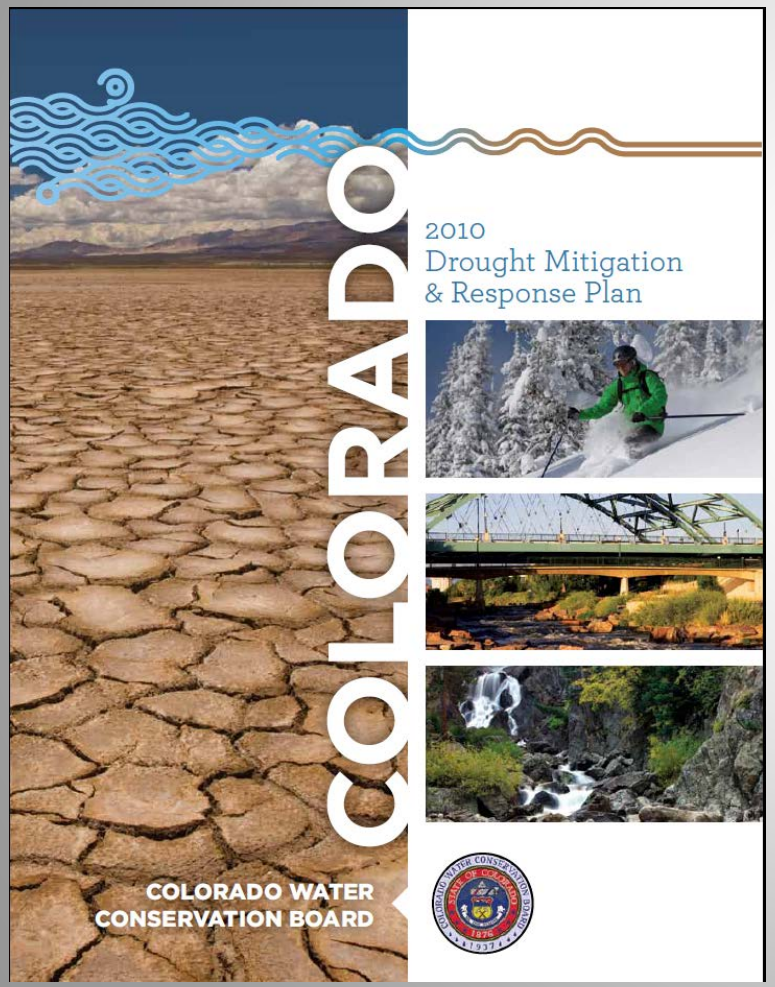
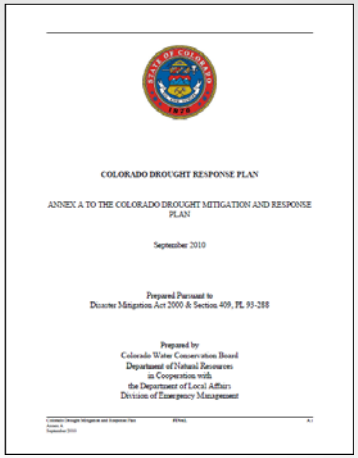
2010 Colorado Drought Mitigation and Response Plan

NIDIS/ NDMC Engaging Preparedness Communities
The Summit Executive Centre, Chicago, IL
June 2011

Drought Mitigation and Response Plan

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September 2010

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Prepared by
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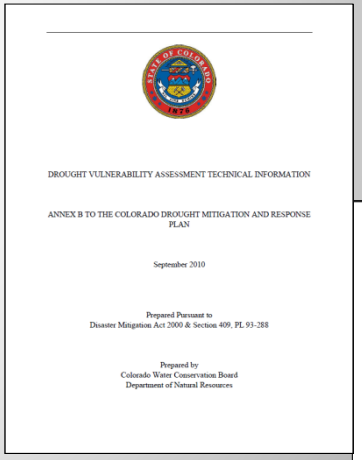
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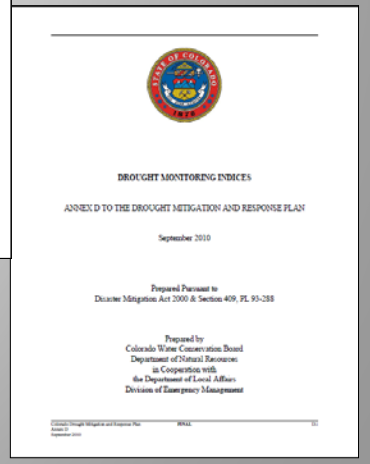
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Drought Monitoring Indices

Key Changes in the 2010 Plan Revision

Planning Process

- Extensive planning effort documented
- Multi-agency outreach and coordination
- More clearly defined and revised plan maintenance process

Vulnerability Assessment

- Revised with latest climate science
- Developed drought vulnerability methodology
- Includes EMAP consequence analysis
- Updated drought indices

Key Changes in the 2010 Plan Revision

Coordination of Local Mitigation Planning

- Information revised with changes and assistance provided in past 3 years

Mitigation Strategy

- Goals re-assessed and revised to reflect current priorities
- Mitigation Action table expanded and organized by goal
- Actions revised and prioritized
- New actions developed
- Comprehensive capability assessment review
- Funding sources revised

