COLORADO AIR QUALITY CONTROL COMMISSION

AGENDA ITEM SUMMARY

Item Title: Climate Change and Greenhouse Gases Workgroup Briefing

Meeting Date: August 21, 2014

TYPES OF ACTION

NON-HEARING ACTIONS	*REQUEST FOR HEARING*	*HEARING*
__ Administrative	__ Rulemaking	__ Rulemaking
x Briefing	__ Public	__ Public
__ Policy	__ Adjudicatory	__ Adjudicatory
__ Other	__ Informational	__ Informational

RECOMMENDED ACTION

__ Adoption __ Approval __ Denial

MOTION

__ Required __ Attached x Not Applicable

STATUTORY AUTHORITY

General ____ Specific _____

EPA SUBMITTAL

Is this issue considered a SIP revision? _NO___x____

Which SIP? N/A_____

EPA submission deadline: N/A_____

Is this a delegated program? ___NO_____

ISSUE STATEMENT:

The Colorado Department of Public Health and Environment, Air Pollution Control Division ("Division") will brief the Colorado Air Quality Control Commission ("Commission") on the following topics as part of the Climate Change and Greenhouse Gases Workgroup:

- Climate Change 101 - high level discussion to prepare for the technical inventory discussion in September
- Climate Change coordination at CDPHE with the Colorado Energy Office and the Colorado Water Conservation Board (HB 13-1293)

ATTACHMENTS:

(1) Presentation (provided in supplemental mailing)

SIGNATURES:

1. Theresa Takushi 7.30.14
Theresa Takushi, Preparer Date

2. 7/30/14
Garry Kaufman, Supervisor or Program Manager Date

3. Kristen Lomia King For Will Allison 8/6/14
Will Allison, Division Director Date

Greenhouse Gas Basics

Preparation for the GHG Inventory Discussion

&

Climate Coordination

Theresa Takushi

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Overview

- GHG Basics
  - Gases in the Earth's Atmosphere
  - Greenhouse Gas Effect
  - Greenhouse Gases – What is included
  - Carbon Dioxide Equivalent
  - Global Warming Potential
    - Time Horizon
  - The Global Carbon Cycle

- Climate Coordination
  - Agencies Involved
  - Adaptation
  - Mitigation
  - Vulnerability

