Water Availability Task Force

Drought Plan and Vulnerability Assessment Overview

Project Overview

- Plan Coordination\Plan Revision
  - Coordinated standard planning process
  - Mitigation and Response Strategy Enhancements
  - Tool development: Local Guidance Document and Web Toolbox
  - Assessment of progress made
- Vulnerability Assessment
  - Enhanced estimates of potential losses
- Triggers and Indices
  - Refinement of monitoring and triggering mechanisms

Plan Coordination\Plan Revision

Benefits of the Newly Revised Drought Plan

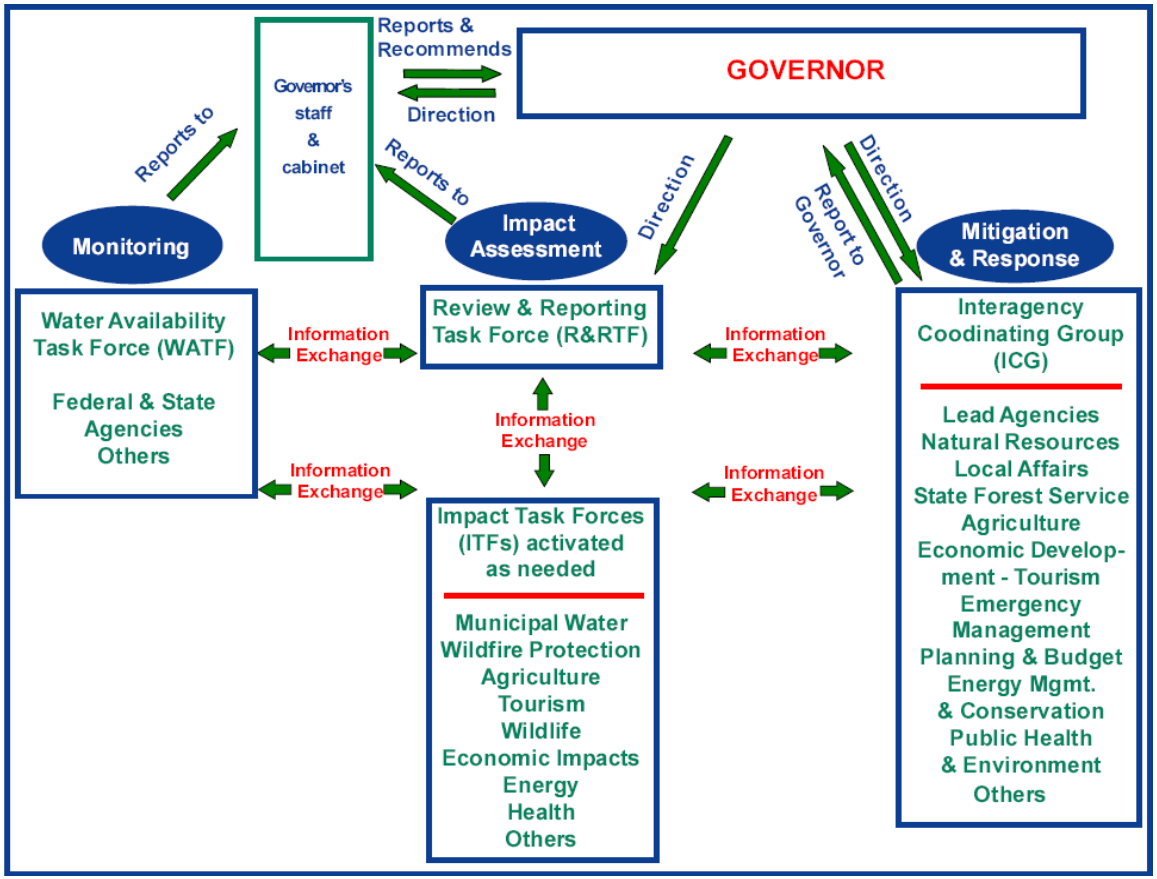
- Reduced Losses (economic, social, physical, etc..)
- Efficient, Coordinated Government
- Reduced Liability
- Reduced State and Local Expenditures
- Includes Continued Eligibility for Mitigation Funding
- Increased Collaboration

