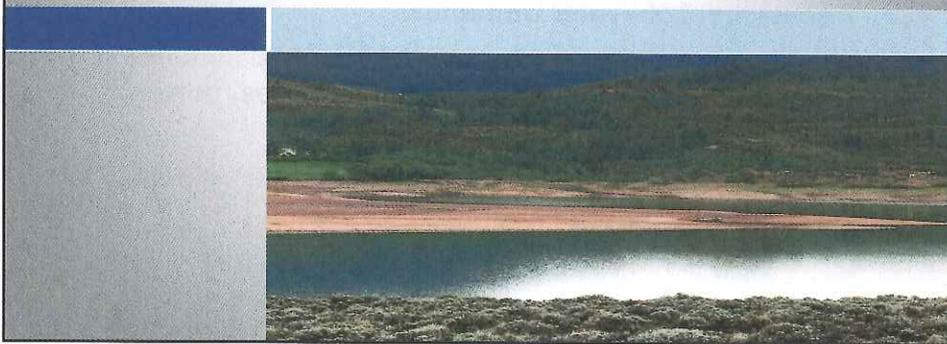




Colorado River Basin Water Supply & Demand Study, Drought Update, and SWSI update

Joint Agriculture Committee
February 6, 2013



Colorado River Basin Study



Study Objectives

- Assess future water supply and demand imbalances over the next 50 years.
- Develop and evaluate opportunities for resolving imbalances.
- Study conducted by the Basin States and Reclamation, in collaboration with stakeholders throughout the Basin.
- Began in January 2010 and completed in December 2012
- A planning study – does *not* result in any decisions, but will provide the technical foundation for future activities

Final Study Report



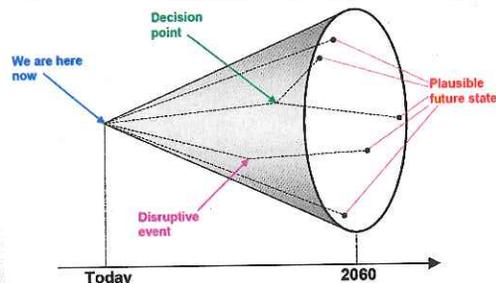
- The Final Study Report is available at the following website:
<http://www.usbr.gov/lc/region/programs/crbstudy/report1.html>
- The Final Study Report uses a scenario approach, and includes:
 - Assessment of Water Supplies
 - Assessment of Water Demands
 - Explores how the various supplies/demand imbalances affect important resources (Water deliveries, power, environmental and recreational metrics).
 - Explores how various options and strategies improve the reliability of important metrics.

3

Scenario Planning: Addressing an Uncertain Future



- The path of major influences on the Colorado River system is uncertain and cannot be represented by a single view.
 - An infinite number of plausible futures exist
 - A manageable and informative number of supply scenarios and demand scenarios (24) were explored.



(adapted from Timpe and Scheepers, 2003)

4

Historic Colorado River Water Supply & Use (Annual)