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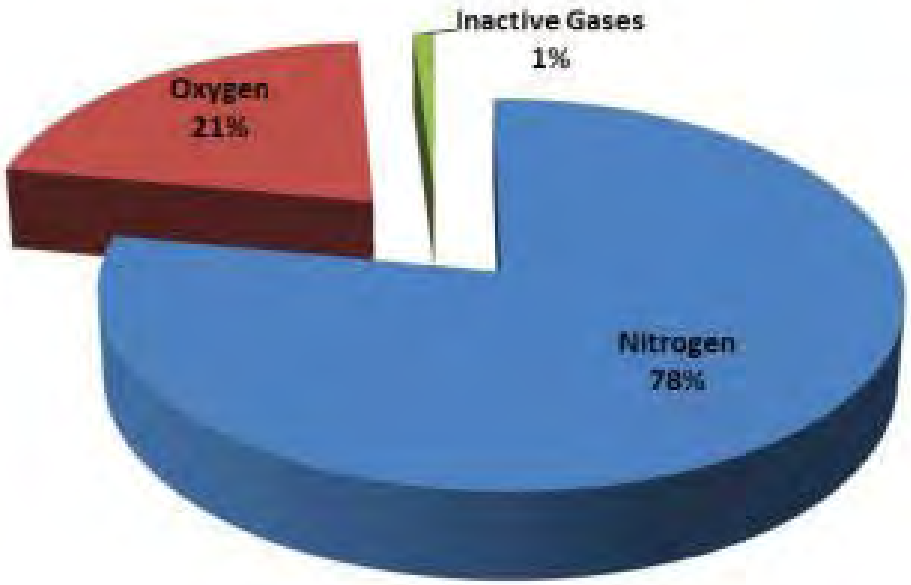
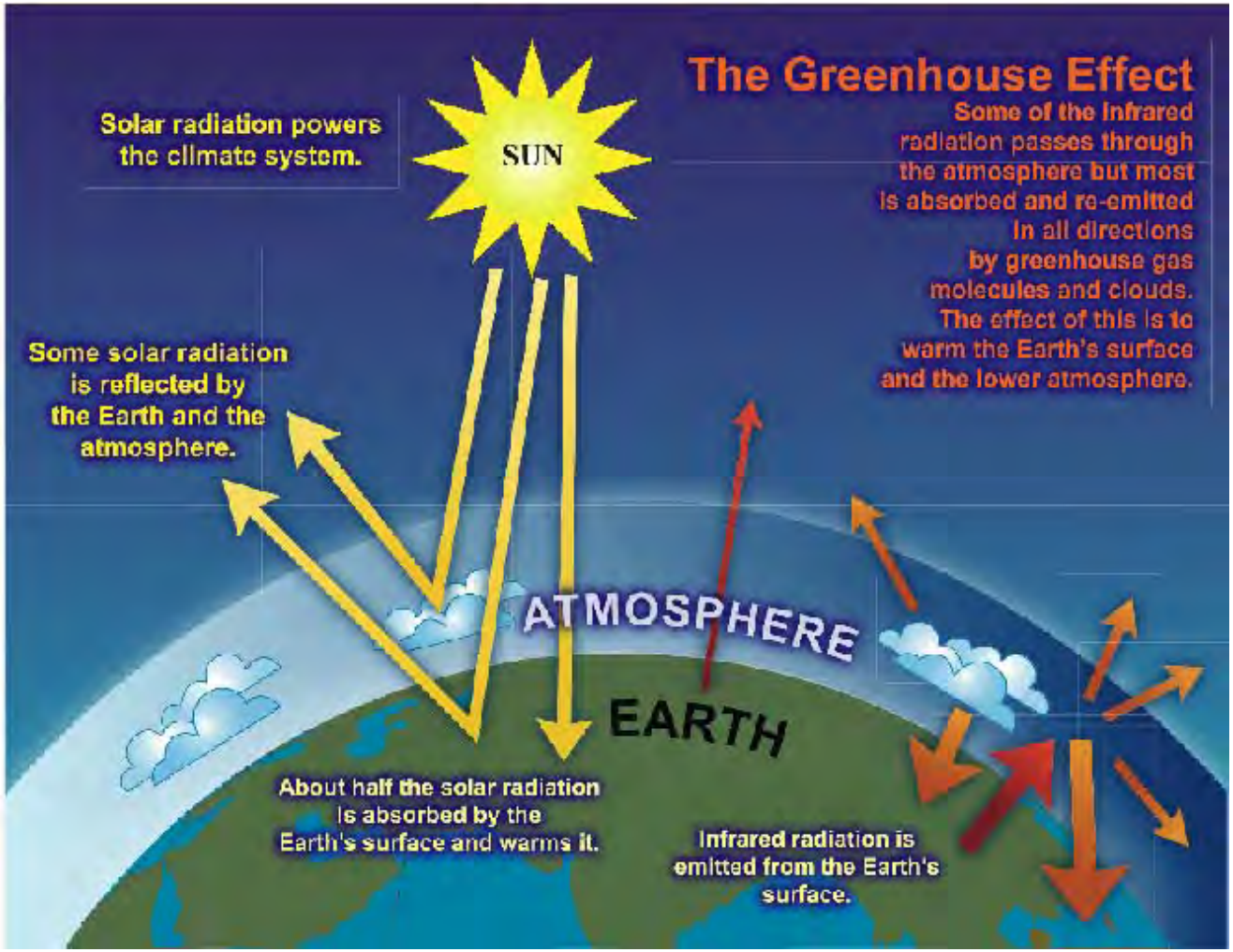
Gases in Earth's Atmosphere



http://www.ces.fau.edu/nasa/module-2/atmosphere/earth.php



http://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/#.U9_CKuNdWdc

GHG – What is included

- Carbon dioxide (CO_2):
  - *Source:* living organisms, burning of fossil fuels
  - 85% of US emissions

- Methane (CH_4):
  - *Source:* coal formations, natural gas development, landfills, livestock digestive processes, decomposing waste
  - 12% of US emissions