Drought Mitigation and Response Plan Goals

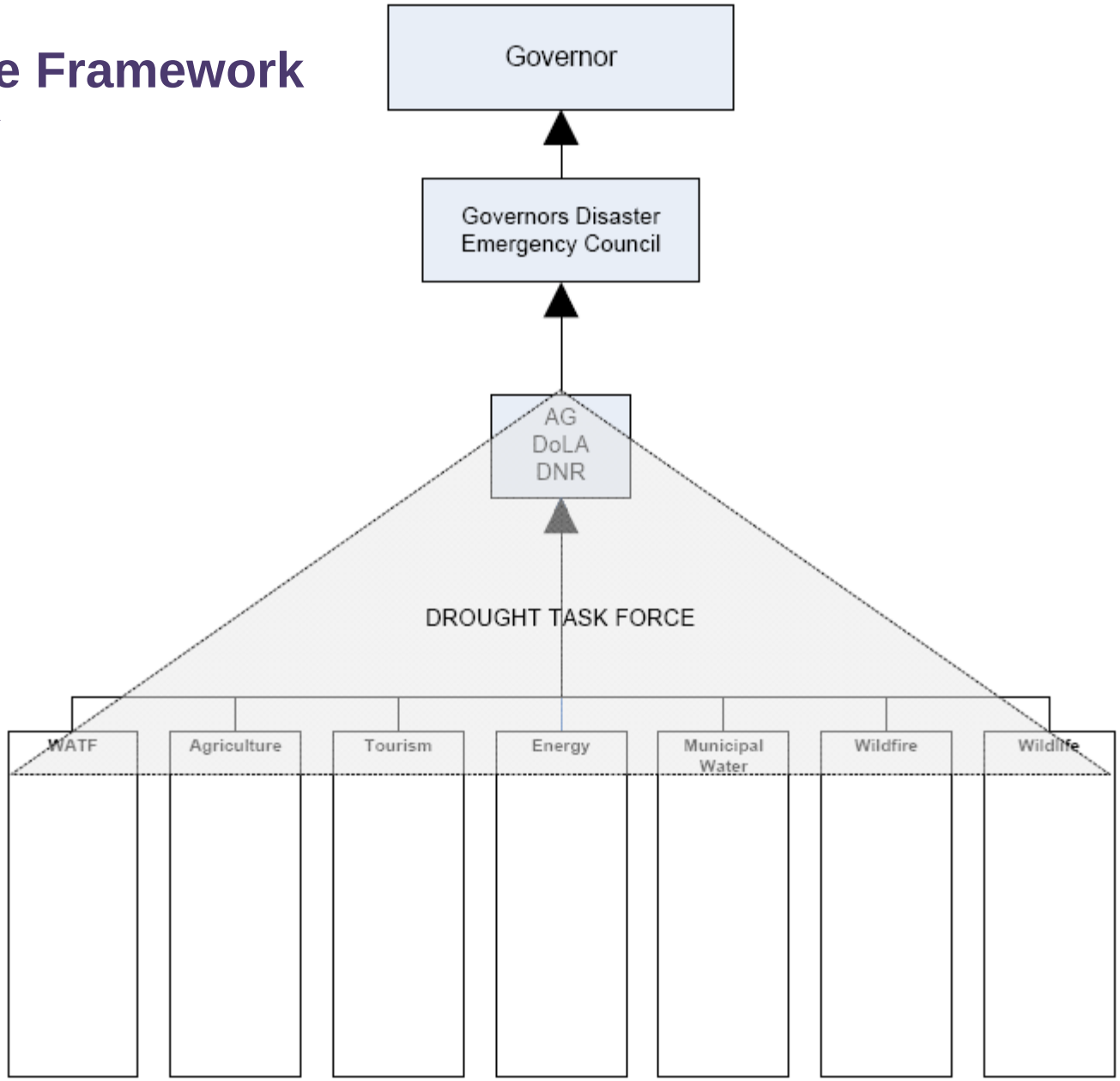
1. Improve Water Availability Monitoring and Drought Impact Assessment
2. Increase Public Awareness and Education
3. Support Substitute Water Supply Plans and Leasing Options to Augment Water Supply
4. Coordinate and Provide Technical Assistance for State, Local, and Watershed Planning Efforts
5. Reduce Water Demand/Encourage Conservation
6. Reduce Drought Impacts to Colorado's Economy, People, State Assets, and Environment.
7. Develop Intergovernmental and Interagency Stakeholder Coordination
8. Evaluate Potential Impacts from Climate Change

Improving State Drought Response

- WATF
- Agriculture ITF
- Tourism ITF
- Economic ITF
- Energy ITF
- Health ITF
- Municipal Water ITF
- Wildfire ITF
- Wildlife ITF



Revised Response Framework



Technical Assistance: Resources & Tools Development

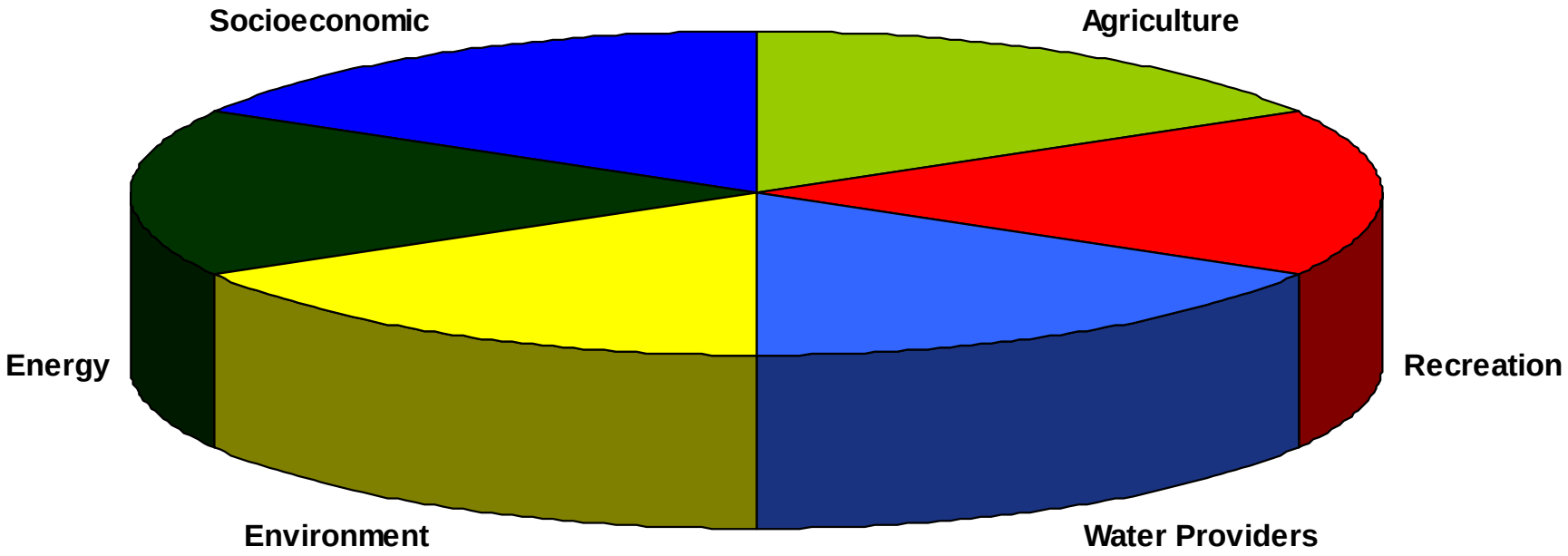
- Web based Drought Tool box under development
- Local Drought Management Plan Guidance Document
  - Developed with input from a steering committee comprised of local water providers from around the State