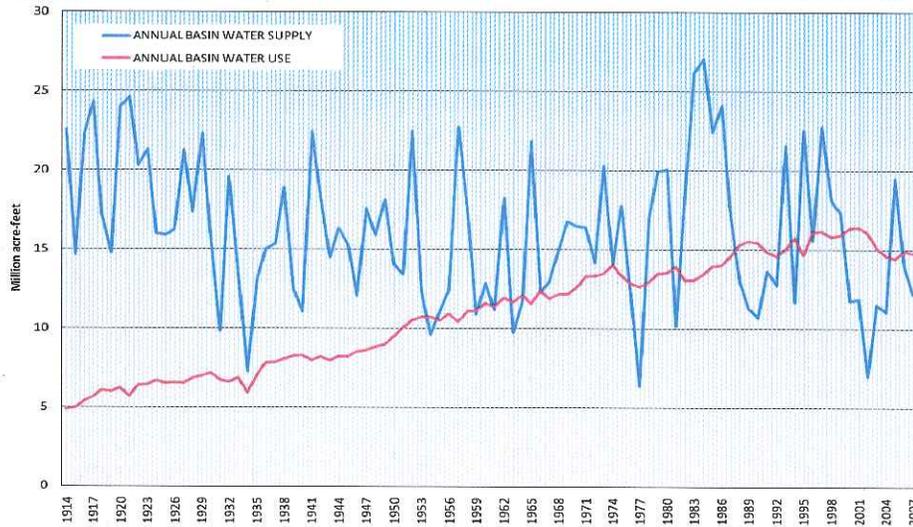
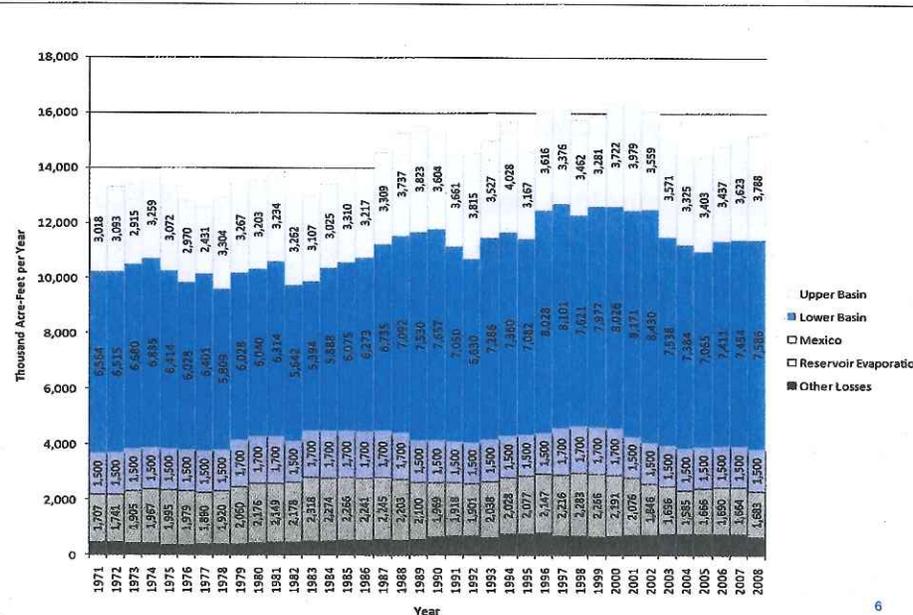


FIGURE C-6
Historical Colorado River Water Consumptive Use¹ by Basin², Delivery to Mexico, Reservoir Evaporation, and Other Losses³, 1971-2008



Law of the River Allocations



- 7.5 MAF to Upper Basin
 - 7.5 MAF to Lower Basin (4.4 CA; 2.8 AZ; 0.3 NV)
 - 1.0 MAF additional to Lower Basin
 - 1.5 MAF to Mexico (in most years)
- 17.5 MAF in allocations

7

Current Use Estimates

MAF/ year



<u>Upper Basin uses incl. reservoir evap.</u>	<u>4.0 - 4.5</u>
Lower Basin mainstem uses	7.5 - 7.5
Lower Basin reservoir evap.	1.0 - 1.5
<u>Lower Basin tributaries</u>	<u>2.0 - 2.5</u>
Total Lower Basin	10.5 - 11.5
Subtotal	14.5 - 16.0
<u>Add Mexico</u>	<u>1.5 1.5</u>
<u>TOTAL</u>	<u>16.0 - 17.5</u>

Source-CRWCD and summarized by REK before the CRBS

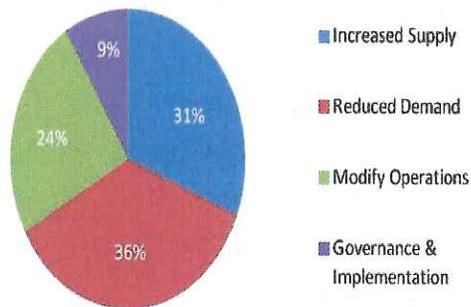
8

Summary of Options Submitted



- Over 150 options were submitted to the Study
- All options received were included and are reflected in the Study

Distribution of Options Received



Increased Supply – reuse, importation, desalination, etc.

Reduced Demand – M&I and agricultural conservation, etc.

Modify Operations – transfers & exchanges, water banking, etc.

Governance & Implementation – stakeholder committees, population control, re-allocation, etc.

9

Key Conclusions



- Demands in the Upper Division States do not reach or exceed apportionments by 2060.
- Lower Division demands already exceed apportionments.
- The average of the 112 Global Climate Models (GCMs) show 9% decrease in 2011-2060 average natural flow at Lees Ferry.
- While a number of GCMs show an increased likelihood of a Lee's Ferry Deficit by 2060, there is a minimal risk of a Lee's Ferry Deficit before 2026.
- "Signposts" of observable conditions can be used to identify the increased risk of a Lee's Ferry Deficit, and the State is developing risk management strategies in order to be prepared.