Key Changes in the 2010 Plan Revision

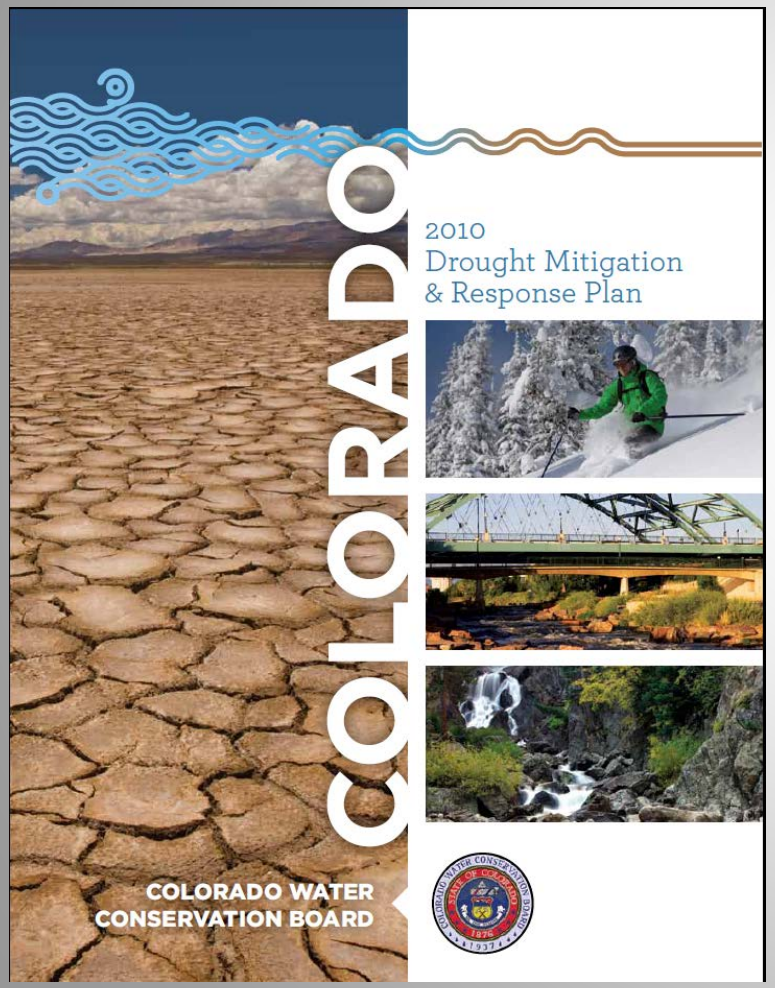
Drought Response Plan Annex

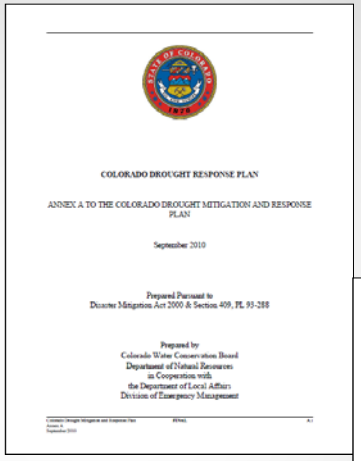
- Response elements from 2002 plan consolidated in Annex.
- NIMS compliant response and recovery plan format
- Streamlined response framework
- Consolidated Impact Task Force framework

Mitigation Action Strategy

- Sample actions include:
  - Collect climatologic data at mid & lower elevations to fill existing gaps in the data collection network
  - Integrate and correlate the State Drought Mitigation Plan with other statewide planning efforts
  - Develop a state-wide drought messaging campaign
  - Construction of water storage facilities on State Trust Land
  - Integrate results, tools and methods from the 2010 vulnerability assessment to improve local hazard mitigation plans
  - Evaluate the relationship/interaction between both drought and water conservation on water quality of streams as well as health related consequences
  - Continue to pursue improved climate data to inform the planning process