Source: http://www.state.gov/www/global/oes/fs_sixgas_cop.html

GHG – What is included

- Nitrous Oxide (N2O):
  - *Source:* fuel burning, fertilizer manufacturing
  - 2.5% of US emissions
- Hydrofluorocarbon gases (HFC):
  - *Source:* refrigeration, semi-conductor manufacturing
- Perfluorocarbons (PFC):
  - *Source:* aluminum smelting, uranium enriching, semi-conductors
- Sulfur Hexafluoride (SF6):
  - *Source:* high-voltage equipment, insulation for manufacturing cable cooling systems

Source: http://www.state.gov/www/global/oes/fs_sixgas_cop.html

Global Warming Potential (GWP) Carbon Dioxide Equivalent (CO2e)

GHG		GWP		CO2e
CO2	X	1	=	1 CO2e
CH4	X	21	=	21 CO2e
N2O	X	310	=	310 CO2e
HFC	X	17,200	=	17,200 CO2e
PFC	X	17,340	=	17,340 CO2e
SF6	X	23,900	=	23,900 CO2e
GHG				Total GHG CO2e

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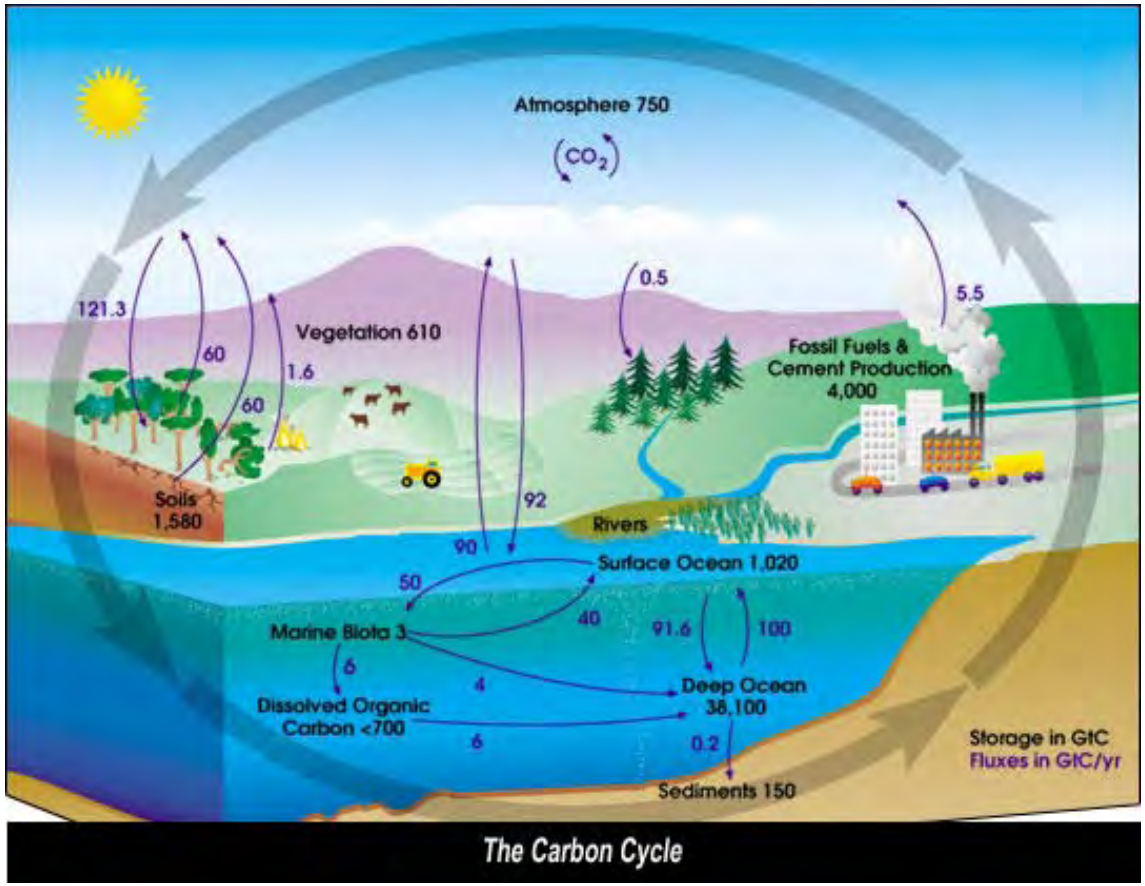
GWP Time Horizon