Vulnerability Assessment

Engineering Risk

1. When should the system fail?
2. How often is system failure expected?
3. What are the likely consequences of a system failure?

Integrated System



Risk

Risk = A combination of multi-sectoral hazard, vulnerability and exposure. The impacts a hazard would have on communities, services, facilities and the environment and the likelihood of a hazard event resulting in adverse conditions that produce negative impacts.

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 =

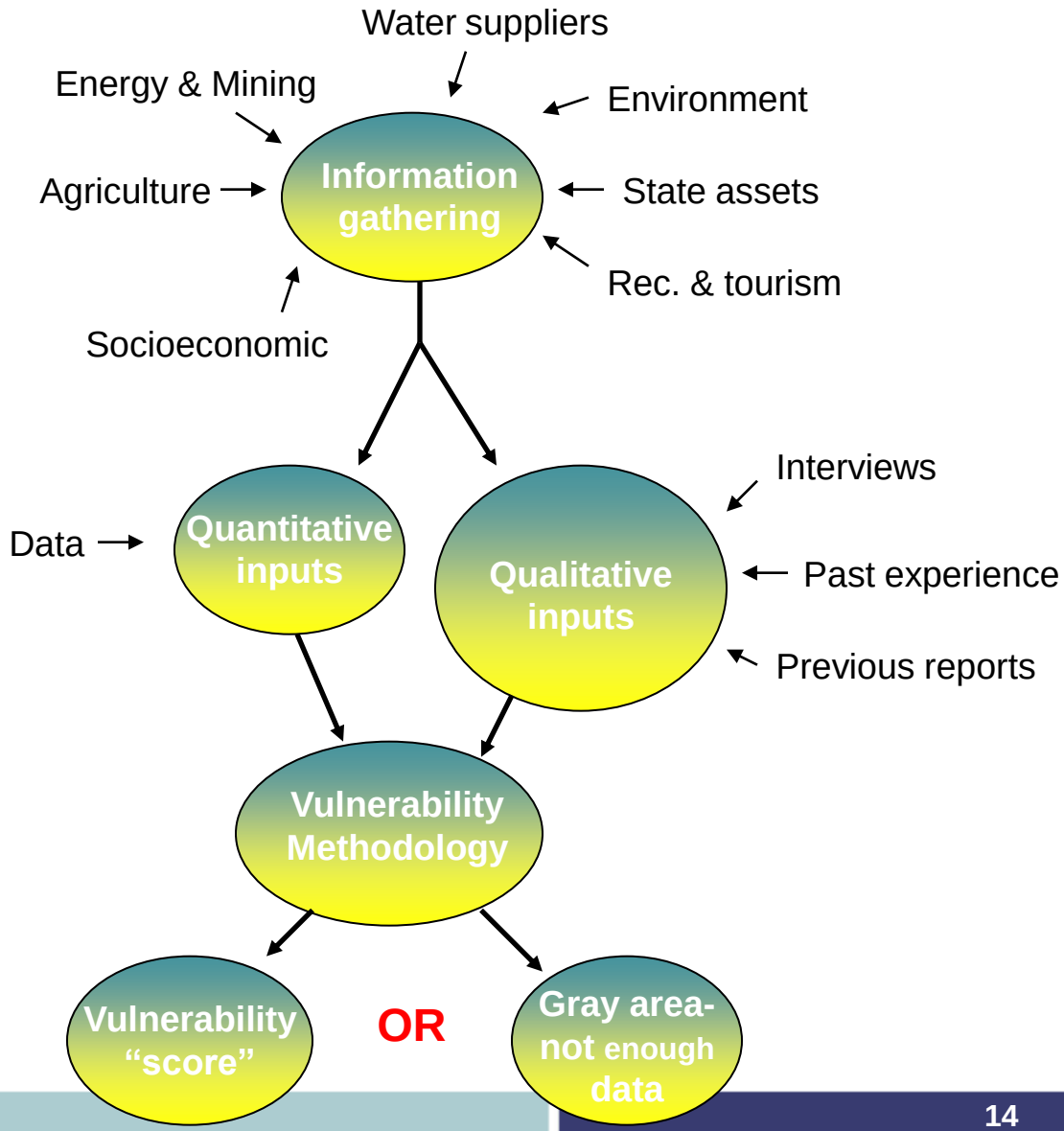
Hazard x **VULNERABILITY**

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

- Research sectors, publications, previous drought studies
- Quantitative data
  - What we have
  - What we need
- Qualitative
  - Interviews
  - Past experiences
  - Specific knowledge of the area
- Methodology
- Vulnerability “score” OR framework for future data collection