10



Next Steps

- Educational outreach.
- States are committed to supporting additional Climate Change research and model improvements.
- States are committed to working together on developing additional actions to take in the immediate future.
 - Augmentation feasibility
 - Water banking will continue to be explored
 - Working groups on Agriculture and M&I Conservation
 - Watershed options (weather modification, tamarisk)
- Explore Environmental and Recreational flow needs.
- Continue to work on an inclusive dialogue.

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U.S.-Mexico, Minute 319

1. Occurred in part due to the successes of Minute 316 (Yuma Desalter Operation) and 318 (Earthquake water)
2. Utilized the Process that was formalized in Minute 317 (The role of the States was recognized in the Consultative Council)
3. Points of Agreement:
 - Surplus and Shortage Sharing
 - Creation and Delivery of Intentionally Created Mexican Allocation (ICMA)
 - Water Exchanges
 - Water for the Environment
 - ICMA to Intentionally Created Surplus (ICS)



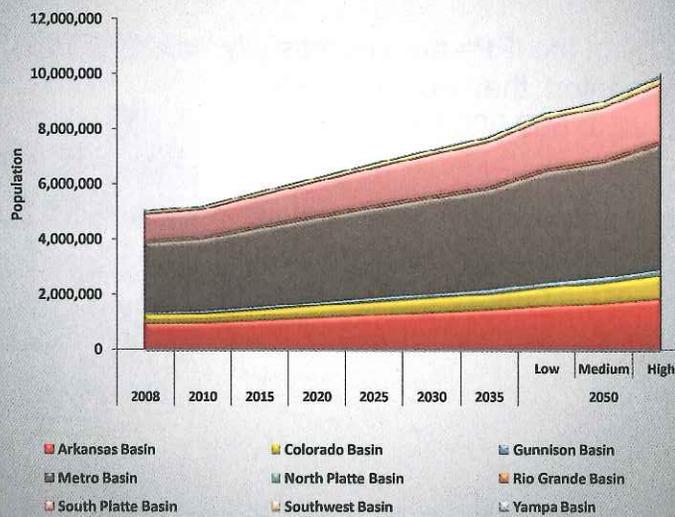
12



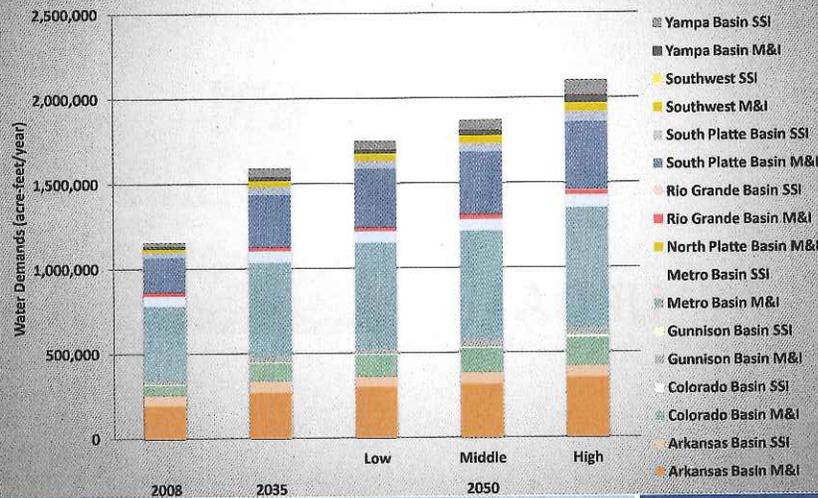
SWSI UPDATE



By 2050, Colorado's Population is Expected to Nearly Double



By 2050, Colorado will Need 600,000 to 1 Million AFY of Additional M&I Supply

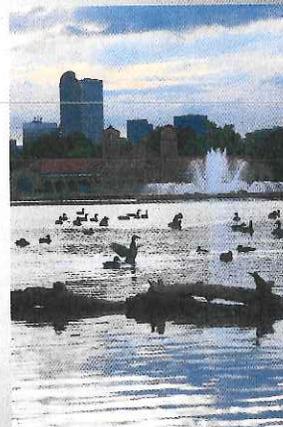


15

M&I Identified Projects and Processes



- If 100% of the IPPs are successfully implemented, they would provide 430,000 to 580,000 AFY
- IPPs, if successfully implemented, have the ability to meet some, but not all of Colorado's 2050 M&I water needs