GHG	500 Year	100 Year	20 Year
CO2	1	1	1
CH4	6.5	21	56
N2O	170	310	280

http://epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Annex-6-Additional-Information.pdf

The Global Carbon Cycle



http://www.global-greenhouse-warming.com/global-carbon-cycle.html

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Climate Coordination at CDPHE

Climate Coordination at CDPHE

- Greening Government
- HB 13-1293

Greening Government

- Reduce energy use by 20%
- Reduce paper use by 20%
- Reduce water consumption by 10%
- Reduce state vehicle petroleum consumption by 25% (volumetric reduction)
- Achieve a 75% waste diversion goal by 2020
- State agencies shall achieve reductions in greenhouse gas (GHG) emissions of 20% below 2005 levels by 2020. By 2050, state agencies must reduce GHG emissions by 80% below 2005

http://www.colorado.gov/cs/Satellite/GovEnergyOffice/CBON/1251597774824

HB 13-1293

"The general assembly hereby declares that climate change presents serious, diverse, and ongoing issues for the state's people, economy, and environment…ensure that the state is apprised of the threats that climate change poses to Colorado and the progress made to mitigate and address those threats…"

- Collaboration with other entities regarding climate change preparedness studies.
- Annual Report to legislature
  - Efforts to reduce emissions of gases and to reform practices known to exacerbate climate change
  - Efforts (proposals) to prepare the state for the effects of Climate change

HB 13-1293

- Key Agencies
  - Colorado Energy Office
    - Mitigation of GHG Emissions
  - Colorado Water Conservation Board
    - Adaptation and studies of climate change in Colorado
  - Colorado Department of Public Health and Environment
    - Environmental & health aspects of climate change

any anthropogenic interventions that can either reduce the sources of greenhouse gas (GHG) emissions (abatement) or enhance their sinks (sequestration)

Primary agencies: CDPHE, CDA, CEO

MITIGATION

Colorado Department of Public Health and Environment

- CDPHE update to the Colorado Greenhouse Gas Inventory
- Title V Permits for the largest sources of GHG emissions
- Rulemaking for Oil and Gas that regulates hydrocarbons
- Climate Change and Greenhouse Gases Work group
  - Workgroup of the Air Quality Control Commission
- Monitor for vector borne diseases

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Colorado Dept. of Agriculture

Focus on energy efficient pilot projects that reduces the use of electricity from the grid due to agricultural applications

- Mirco-hydropower applications
  - Completed analysis of opportunities for development in Colorado
  - Will help several producers implement on pivot irrigation systems in 2014
- Development of renewable heating and cooling applications
  - Completed analysis of opportunities for development in Colorado
  - 2014/15, CDA will help several producers install in various agricultural sectors (e.g., dairies, livestock watering, greenhouses)

CDA Efforts Continued…

- Heartland Biogas Anaerobic Digester
  - 20-megawatt-equivalent anaerobic digester (AD) facility that is capable of producing renewable natural gas in Weld County
  - waste conversion process will preclude the release of pollutants to the environment and will reduce the emission of significant amounts of greenhouse gas to the atmosphere.
  - Expected to be fully operational in 2015

- Agricultural Energy Efficiency Program (joint with CEO)
  - focuses on irrigator and dairy energy efficiency
  - 2014 pilot to help irrigators determine electricity use, makes cost-effective recommendations to improve energy efficiency, and helps fund the installation of more energy efficient technology (new pumps, chillers, lights, etc)

Colorado Energy Office

Mission:

- *To improve the effective use of all of Colorado's energy resources and the efficient consumption of energy in all economic sectors, through providing technical guidance, financial support, policy advocacy and public communications.*
  - While not developed as climate change mitigation activities, many of the CEO's programs do effectively result in reduced GHG emissions.
  - CEO will continue to help Coloradoans live more prosperous and healthy lives by promoting innovative energy production and efficient energy consumption practices that are beneficial to the economic and environmental health of the state.