Methodology Example

County	Quantitative Impact Rating							
	1	2	3	4	5	6	7	8
	Buildings	Critical Infrastructure	Instream Flows	Teresstrial Habitat	Protected Species	State Hatcheries	State Land Trust Revenue	Outdoor Recreation Revenue
ADAMS	2.5	2	2	1.5	1	1	4	2.1
ALAMOSA	4	2	4	3.5	1	3.4	3	1.3
ARAPAHOE	1.5	2	4	1.5	1	2	4	2
ARCHULETA	4	2	2	2.5	1	3.6	4	2.8
BACA	3	1.5	2	2.5	1	2.2	4	1.9
BENT	1.5	1	2	3	1	2.8	4	2.5

County	Impact Ratings with Qualitative Adjustments							
	1	2	3	4	5	6	7	8
	Buildings	Critical Infrastructure	Instream Flows	Teresstrial Habitat	Protected Species	State Hatcheries	State Land Trust Revenue	Outdoor Recreation Revenue
ADAMS	1.25	1.1	2	2	1	3.4	4	3.7
ALAMOSA	2	2	4	1.5	1	1.8	3	1.7
ARAPAHOE	1.25	2.5	4	2	1	1	4	2.5
ARCHULETA	0.5	1	2	4	1	2.6	4	2.3
BACA	1.5	1.5	2	1.5	1	2.2	4	1.3
BENT	1.5	2	2	2	1	1.4	4	2.2

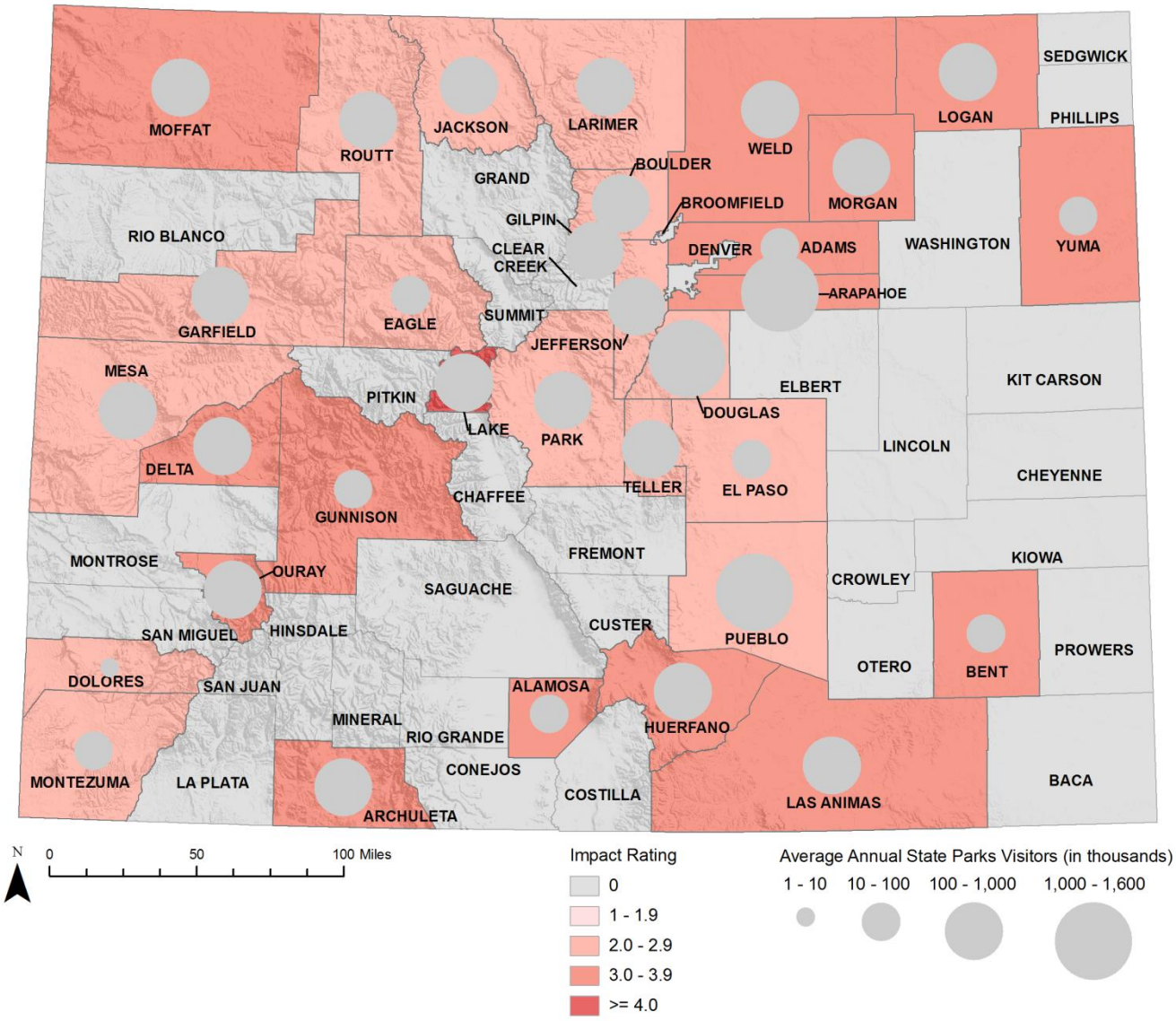
County	Overall Vulnerability Ranking
ADAMS	2.23
ALAMOSA	2.83
ARAPAHOE	2.56
ARCHULETA	2.55
BACA	2.42
BENT	2.09