16

M&I and SSI Gaps Estimated for Low, Medium, and High Scenarios



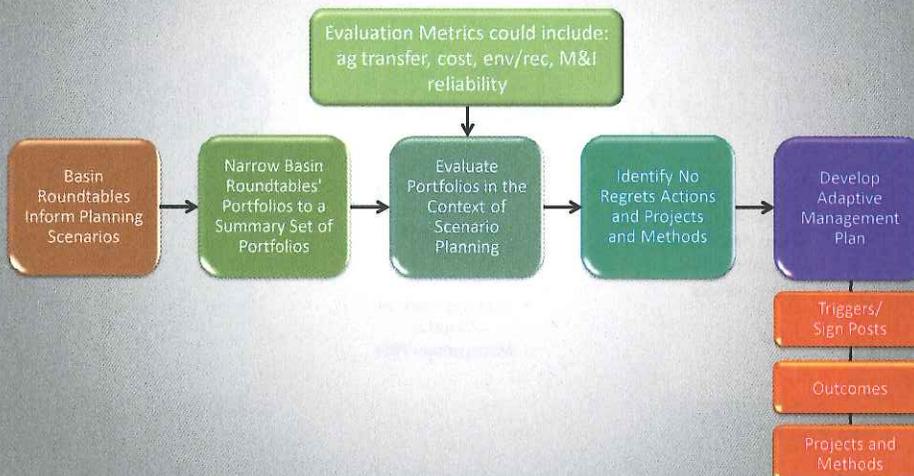
- **Low Gap Scenario:** Low M&I and SSI Demands with 100 percent IPP Yield Success
- **Medium Gap Scenario:** Medium M&I and SSI Demands with 70 percent IPP Yield Success
- **High Gap Scenario:** High M&I and SSI Demands with 60 percent IPP Yield Success

The 2050 Gap is estimated to be between 190,000 and 630,000 AFY

The 2050 Arkansas Basin Gap is estimated to be between 36,000 and 110,000 AFY

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IBCC's Approach to Scenario Planning and Adaptive Management



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Handout



	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
Population	4 people icons	3 people icons	4 people icons	5 people icons	6 people icons
Climate (precipitation/temperature)	Cloud with rain, thermometer icon, 'Hotter Wetter Current'	Cloud with rain, thermometer icon, 'Hotter Wetter Current'	Cloud with rain, thermometer icon, 'Hotter Wetter Current'	Cloud with rain, thermometer icon, 'Hotter Wetter Current'	Cloud with rain, thermometer icon, 'Hotter Wetter Current'
Energy Water Needs	Wind turbine, water pump, water tap icons				
Agricultural Demands/ Water Use	4 cow icons	3 cow icons	4 cow icons	5 cow icons	6 cow icons
Water Efficient Technology	Water tap icon				
Social/ Environmental Values	Wavy lines, fish icon				
Urban Land Use	4 house icons	3 house icons	4 house icons	5 house icons	6 house icons
Regulatory Constraints	Scales icon, 'Regulation Derogation'				
M&I Water Demands	4 water tap icons	3 water tap icons	4 water tap icons	5 water tap icons	6 water tap icons

2013 Milestones



Is Progress Being Made in Colorado?



- Yes.... especially in the area of planning
- Implementation takes time and is often aided by crisis
- "Who decides" remains an important consideration



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SWSI 2016 Common Technical Platform



- Utilize Technical Advisory Committee Concept to address SWSI 2016 common technical platform?
- Potential SWSI 2016 changes:
 - Incorporation of climate change into demand and supply analyses
 - Hydrologic variability (examine droughts and floods in addition to average conditions)
 - Agricultural gap?
 - Environmental gap?
 - Methodology