ADAPTATION

changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change

Primary agencies: DNR/CWCB, CEO

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COLORADO WATER CONSERVATION BOARD EFFORTS

Update to the Climate Change in Colorado Report (2014)

- A synthesis of climate change science important for Colorado's water supply.
- Observed trends, modeling, and projections of temperature, precipitation, snowmelt, and runoff.
- Colorado-specific findings from peer-reviewed regional studies
- Presents new graphics derived from existing datasets.

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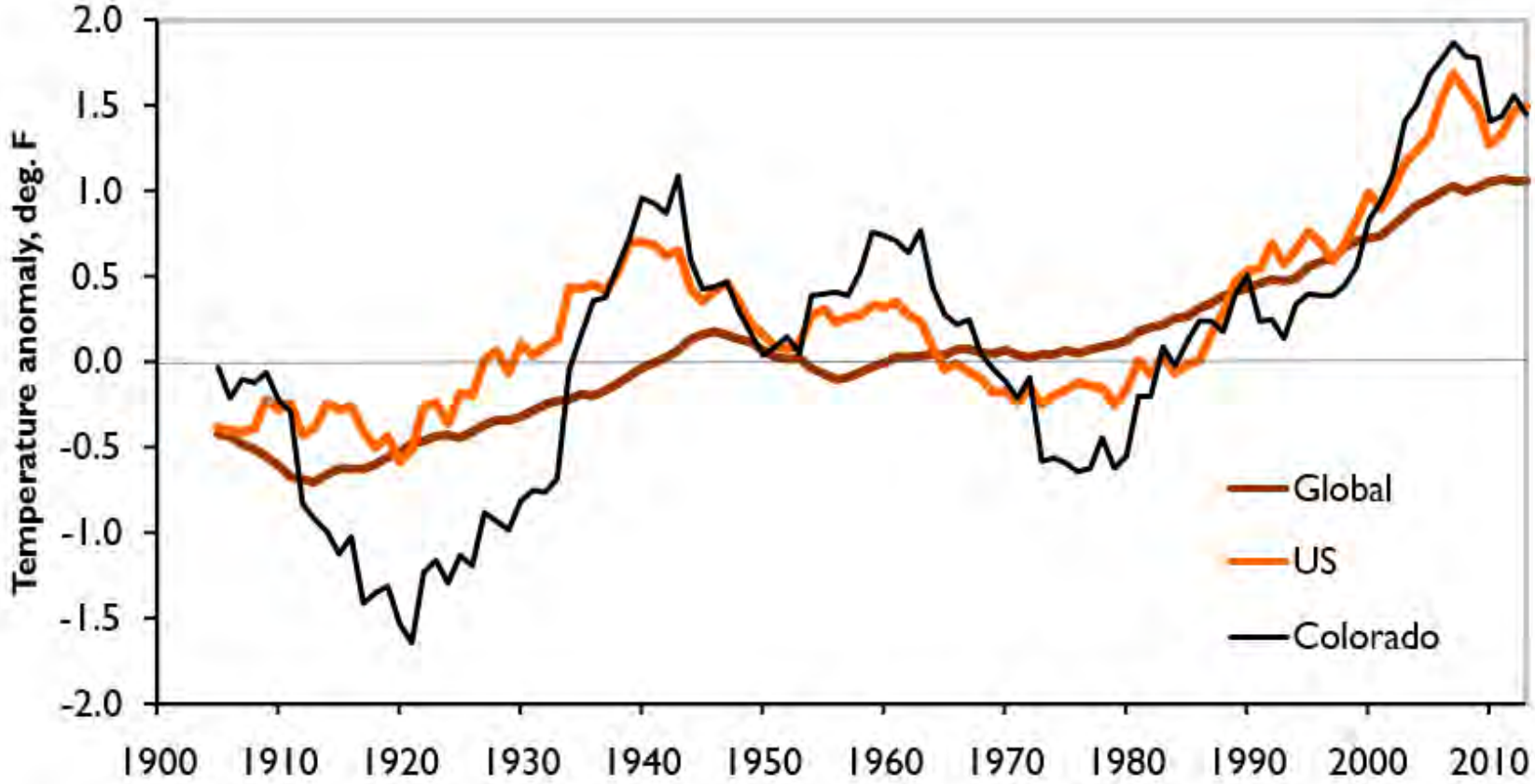
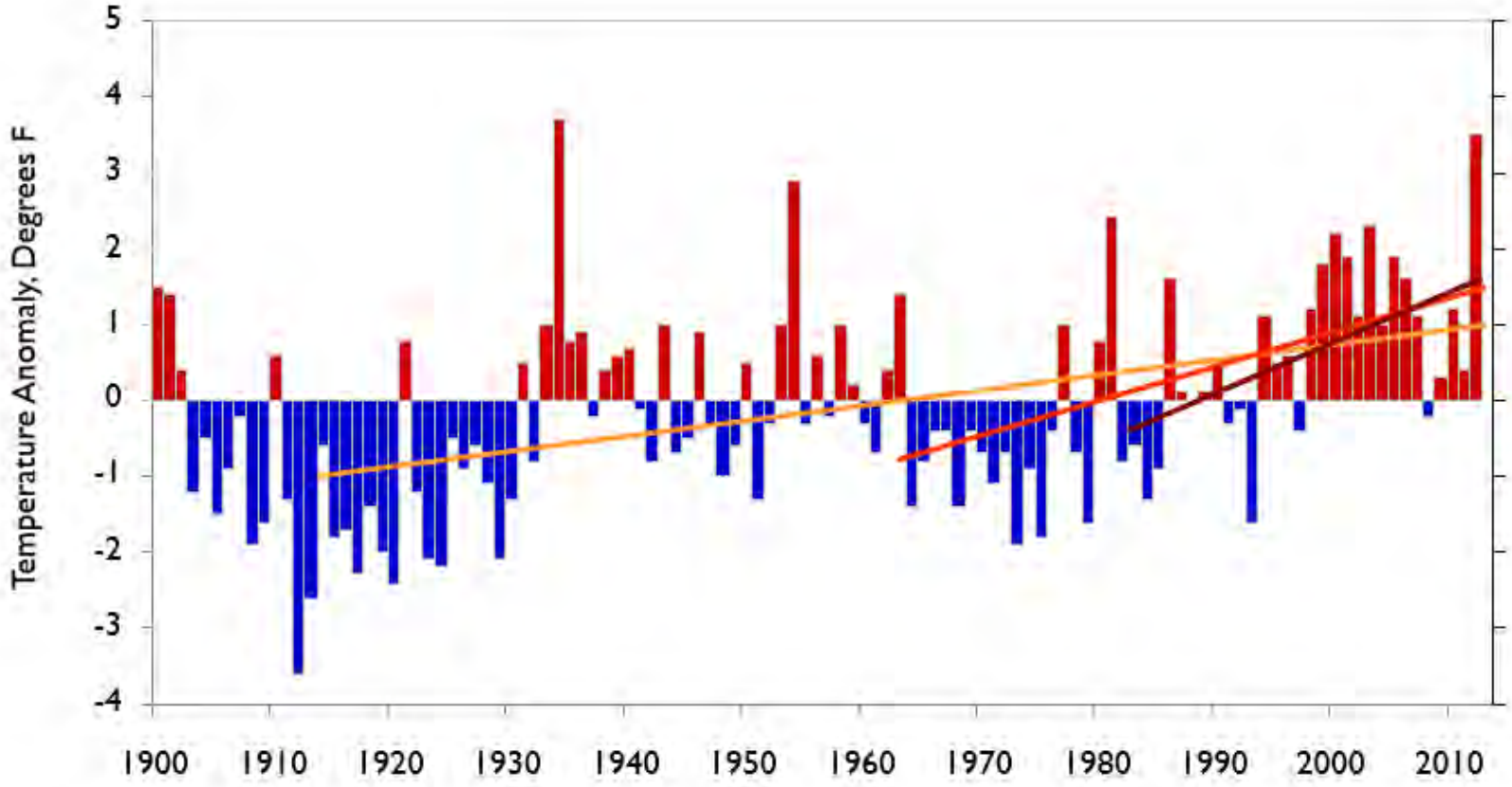
Graphic from Draft Report



Observed temperature departures for Colorado, the US, and globally, smoothed with a 10-year running mean

Climate variability is relatively larger at smaller scales, as seen in the US and Colorado time-series. You shouldn't judge the global trends from what is going on in Colorado. But all three records have followed a similar trajectory since 1900.