Drought Mitigation and Response Plan

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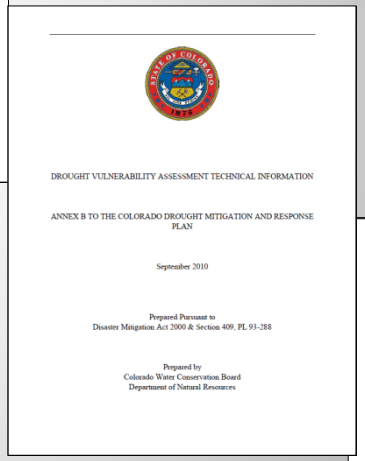
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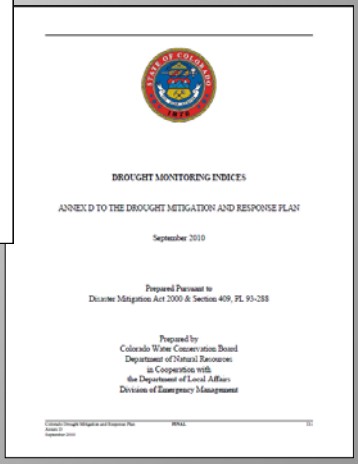
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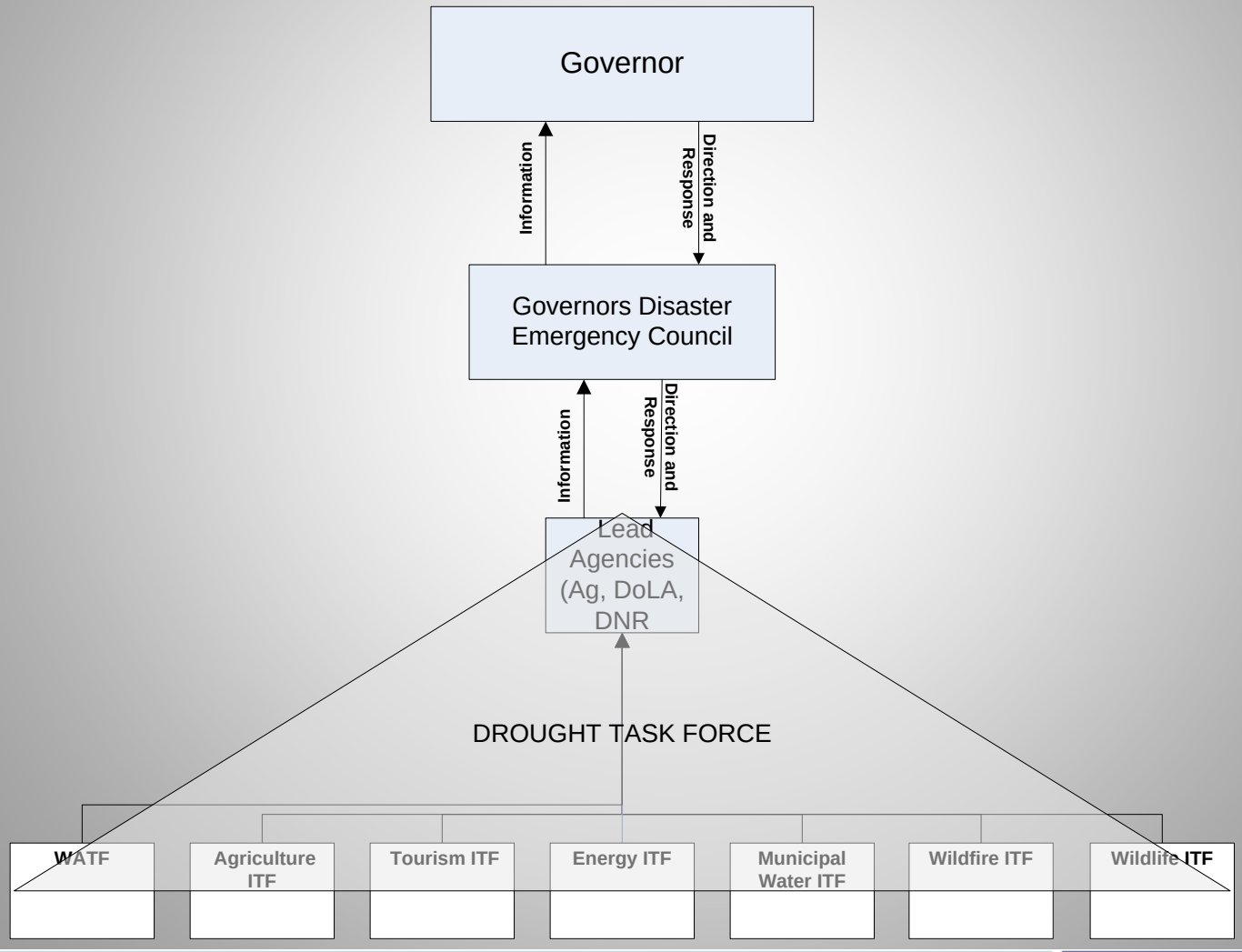
Drought Monitoring Indices

Response Element Key Updates

- Aligned with modern emergency planning guidelines
- Impact Task Force structure evaluated modified
- Response framework evaluated, modernized and streamlined
- Roles and responsibilities of state agencies updated
- Roles and responsibilities of Impact Task Forces updated and clarified