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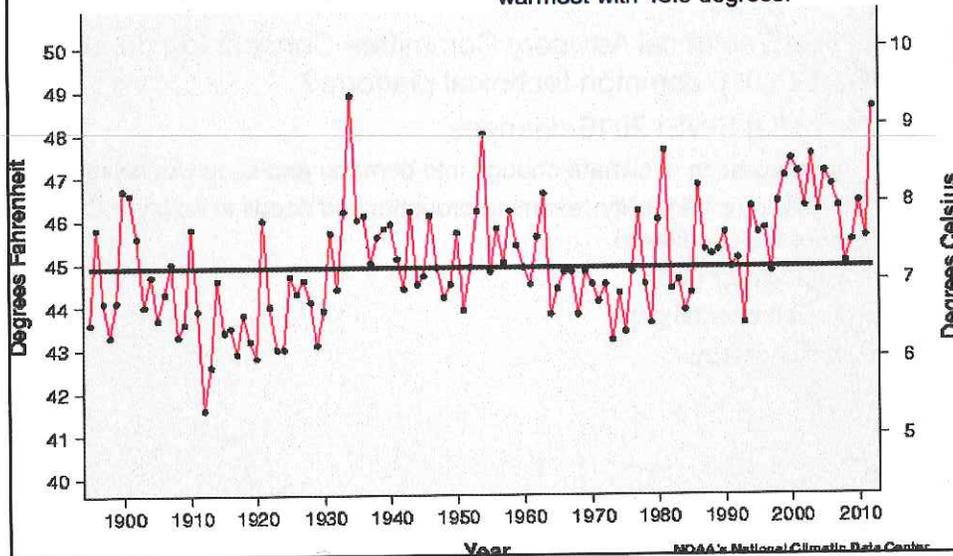
2011-2013

DROUGHT CONDITIONS & RESPONSE

Annual Average Temperature History for Colorado (NCDC)

— Actual Temperature
— Average Temperature

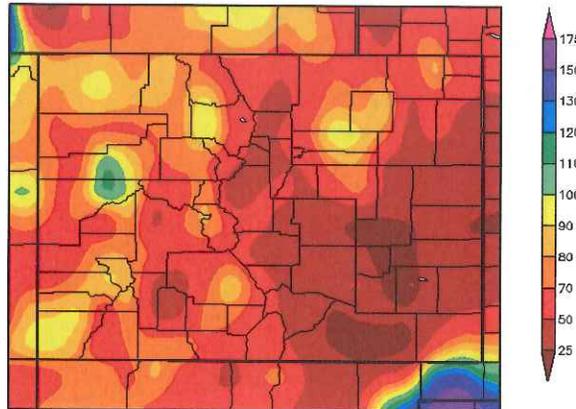
48.6 Ranks as the 2nd warmest on record 1895-2012. 1934 calendar year was warmest with 48.9 degrees.



Water Year Precipitation as Percentage of Normal



Percent of Normal Precipitation (%)
10/1/2012 - 2/4/2013



Generated 2/5/2013 at HPRCC using provisional data.

Regional Climate Centers

Total Change in Economic Activity across all Sectors in the Rio Grande

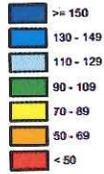
	Total Impact	Employment Loss
Barley	(755,819)	(20)
Corn (grain)	-	-
Hay	(11,690,515)	(50)
Potatoes	16,541,204	94
Sorghum	-	-
Sunflowers	-	-
Wheat	661,957	18
Total	4,756,827	42

Total Change in Economic Activity across all Sectors in the Arkansas

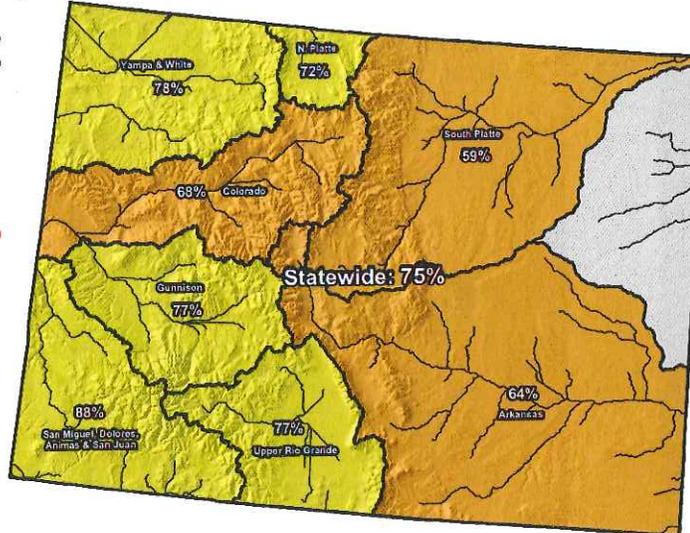
	Total Impact	Employment Loss
Barley	-	-
Corn (grain)	(48,087,345)	(630)
Hay	(21,176,058)	(236)
Potatoes	-	-
Sorghum	(14,750,428)	(193)
Sunflowers	(3,178,128)	(21)
Wheat	(17,548,434)	(230)
Total	(104,740,393)	(1,309)