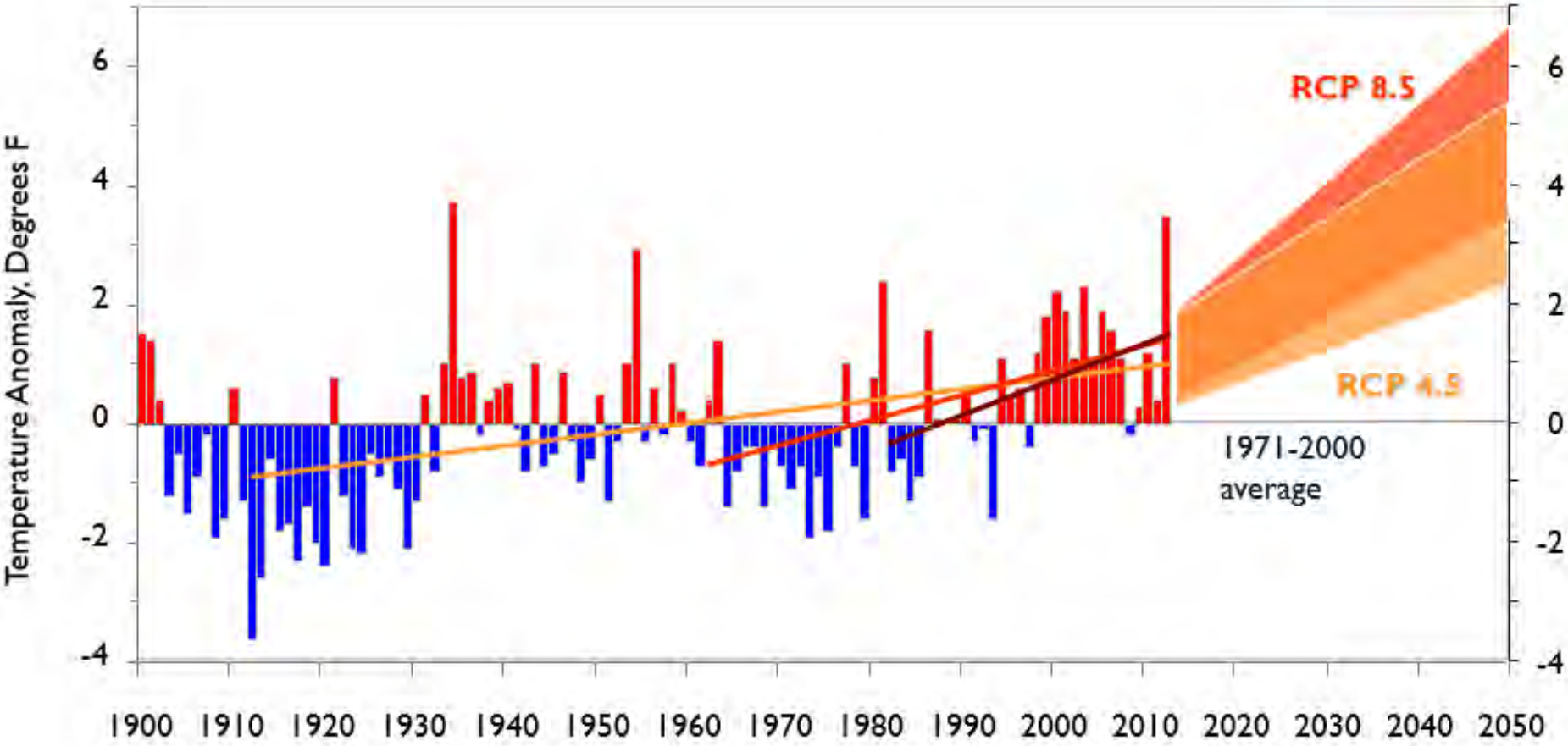
Graphic from Draft Report



Colorado average annual temperatures (°F) from 1900 to 2012

Annual temperatures are shown as departures from a 1971-2000 reference period. The nes are the 100-year, 50-year, and 30-year trends, respectively. All cant. (Source: NOAA NCDC)