Colorado State Parks

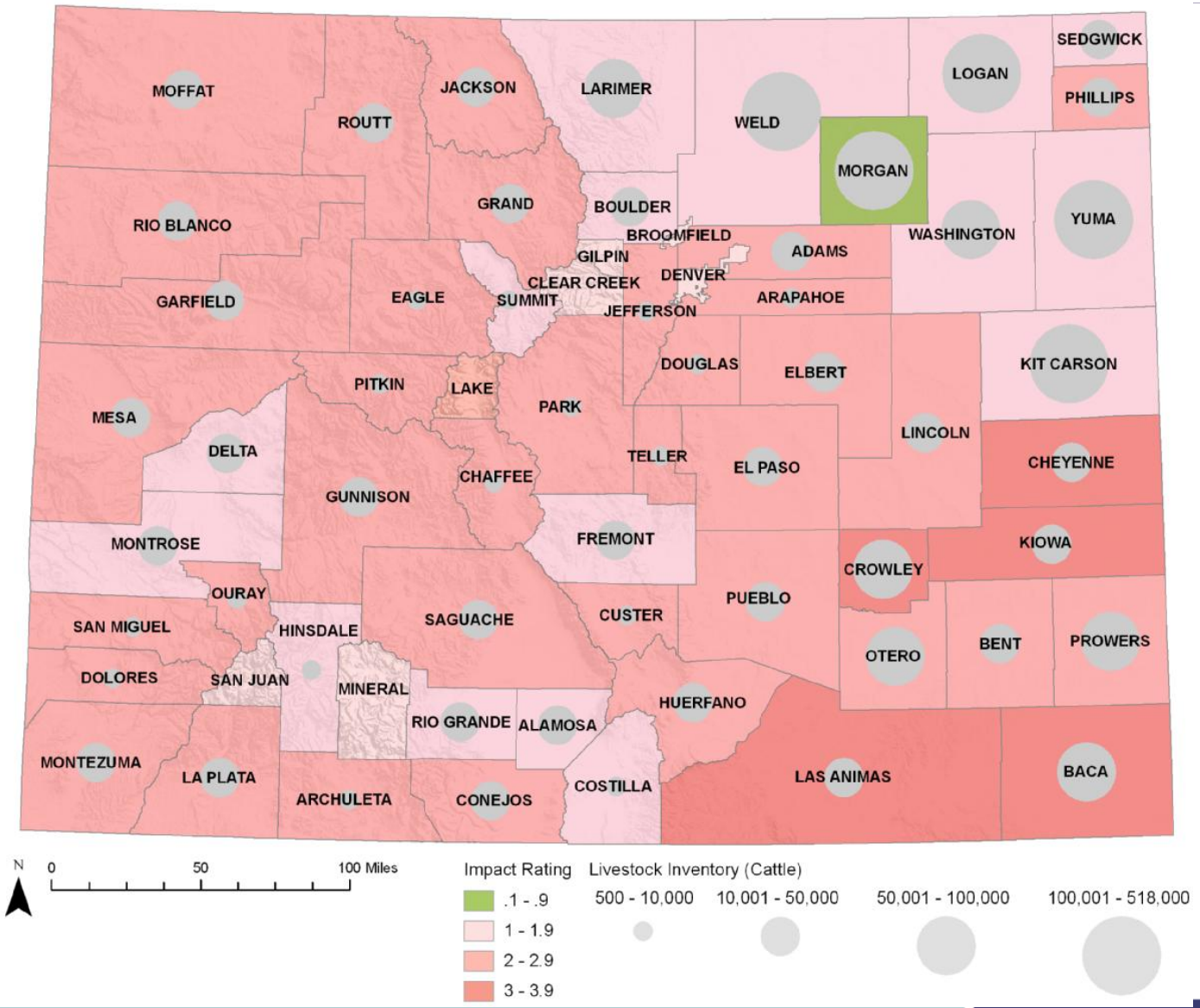
- Two phases of drought impacts
  - Low river and reservoir water levels immediately impact visitation
  - Visitation further impacted by wildfires later, as the drought progresses
- Public perception
  - Confusion over national parks and forests closures
  - Are state parks still open?
  - Negative perception of drought, wildfires

Key Impacts to State Parks	Key Adaptive Capacities or Mitigation Strategies
Lower reservoir and stream levels	PR campaign to educate the public about alternative activities to boating/fishing
Impacts from wildfires, including park closures and campfire restrictions	Communicate with media to emphasize which state parks are still open, which counties don't have campfire restrictions
Negative media portrayal	Maintain communication with other state agencies, the media, and the public