Colorado SNOTEL Snowpack Update Map

Percent of Average



Provisional Data
Subject to Revision



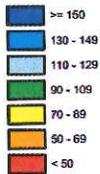
Current as of Feb 04, 2013

*Data may not provide a valid measure of conditions

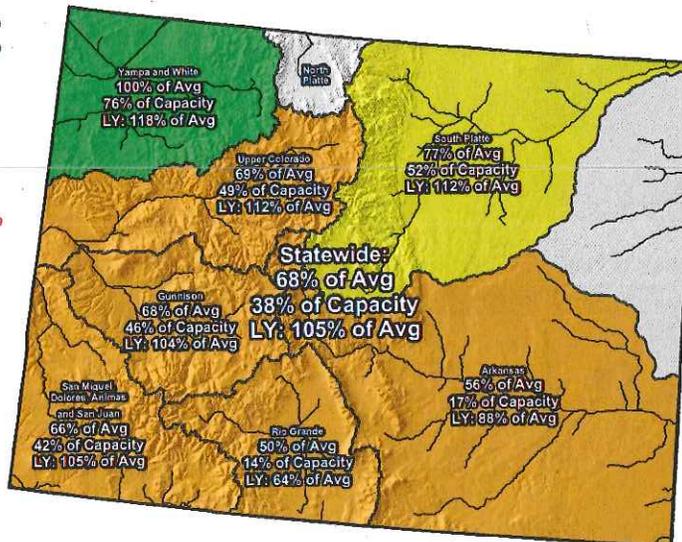
Colorado Reservoir Storage Map



Percent of Average

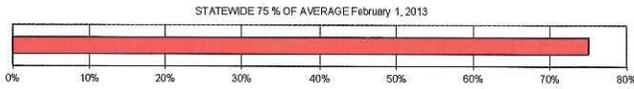


Provisional Data
Subject to Revision

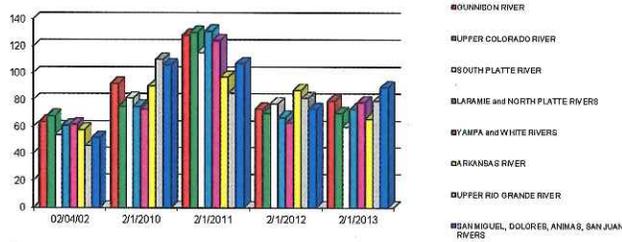


End of December 2012

Feb 2002 v. 2013 SNOTEL – Snow Water Equivalent Percent of Average



BASINS	02/04/02	2/1/2010	2/1/2011	2/1/2012	2/1/2013
GUNNISON RIVER	64	92	128	73	79
UPPER COLORADO RIVER	68	75	130	70	70
SOUTH PLATTE RIVER	54	81	115	77	60
LARAMIE and NORTH PLATTE RIVERS	61	75	131	67	73
YAMPA and WHITE RIVERS	62	73	124	63	78
ARKANSAS RIVER	58	90	97	87	66
UPPER RIO GRANDE RIVER	46	110	85	81	79
SAN MIGUEL, DOLORES, ANIMAS, SAN JUAN RIVERS	52	106	107	73	89



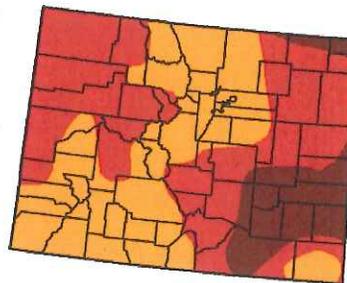
Current Drought Conditions



U.S. Drought Monitor Colorado

January 29, 2013
Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	59.58	13.50
Last Week (01/22/2013 map)	0.00	100.00	100.00	100.00	58.84	13.50
3 Months Ago (10/30/2012 map)	0.00	100.00	100.00	91.33	51.05	14.01
Start of Calendar Year (01/01/2013 map)	0.00	100.00	100.00	95.06	53.47	13.48
Start of Water Year (09/25/2012 map)	0.00	100.00	100.00	100.00	61.75	16.89
One Year Ago (01/29/2012 map)	29.16	70.84	41.13	10.60	0.20	0.00