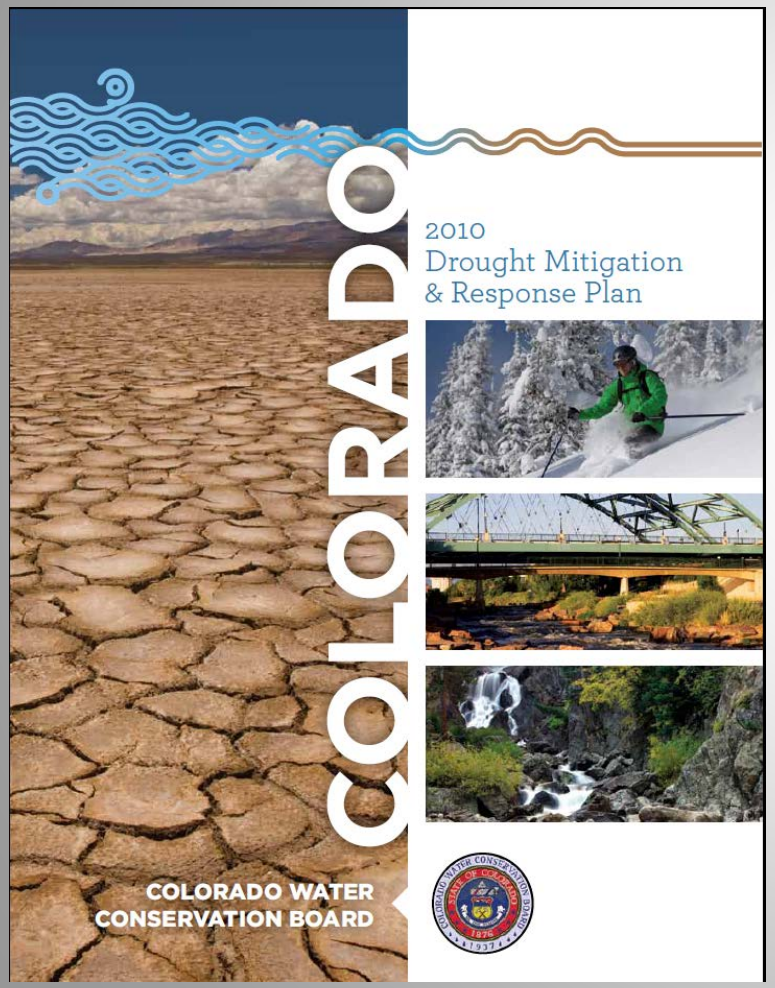
Revised Response Framework

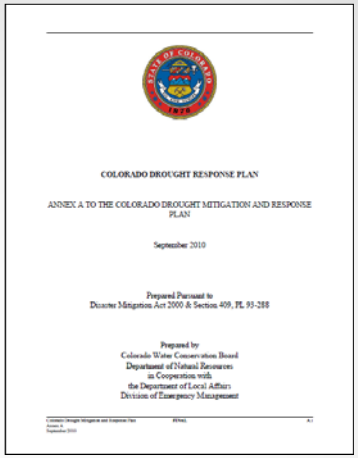


Revised Drought Response Summary Action Table

Severity Indicators and Impacts	Drought Phase and Response Summary	Actions to be Considered
• -0.5 to positive SPI (six month) • D0 Abnormally Dry • CMPDI or SWSI: -1.0 to -1.9 • SPI: -0.5 to -0.7	Normal Conditions Regular Monitoring	• CWCB/WATF monitors situation on monthly basis. • Data reviewed for drought emergence and summarized in Governor's Drought Situation Report. • Implement long term mitigation actions • ITF chairs meet twice yearly
• -0.6 to -1.0 SPI (six month) • D1 Moderate Drought • CMPDI or SWSI: -2.0 to -2.9 • SPI: -0.8 to -1.2	**Phase 1** More close monitoring of conditions for persisting or rapidly worsening drought; Official drought not yet declared	• ITF chairs alerted of potential for activation, monitoring of potential impacts • Assess need for formal ITF and DTF activation • DTF Lead Agencies (CDA/DoLA/DNR) notified of need for potential activation
• Less than -1.0 SPI (six month) • D2 Severe Drought • CMPDI or SWSI: -3.0 to -3.9 • SPI: -1.3 to -1.5	**Phase 2** Drought Task Force and Impact Task Forces are activated; Potential Drought Emergency declared Current Status for SE Colorado	• Governor's Memorandum activates the Drought Task Force and necessary Impact Task Forces. • Department of Agriculture initiates Secretarial Disaster Designation process if appropriate • ITF's make an initial damage or impact assessment. • ITF's recommend opportunities for mitigation to minimize or limit potential impacts • Relevant state agencies undertake response and incident mitigation actions with their normal programs with available resources

Drought Mitigation and Response Plan





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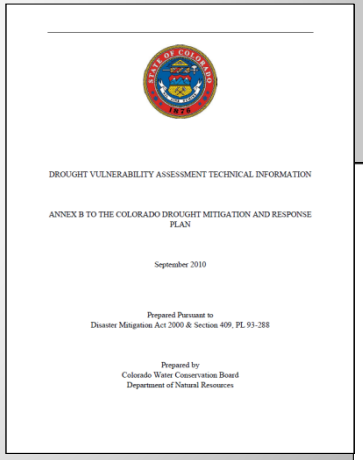

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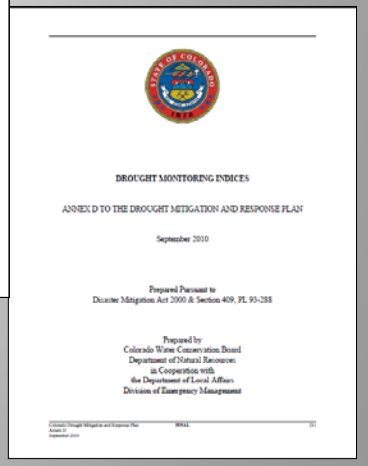


Drought Monitoring Indices

Definitions

Risk Assessment: The process of identifying the likelihood and consequences of an event to provide the basis for informed planning decisions on a course of action (FEMA 1992)