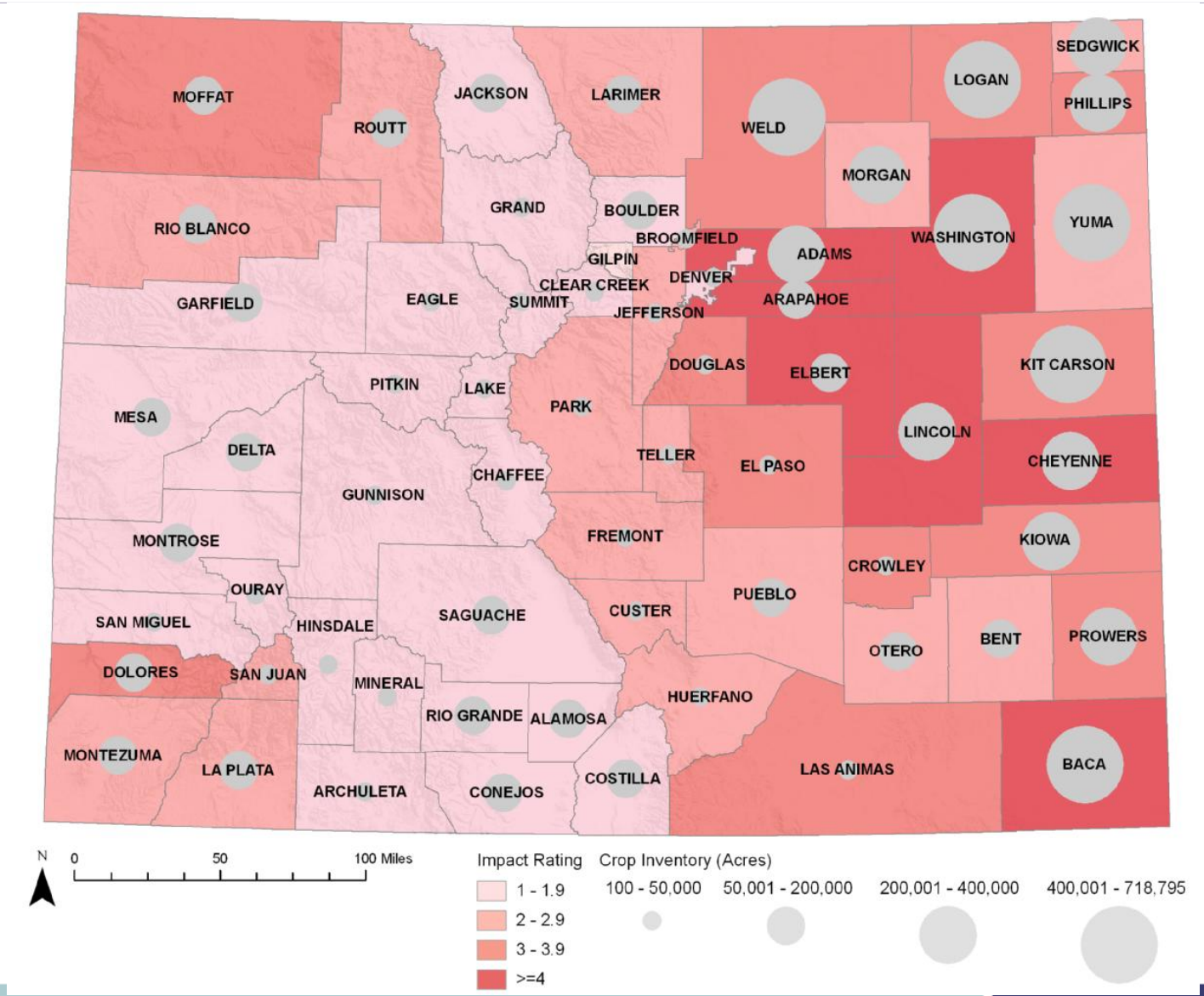
State Parks Recreations Impacts & Spatial Density by County



Agriculture: Livestock Inventory and Vulnerability Ranking



Agriculture: Crop Inventory and Vulnerability Ranking



Drought and Climate Change

Climate Change Analysis

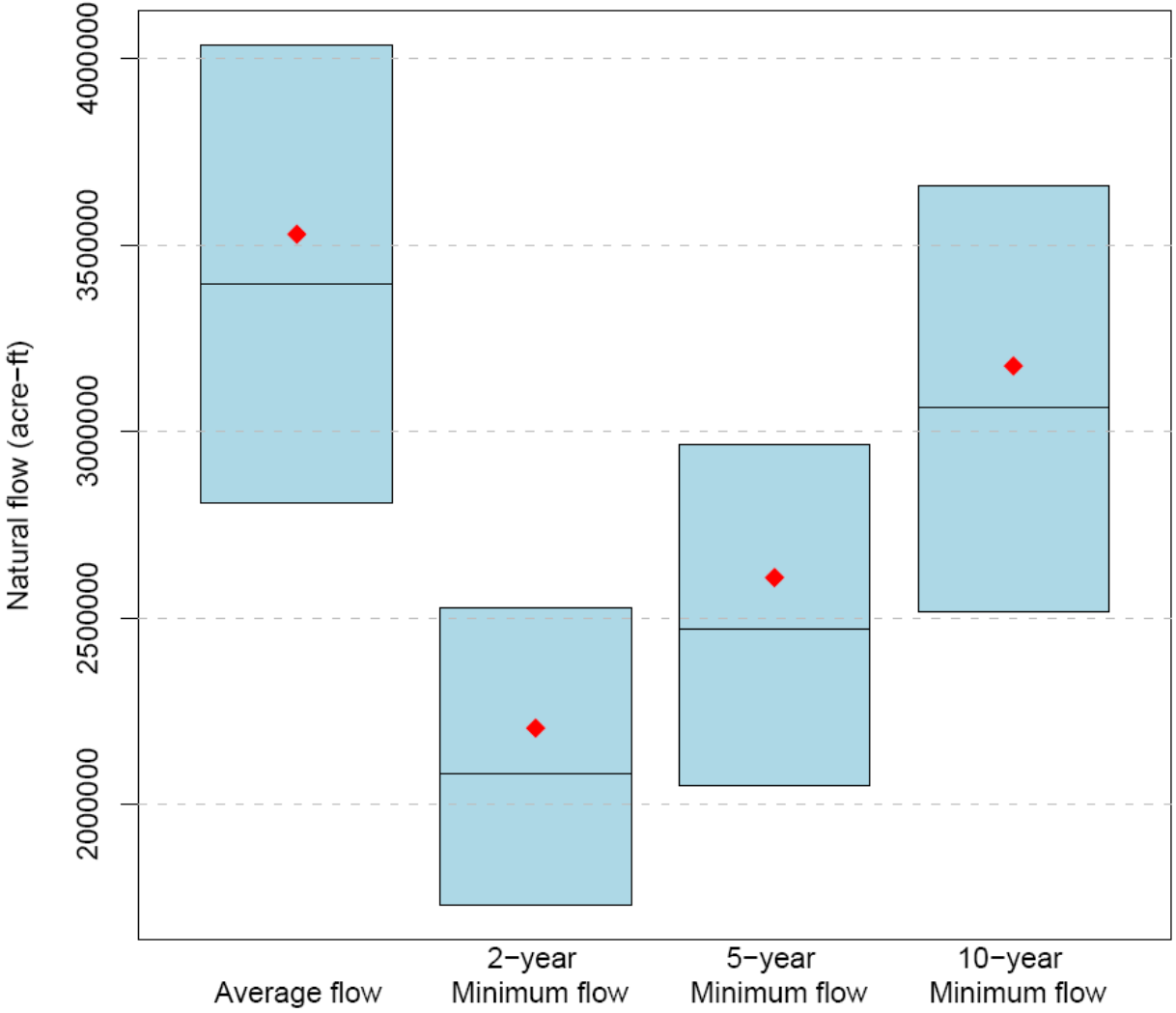
- What could drought look like in the future?
- Drought profile analysis using Colorado River Water Availability Study results for 2040
- Six scenarios from Colorado River Water Availability Study considered
- 100 paleo re-sequenced traces for each scenario
- Calculated maximum drought duration and intensity 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%