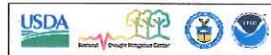


Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

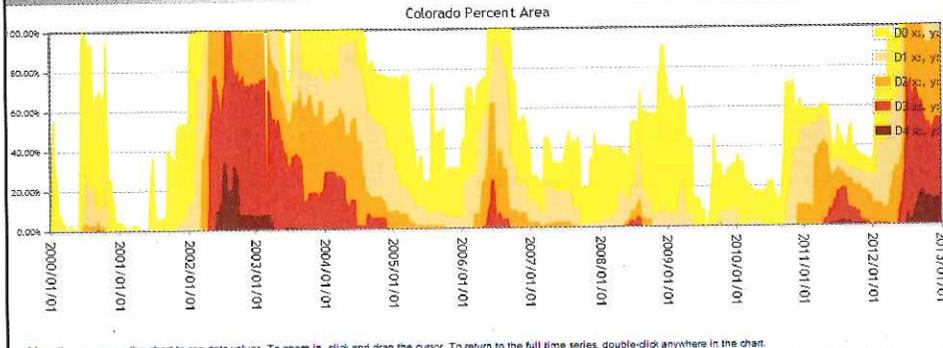
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu>



Released Thursday, January 31, 2013
Mark Svoboda, National Drought Mitigation Center

Time series showing drought in Colorado since 2000



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Week	Nothing	D0-D4	D1-D4	D2-D4	D3-D4	D4
January 29, 2013	0.00	100.00	100.00	100.00	58.58	13.50
January 22, 2013	0.00	100.00	100.00	100.00	58.64	13.50
January 15, 2013	0.00	100.00	100.00	100.00	58.64	13.50
January 8, 2013	0.00	100.00	100.00	95.08	53.47	13.48
January 1, 2013	0.00	100.00	100.00	95.06	53.47	13.48
December 25, 2012	0.00	100.00	100.00	95.06	53.47	13.48
December 18, 2012	0.00	100.00	100.00	95.06	53.47	13.48
December 11, 2012	0.00	100.00	100.00	95.06	53.43	13.48
December 4, 2012	0.00	100.00	100.00	95.06	53.43	13.48
November 27, 2012	0.00	100.00	100.00	93.27	51.05	12.56
November 20, 2012	0.00	100.00	100.00	91.52	48.56	12.56
November 13, 2012	0.00	100.00	100.00	91.52	48.56	12.50
November 6, 2012	0.00	100.00	100.00	91.33	48.56	13.69
October 30, 2012	0.00	100.00	100.00	91.33	51.05	14.01
October 23, 2012	0.00	100.00	100.00	91.36	51.05	14.01
October 16, 2012	0.00	100.00	100.00	91.36	51.05	14.01
October 9, 2012	0.00	100.00	100.00	91.93	53.07	14.02
October 2, 2012	0.00	100.00	100.00	97.91	55.48	16.40
September 25, 2012	0.00	100.00	100.00	100.00	61.75	16.89
September 18, 2012	0.00	100.00	100.00	100.00	61.75	16.89
September 11, 2012	0.00	100.00	100.00	100.00	61.95	16.13
September 4, 2012	0.00	100.00	100.00	100.00	64.08	13.76
August 28, 2012	0.00	100.00	100.00	99.96	67.31	12.30
August 21, 2012	0.00	100.00	100.00	99.96	68.38	9.64
August 14, 2012	0.00	100.00	100.00	99.96	68.37	9.19
August 7, 2012	0.00	100.00	100.00	99.96	65.46	5.67
July 31, 2012	0.00	100.00	100.00	99.70	65.35	3.27
July 24, 2012	0.00	100.00	100.00	99.70	73.67	2.62
July 17, 2012	0.00	100.00	100.00	100.00	70.46	1.77
July 10, 2012	0.00	100.00	100.00	99.99	70.46	5.52
July 3, 2012	0.00	100.00	100.00	100.00	70.69	5.52
June 26, 2012	0.00	100.00	100.00	97.72	45.83	0.00
June 19, 2012	0.00	100.00	97.71	60.96	26.63	0.00