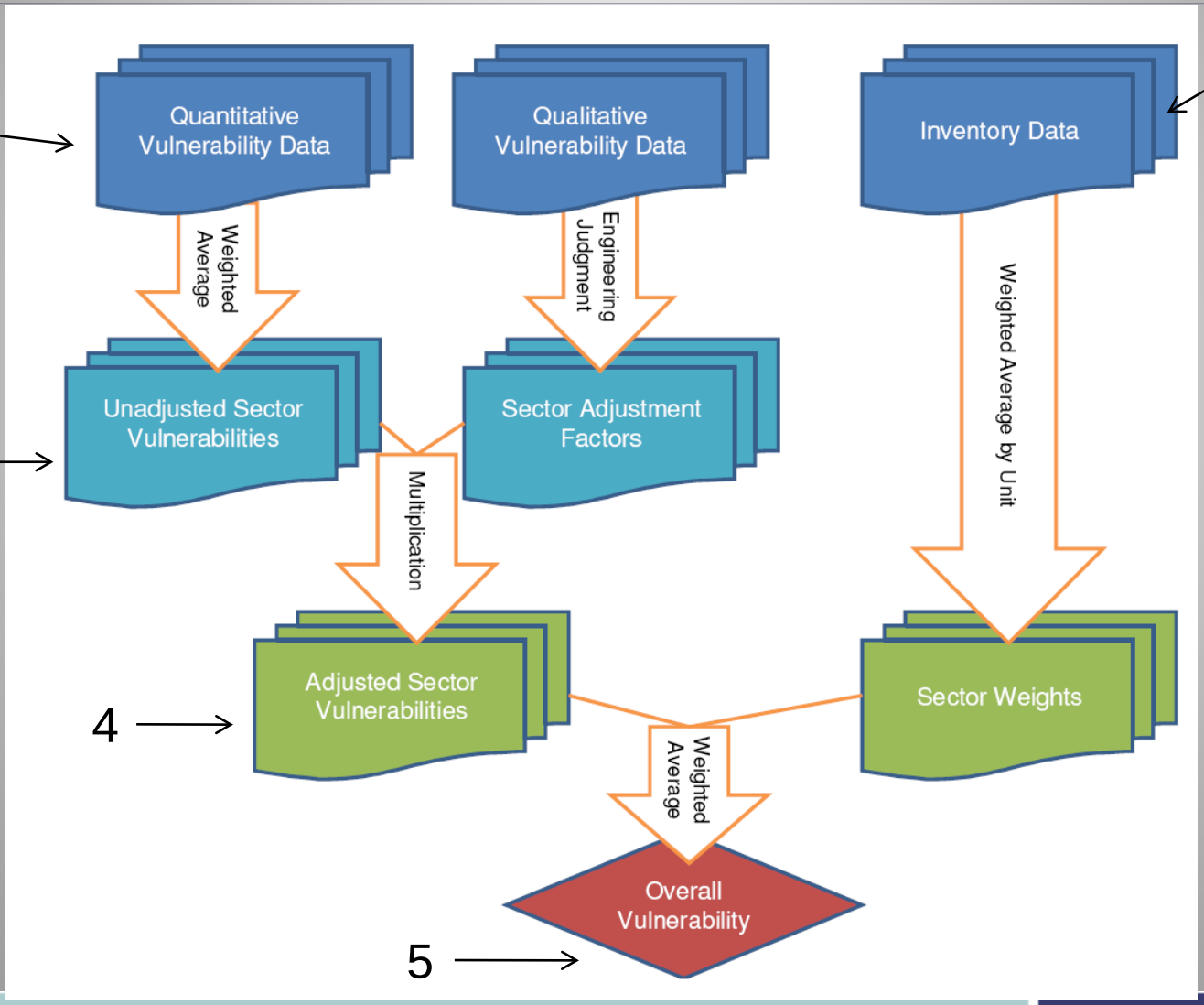
Drought Risk =

Hazard x **VULNERABILITY**

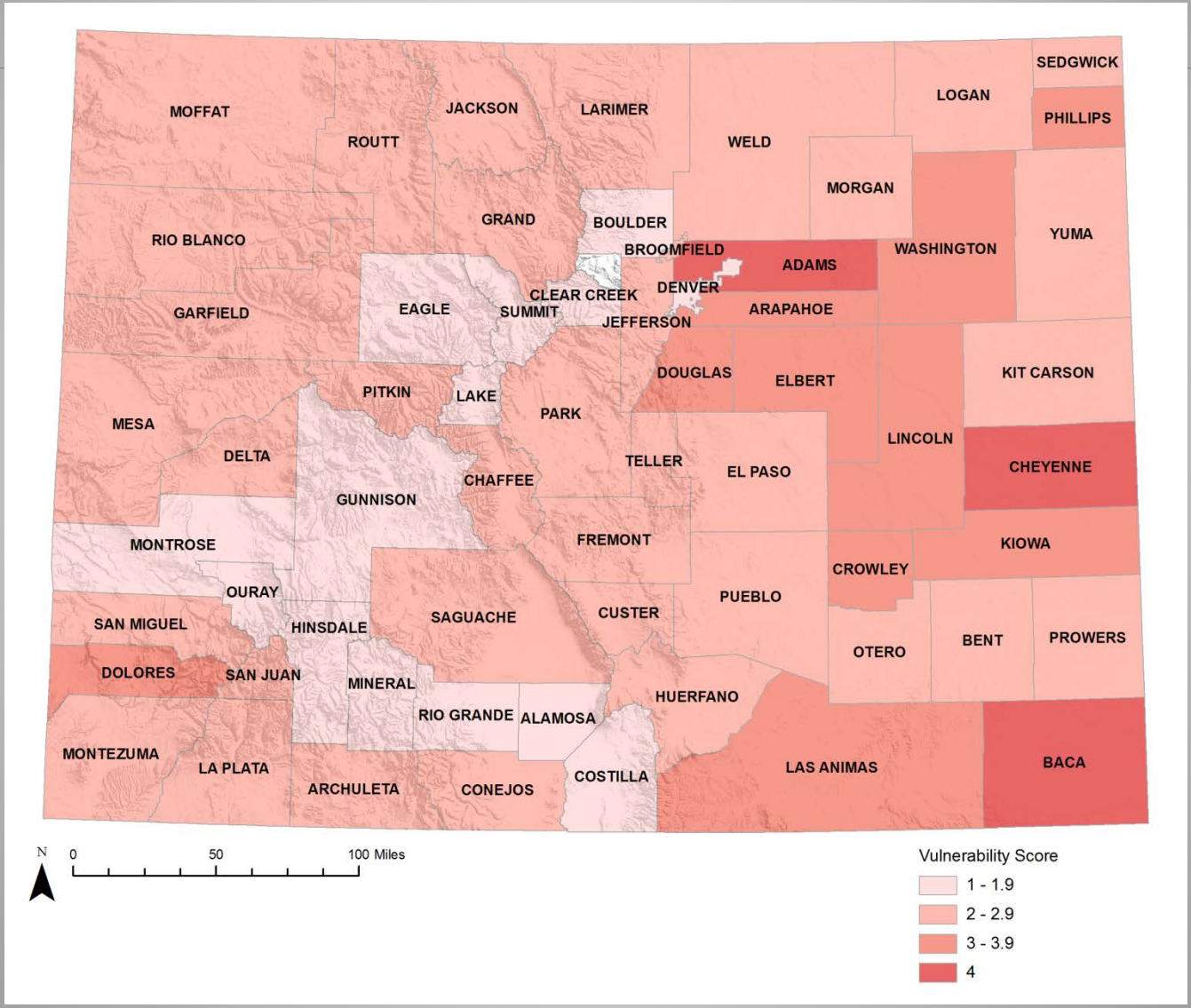
Drought Hazard: a period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area."