Colorado River near Cameo

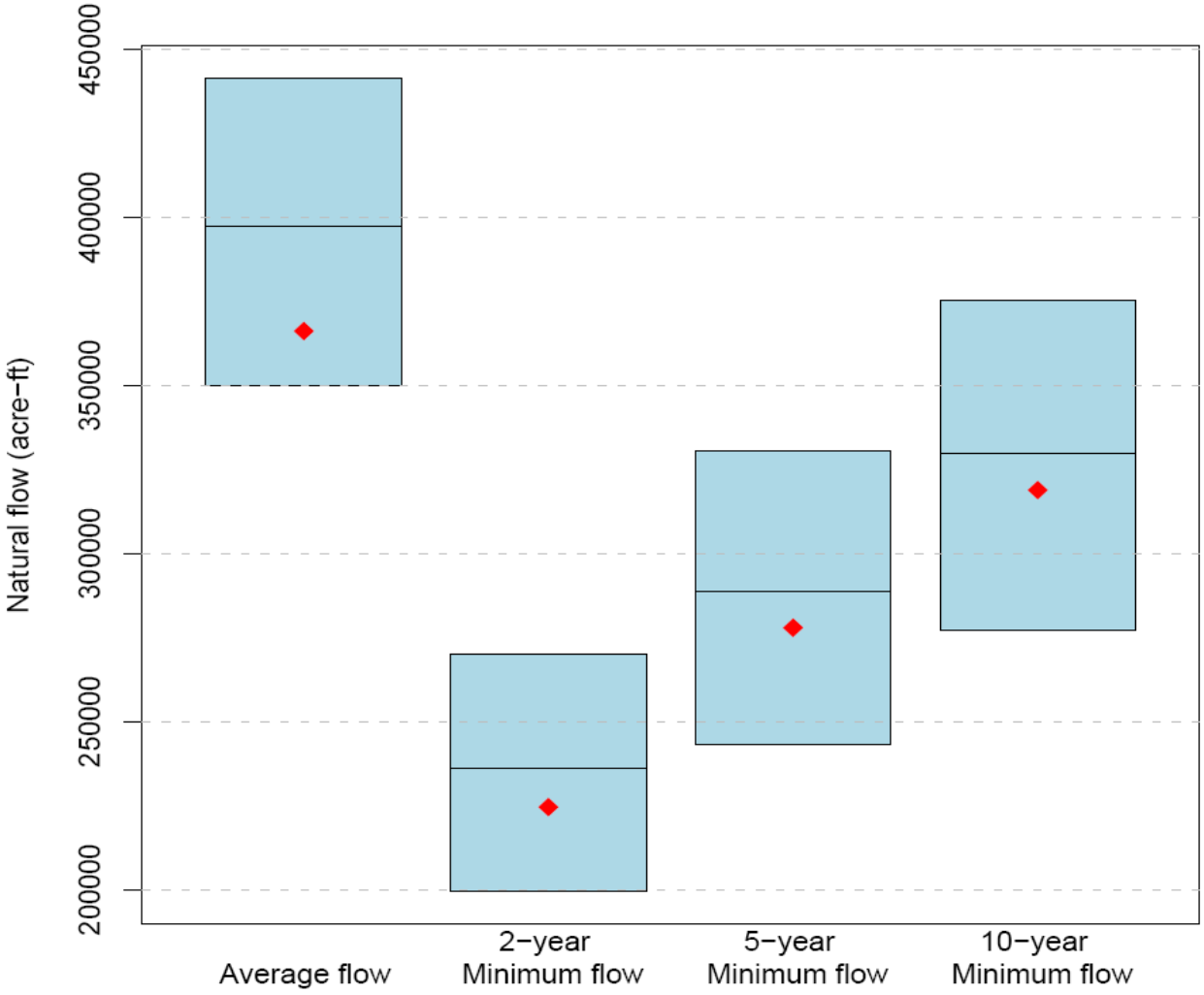


Yampa River at Steamboat Springs

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	12	42.5%
Climate Scenario 1	6.0	13	45.4%
Climate Scenario 2	5.6	11	37.5%
Climate Scenario 3	5.6	11	38.1%
Climate Scenario 4	5.6	11	36.3%
Climate Scenario 5	5.8	12	42.4%

