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

Drought Response Plan

Vulnerability Assessment

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

- 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

Drought Monitoring Indices

Drought Response Plan

Vulnerability Assessment
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

Governor

Governors Disaster Emergency Council

Lead Agencies (Ag, DoLA, DNR)

DROUGHT TASK FORCE

WATF
Agriculture ITF
Tourism ITF
Energy ITF
Municipal Water ITF
Wildfire ITF
Wildlife ITF
## Revised Drought Response Summary Action Table

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

**Current Status for SE Colorado**
Drought Mitigation and Response Plan

- Drought Response Plan
- Vulnerability Assessment
- 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)

\[
\text{Drought Risk} = \text{Hazard} \times \text{Vulnerability}
\]

**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

1. Inventory Data

2. Quantitative Vulnerability Data
   - Weighted Average
   - Unadjusted Sector Vulnerabilities

3. Qualitative Vulnerability Data
   - Engineering Judgment
   - Sector Adjustment Factors

4. Multiplication
   - Adjusted Sector Vulnerabilities

5. Weighed Average
   - Sector Weights
   - Overall Vulnerability
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
## Longest observed drought: 6 Years

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Average length of maximum drought (years)</th>
<th>Maximum drought length (years)</th>
<th>Chance of drought longer than observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate Historical Hydrology</td>
<td>5.8</td>
<td>15</td>
<td>58.3%</td>
</tr>
<tr>
<td>Climate Scenario 1</td>
<td>6.5</td>
<td>13</td>
<td>56.7%</td>
</tr>
<tr>
<td>Climate Scenario 2</td>
<td>6.1</td>
<td>15</td>
<td>54.0%</td>
</tr>
<tr>
<td>Climate Scenario 3</td>
<td>6.2</td>
<td>12</td>
<td>50.5%</td>
</tr>
<tr>
<td>Climate Scenario 4</td>
<td>6.5</td>
<td>12</td>
<td>55.4%</td>
</tr>
<tr>
<td>Climate Scenario 5</td>
<td>6.4</td>
<td>12</td>
<td>54.3%</td>
</tr>
</tbody>
</table>
Average Maximum Drought Length Exceedance Probabilities
Drought Mitigation and Response Plan

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Drought Response Plan
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

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

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

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

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