Vulnerability: The susceptibility to injury or damage from hazards." (Godschalk 1991, 132)

Methodological Framework



Overall Agriculture Vulnerability Scores



Climate Change Analysis

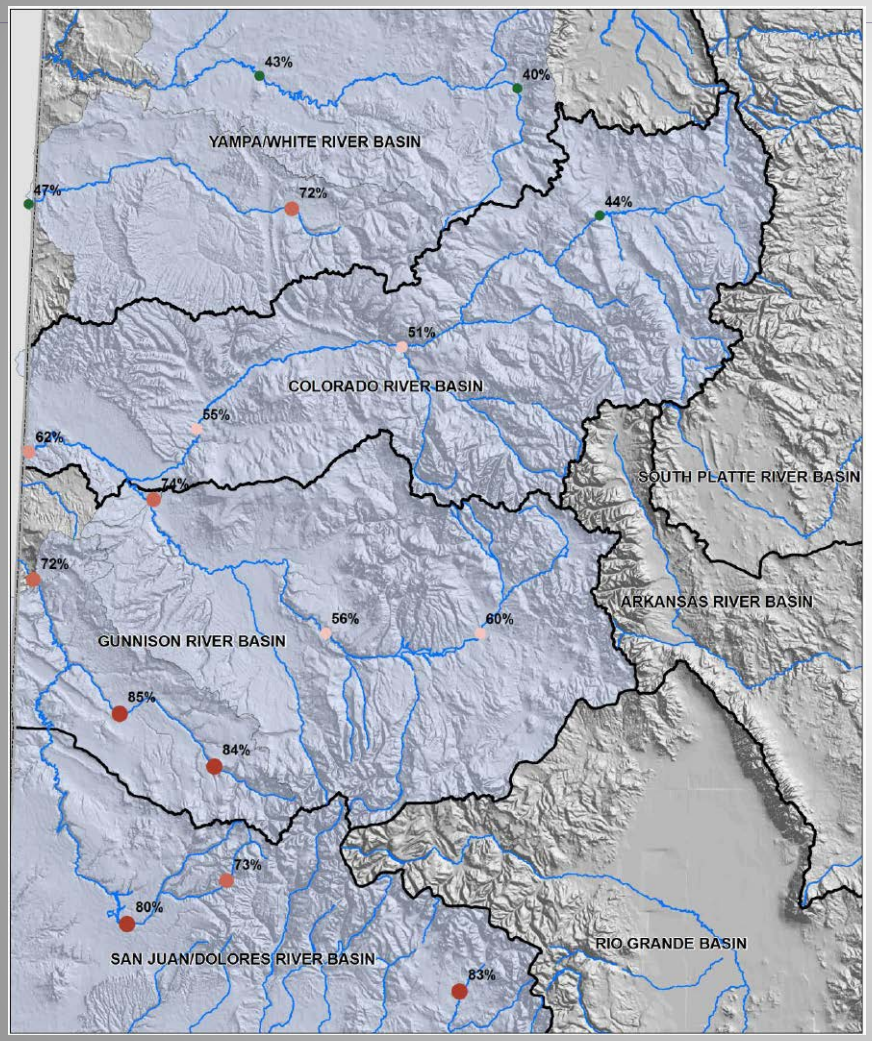
- What could drought look like in the future?
- Drought profile analysis using Colorado River Water Availability Study results for 2040
- Six scenarios from Colorado River Water Availability Study considered
- 100 paleo re-sequenced traces for each scenario
- Calculated maximum drought duration and intensity for each trace
- Drought calculations done relative to the mean of each scenario
- Exceedance probability is the chance that the maximum drought length will be greater than the observed median drought length given 100 traces

