.S. Forest Service and the BLM, and enterprises established through an interstate compact may be awarded the loans. The act required the State Forest Service to collaborate with federal, state, and local water providers to recommend the use of available resources for high priority areas and projects on state and federal lands that serve as the primary source of water for communities and municipalities.

Consideration for funding must be given to agencies that effectively use available resources by applying the principles of the Colorado Good Neighbor Authority program, which helps implement forest management projects between bordering properties that share similar objectives for forest management and protection. Consideration for funding must also be given to agencies that combine resources with any available federal grant money, and agencies that partner with land management agencies with jurisdiction for community and municipal watersheds. A memorandum of understanding between governmental agencies and the authority must specify how the moneys should be allocated with the following distribution restrictions:

- up to 20 percent may be distributed to the Clean Energy Development Authority for watershed protection, forest health projects, and incentives for the use of beetle infested lumber; and
- the remainder shall be distributed for watershed protection and forest health projects identified by the State Forest Service.

Appropriations:

No state appropriations were required in FY 2008-09.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Adopted)	
Bill Number: House Joint Resolution 08-1033	**Short Title:** Colorado Forest Health
Sponsors: *Rep. Lundberg* *Sen. Gibbs*	**Status:** Adopted
The General Assembly requested proactive forest management responses to the bark beetle epidemics in the state's national forests. Specifically, House Joint Resolution 08-1033 requested the support from the USFS, USDA, and the U.S. Congress for proactive management of Colorado forests and new funding mechanisms to reduce the likelihood of catastrophic fires due to the bark beetle epidemic. The resolution also conveys the General Assembly's aggressive support of implementing the recently passed federal law entitled the "Healthy Forests Restoration Act" and its community wildfire protection plans that involve at-risk communities.	**Appropriations:** Not applicable
Bill Number: Senate Joint Resolution 08-010	**Short Title:** Stewardship Contracting Forest Health
Sponsors: *Sen. Gibbs* *Rep. Scanlan*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning forest health stewardship: • that the U.S. Forest Service regional forester for the Rocky Mountain Region and the BLM Colorado State Director collaborate with the Colorado State Forester and key stakeholders to identify and obtain the necessary funding to implement up to three long-term (ten-year) stewardship contracts in Colorado; • that these stewardship contracts address forest conditions in Colorado's Front Range, High Country, and Southwest regions in a way that emphasizes community protection, provides for improved forest resilience, and offers locally based economic opportunities; and • that the Governor and Colorado's Congressional delegation work with the U.S. Department of Agriculture Undersecretary for Natural Resources and the Environment and the USFS Washington, D.C., office to facilitate the implementation of such stewardship contracts in Colorado.	**Appropriations:** Not applicable

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2008 Legislation (Adopted) (Cont.)			
Bill Number:	Senate Joint Resolution 08-025	**Short Title:** Create Interim Committee on Wildfire Issues in Wildland-Urban Interface Areas	
Sponsors:	*Sen. Kopp* *Rep. Witwer*	**Status:** Adopted	
This resolution created an eight-member committee, comprised of four senators and four representatives, to study wildfire issues in wildland-urban interface areas, to meet during the 2008 interim. The committee leveraged existing studies and analyses relating to wildfire in wildland-urban interface areas in order to develop a series of legislative recommendations to present to the General Assembly.		**Appropriations:** Not applicable	

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2007 Legislation (Enacted)	
Bill Number: House Bill 07-1130	**Short Title:** Forest Restoration Pilot Program
Sponsors: *Rep. Gibbs* *Sen. Fitz-Gerald*	**Status:** Signed into Law
The act created the Forest Restoration Pilot Program as part of the Colorado Forest Restoration Act. It directed the State Forest Service and the Division of Forestry within the Department of Natural Resources (DNR), to solicit proposals for experimental forest restoration projects that protect water supplies. Proposals were required to be collaborative, to be community-based, and to include cost-sharing elements. The state's share on any given project could not exceed 60 percent, and no more than 3 percent of the funds could be used for administrative expenses. Projects may be located on public or private land, but they must be located in an area with an approved community wildfire protection plan. The act also created a technical advisory panel of 7 to 11 members, appointed by the executive director of DNR, to assist the State Forest Service in the proposal selection process. The program was to be repealed and a report on the program was to be submitted to the Governor by July 1, 2008.	**Appropriations:** The act did not specify any appropriations for FY 2007-08. However, Senate Bill 07-122, *Concerning the Funding of Colorado Water Conservation Board Projects*, provided $1 million from the perpetual base account of the Severance Tax Trust Fund to the DNR for allocation to the Division of Forestry to implement the grant activities authorized in House Bill 07-1130.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2007 Legislation (Enacted) (Cont.)

Bill Number: House Bill 07-1168

Short Title: Forest Improvement Districts

Sponsors: *Rep. White*
Sen. Fitz-Gerald

Status: Signed into Law

The act added forest improvement districts to the types of special districts authorized in law. This allows a municipality or county to create or join a forest improvement district, subject to voter approval, to protect communities from wildfires and improve forest conditions. Forest improvement districts are authorized to seek voter approval to levy a sales tax and use such revenue to:

- plan and implement forest improvement projects in wildland-urban interface areas to reduce hazardous fuels and protect communities;
- establish financial incentives for private landowners to mitigate wildfire risks on their property;
- establish incentives for local wood products industries to improve the use of or add value to small-diameter or beetle-infested trees;
- match state and federal grants for bioheating conversion and infrastructure support for biomass collection and delivery; and
- assist the State Forest Service in ensuring that all communities at risk of wildfire within the district have adopted a community wildfire protection plan and are using appropriate planning, education, and outreach tools.