Graphic from Draft Report



Observed Colorado temperatures and projected temperatures by 2050

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Graphic from Draft Report

2050 Temperature Projections in Context

2° F: **Denver**'s seasonal temperature cycle will become more like **Pueblo** today

4° F: **Denver**'s seasonal temperature cycle will become more like **Lamar** today

6° F: **Denver**'s seasonal temperature cycle will become more like **Albuquerque** today

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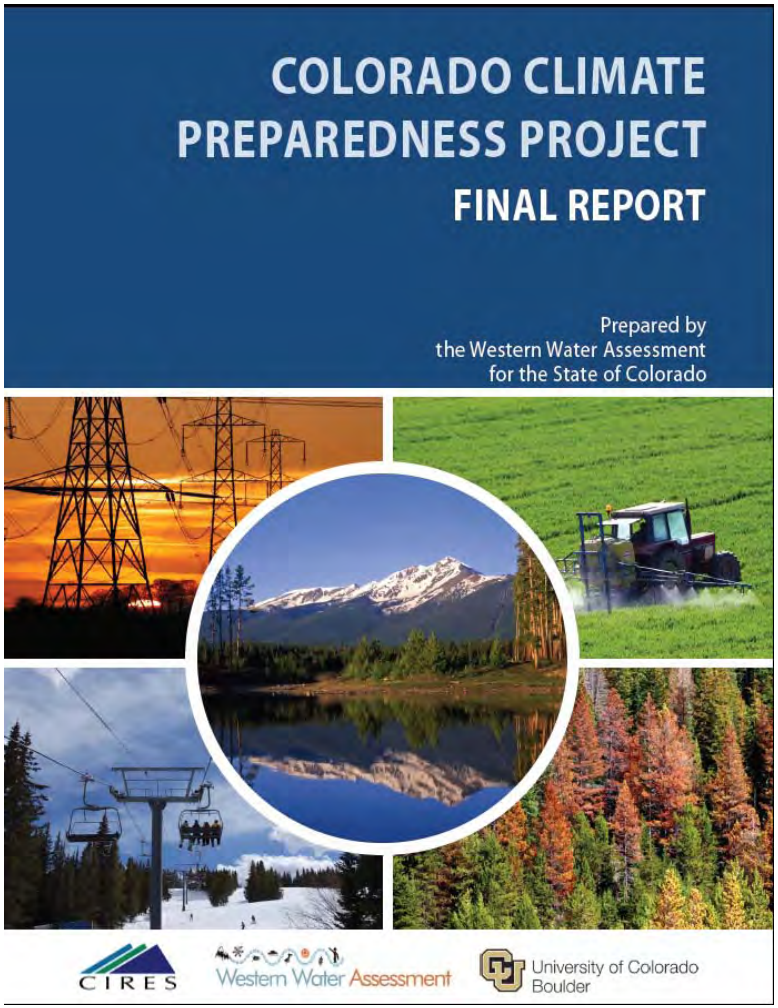
Colorado Climate Preparedness Report (2011)



Collaborative effort between CWCB, CEO, CDA and CDPHE

- Adaptation will require coordination
- Monitoring is a critical element of climate adaptation
- More complete impacts and vulnerability assessment is needed to prioritize Colorado's key climate threats and vulnerabilities
- Climate impacts on water resources—e.g., changes in runoff patterns, snowpack, and storage—are a significant source of impacts
- The state is already engaged in many activities, additional research is needed
- Inherent uncertainty of long-term climate projections and the incompatibility of the timescales of climate change with existing planning regimes.

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Other Efforts from CWCB

- Colorado River Water Availability Study
- Colorado River Basin Water Supply and Demand Study
- Climate Change Incorporation into Colorado Water Plan
- Climate Change Incorporation into Statewide Water Supply Initiative (SWSI) 2016

Climate Change Vulnerability Study

- Lead Agency: CEO
  - Project Goal: To provide an assessment of the **key climate change vulnerabilities** facing Colorado's economy and resources.
  - Qualitatively assesses vulnerabilities in the following sectors:
    - Water
    - Energy
    - Public Health
    - Transportation
    - Ecosystems
    - Agriculture
    - Tourism
  - Conducted by researchers at CU & CSU

Questions?