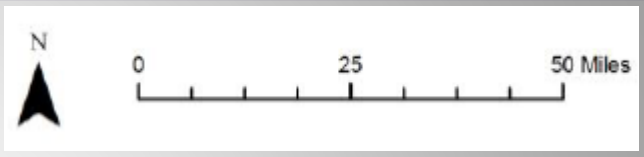
Colorado River near Cameo

Longest observed drought : 6 Years

	Average length of maximum drought (years)	Maximum drought length (years)	Chance of drought longer than observed
Alternate Historical Hydrology	5.8	15	58.3%
Climate Scenario 1	6.5	13	56.7%
Climate Scenario 2	6.1	15	54.0%
Climate Scenario 3	6.2	12	50.5%
Climate Scenario 4	6.5	12	55.4%
Climate Scenario 5	6.4	12	54.3%

Average Maximum Drought Length Exceedance Probabilities





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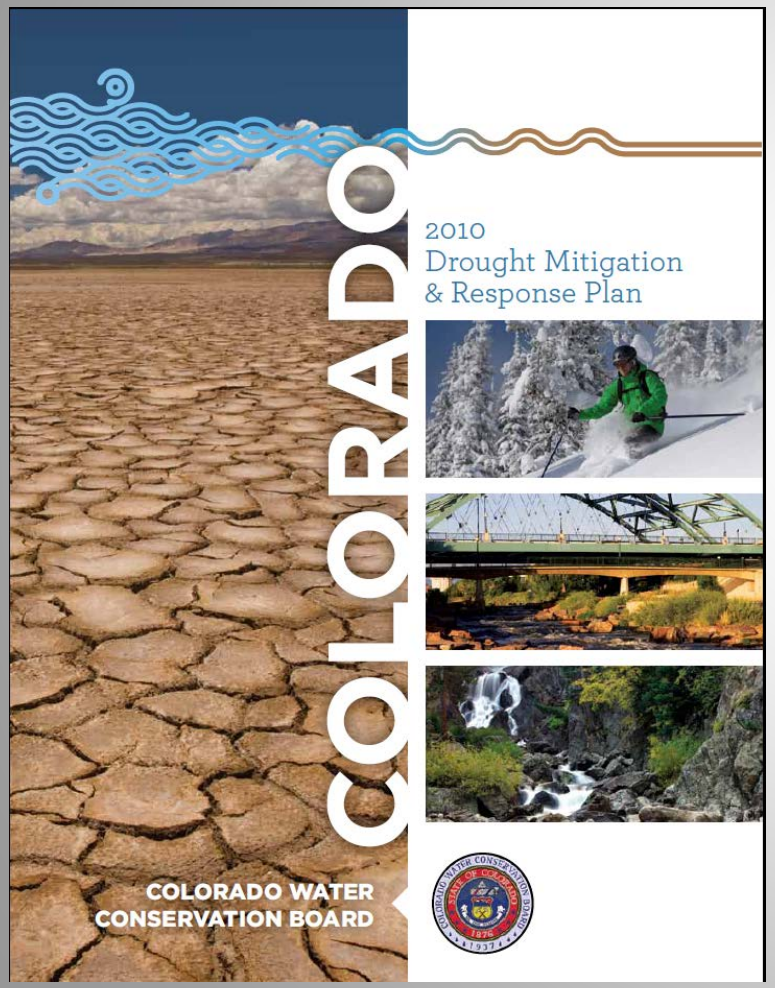

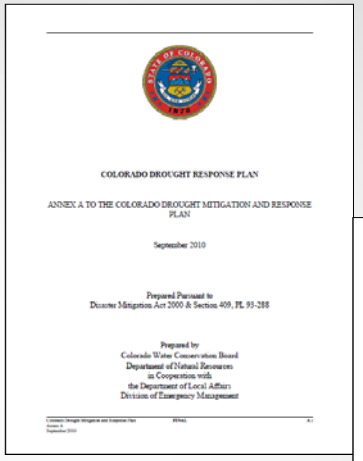
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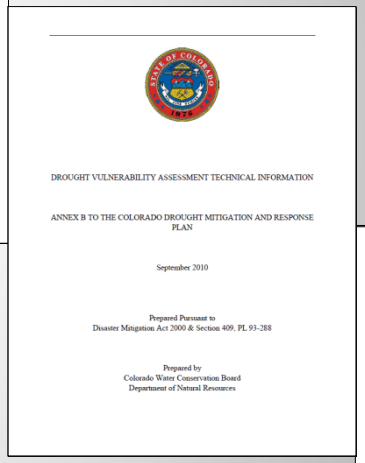
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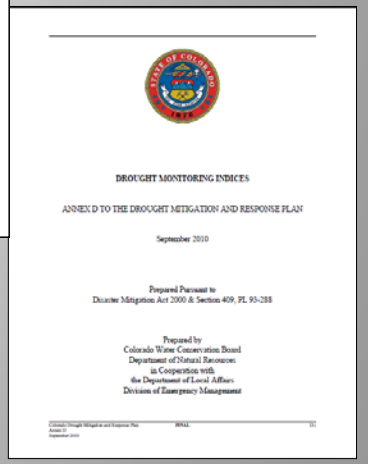
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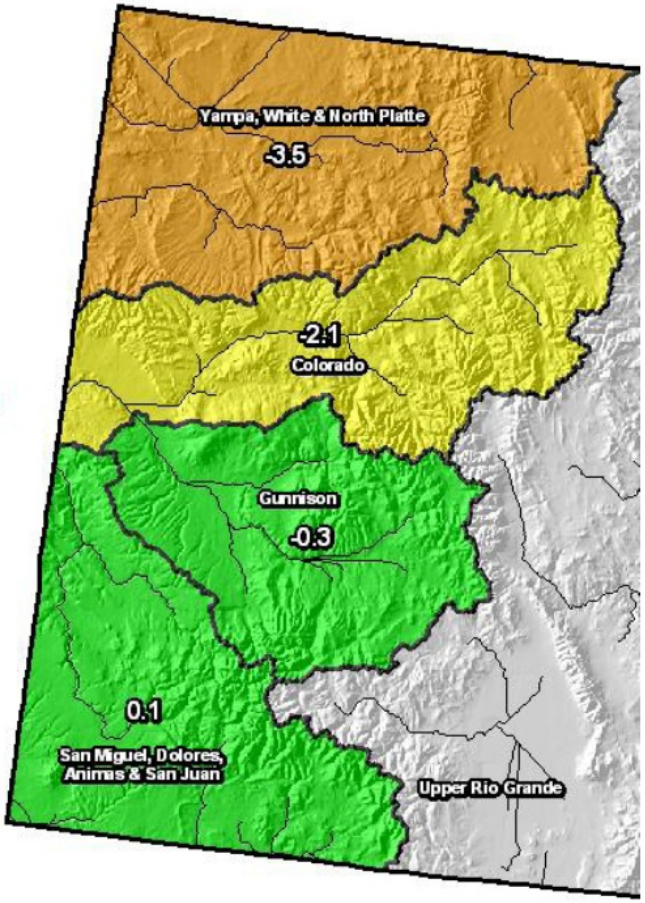
Drought Monitoring Indices