A landowner who performs wildfire mitigation measures can request reimbursement from the district, if the wildfire mitigation measures are performed in a wildland-urban interface area within the district boundary, authorized by a local government community wildfire protection plan, and approved by the district board. A landowner who qualifies for reimbursement from a district must file an application with the district board for reimbursement up to $10,000 or 50 percent of the landowner's direct costs of performing wildfire mitigation measures in a single year, whichever is less.

Appropriations:

No state appropriations were required in FY 2007-08.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2007 Legislation (Adopted)	
Bill Number: Senate Joint Resolution 07-006	**Short Title:** Stewardship Contracting Forest Health
Sponsors: *Sen. Fitz-Gerald* *Rep. Gibbs*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning stewardship contracting for forest health: • that the U.S. Forest Service regional forester for the Rocky Mountain Region and the BLM Colorado State Director collaborate with the state forester and key stakeholders to identify and obtain the necessary funding to implement up to three long-term (ten-year) stewardship contracts in Colorado; • that these stewardship contracts address forest conditions in Colorado's Front Range, High Country, and Southwest regions in a way that emphasizes community protection, provides for improved forest resilience, and offers locally-based economic opportunities; and • that the Governor and Colorado's Congressional delegation work with the U.S. Department of Agriculture's Undersecretary for Natural Resources and the Environment and the USFS Washington, D.C. office to facilitate the implementation of such stewardship contracts in Colorado.	**Appropriations:** No state appropriations were required in FY 2007-08.

Table 1 (Cont.)
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012

2006 Legislation (Enacted)

Bill Number: Senate Bill 06-096

Short Title: Resources To Fight Wildfires

Sponsors: *Sen. Taylor*
Rep. Butcher

Status: Signed Into Law

The act created the Wildfire Preparedness Fund and expanded the purposes for which the Wildfire Emergency Response Fund can be used. Pursuant to this act, the Wildfire Emergency Response Fund may be used to cover the costs of employing crews to fight a wildfire for the first two days of a wildfire, if the crew is requested by a county sheriff, municipal fire department, or fire protection district.

The act also required that $3.25 million in severance tax revenues be continuously appropriated from the Local Government Mineral Impact Fund to the Wildfire Preparedness Fund for FY 2006-07 through FY 2010-11. Moneys in the Wildfire Preparedness Fund are for wildfire preparedness activities and can be accessed by the State Forest Service for limited uses or upon executive order or proclamation of the Governor.

The act also authorized the Governor to enter into an interstate compact for the prevention and control of forest fires and also required that an annual state wildfire preparedness plan and a report on the use of money in the Wildfire Preparedness Fund be submitted to the Governor and the members of the General Assembly.

Appropriations:

The act required that $3.25 million be transferred annually from the Local Government Mineral Impact Fund to the Wildfire Preparedness Fund for FY 2006-07 through FY 2010-11. The Wildfire Preparedness Fund received transfers for FY 2006-07 and FY 2007-08.

2006 Legislation (Adopted)

Bill Number: House Joint Resolution 06-1021

Short Title: Colorado Forest Health

Sponsors: *Rep. Rose*
Sen. Isgar

Status: Adopted

This resolution commended the Forest Advisory Board and the Division of Forestry, and urged increased and equitable federal funding for forest management, fuels treatment, and insect and disease response in Colorado. Specifically, the resolution:

- commended the Forestry Advisory Board and Division of Forestry for their important work in highlighting the issues of concern and related opportunities for improvement of our state's forests and woodlands;
- expressed its support for management efforts that reduce wildfire and insect and disease risks to communities and natural resources and restore more resilient and sustainable conditions to Colorado forests; and
- urged the Colorado congressional delegation and federal land management agencies to secure increased and equitable federal funding for forest management, fuels treatment, and insect and disease response in Colorado.

Appropriations:

Not applicable

Table 1
Summary of State Legislation Concerning Forest Health / Wildfire Preparedness from 2005 to 2012 (Cont.)

2005 Legislation (Enacted)	
Bill Number: House Bill 05-1067	**Short Title:** County Fire Protection
Sponsors: *Rep. Buescher* *Sen. Teck*	**Status:** Signed into Law
The act authorized boards of county commissioners to erect firehouses, provide fire equipment and provide for the use and management of such firehouses and equipment. The act also specifically authorized the creation of public improvement districts (PIDs) within a county to construct, install, acquire, operate, maintain or provide fire protection. Creation of such a district would require approval through an election, including stipulations for increasing property taxes to cover the formation and operational costs of the district. A county fire protection PID would have the authority to levy property taxes, and fix rates, tolls and charges as other PIDs for the purpose of fire protection.	**Appropriations:** No state appropriations were required in FY 2005-06.

2005 Legislation (Adopted)	
Bill Number: House Joint Resolution 05-1039	**Short Title:** The Fiftieth Anniversary of the Colorado State Forest Service
Sponsors: *Rep. Hoppe* *Sen. Isgar*	**Status:** Adopted
The resolution provided the following directives from the General Assembly concerning the Colorado State Forest Service: • to recognize and celebrate the 50th anniversary of the Colorado State Forest Service and thank the many people who have generously served in this organization over the years; • renew our commitment to the health and sustainability of our state's valuable forest resources; and • encourage the Colorado State Forest Service to continue providing the quality service it is known for in protecting and enhancing the forests of Colorado.	**Appropriations:** No state appropriations were required in FY 2005-06.