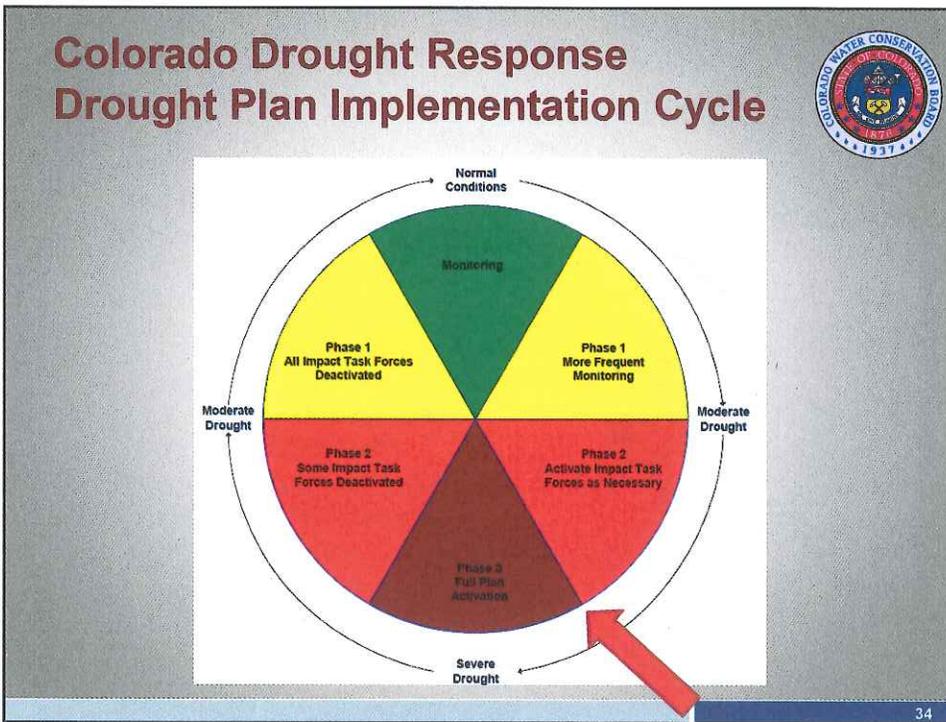
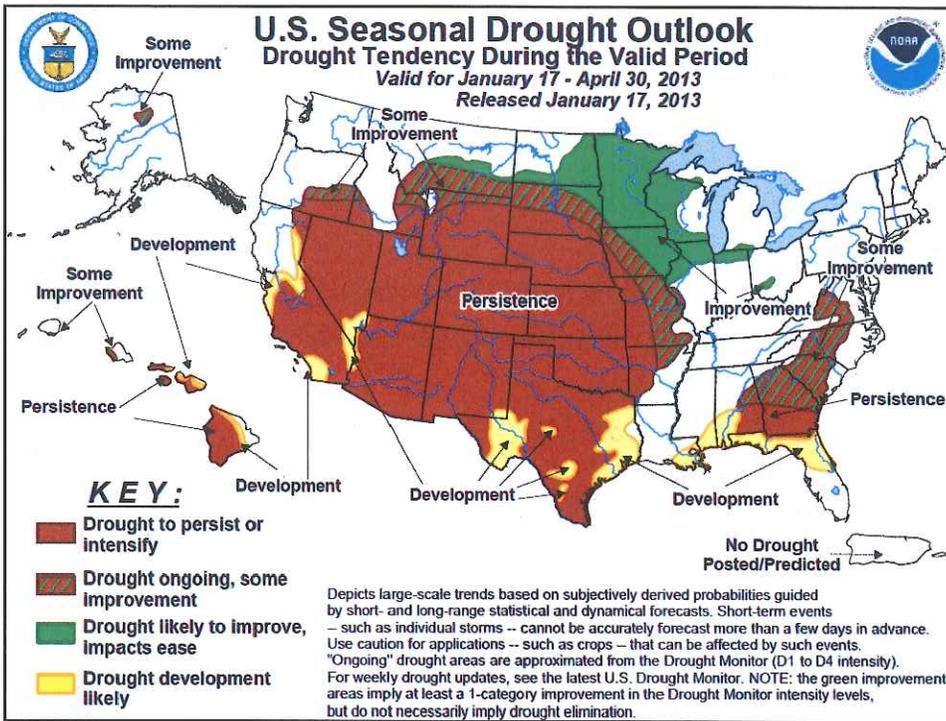


■95% of the state has been in some form of drought classification since March 27, 2012.

■50% or more of the state has been classified at some level since January 17, 2012.

■Since 2000 Colorado has consistently experienced drought some place in the state.

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Next Steps...



- Gearing up for dry conditions this spring
- Continued monitoring
- Continued and frequent communication with DTF/ Ag ITF
- Engaging additional stakeholders- including other ITFs
- Tracking Impacts
- Coordination with, & support for, Water Providers
- Estimating the short and long-term economic and social impacts from 2012 (Joint partnership with Dept of Agriculture, CSU & Farm Credit Services of Southern Colorado)
- Collaboration with neighboring state regarding drought response and mitigation actions (NDMC/ NIDIS)
- 2013 Drought Plan Update

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Questions?



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