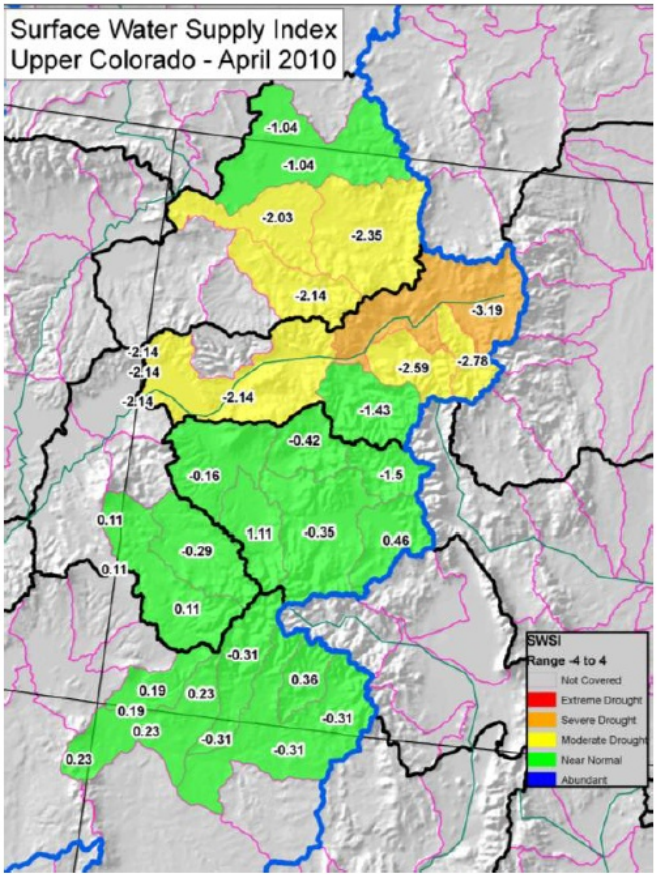
Drought Monitoring Indices

- Drought Indicators historically used for activation and deactivation of the Colorado Drought Response Plan:
  - Surface Water Supply Index (SWSI)
  - Palmer Drought Severity Index (PDSI)
  - Standardized Precipitation Index (SPI)
- Goals of this work
  - Modernize the SWSI index for Colorado
  - Analyze the effectiveness of the Colorado Modified Palmer Drought Index (CMPDI)

Comparison of Old and New Surface Water Supply Index – April 2010

Old Method	New Method





Source: USDA – Natural Resources Conservation Service

Current Outreach Efforts

Municipal Drought Planning Toolbox Workshop Series

These one day workshops will provide attendees with the knowledge to understand and fully utilize new and innovative resources available for improved drought planning.

Public and Private sector welcome

Dates & Locations:
May 19th - Durango
June 2nd - Denver
June 14th - Glenwood Springs
June 15th - Steamboat Springs
June 28th - Colorado Springs

Questions?

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Topics to be covered during these one day interactive workshops include:

Highlights of the 2010 State Drought Plan revision
What is new and different about this Plan?

What the State Plan tells us about your community
An overview of the vulnerability assessment for your basin

Planning tools for local municipal water providers
Planning Toolbox - how to use the resources provided
Monitoring & Indices - how to use indices to track and monitor drought
Guidance Document - overview of what it is, essential elements for a drought plan, and how it can be applied to a specific area
Sample Drought Plan - overview and how it should be used
Vulnerability Assessments - what they are and how they help

Climate change
Ideas on how to incorporate into the planning process

Additional resources available to help with drought planning

Registration:
$25 for government, utilities & non-profit; $50 consultants & private sector

Space is limited. Register now!
For more information & to register, please go to www.cwcb.state.co.us

Colorado Water Conservation Board 1313 Sherman Street, Room 721 Denver, Colorado 80203

- ✓ Municipal Drought Planning Toolbox Workshop Series
- ✓ Basin Roundtable Presentations
- ✓Phase 2 – activation and management
- ✓Water Availability Task Force

Questions?

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