Yampa River at Steamboat Springs

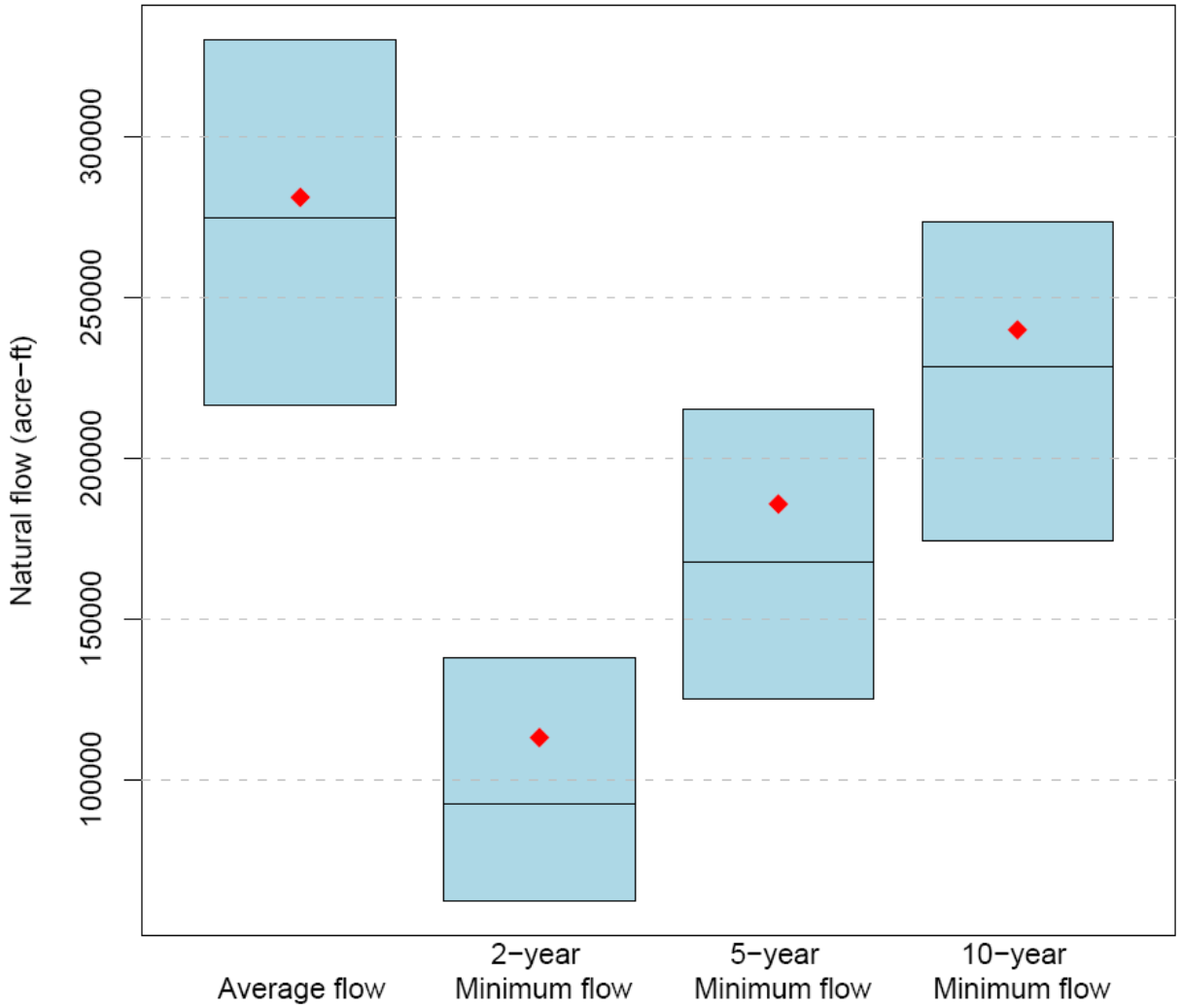


San Juan River at Pagosa Springs

Longest observed drought : 4 Years

	Average length of maximum drought (years)	Maximum drought length (years)	Chance of drought longer than observed
Alternate Historical Hydrology	5.1	11	75.7%
Climate Scenario 1	5.2	10	78.3%
Climate Scenario 2	5.6	11	83.3%
Climate Scenario 3	5.7	11	85.5%
Climate Scenario 4	5.8	11	89.0%
Climate Scenario 5	5.9	11	88.5%

San Juan River at Pagosa Springs



Next Steps

- Public Comment and stakeholder review period July 23rd - August 20th
- Incorporate final comments and finalize plan Sept 14th
- Board approval in September 14th/ 15th
- Submit to CDEM late September for inclusion in State Hazard Mitigation Plan
- Adoption by Governor and submittal to FEMA late 2010

Questions?

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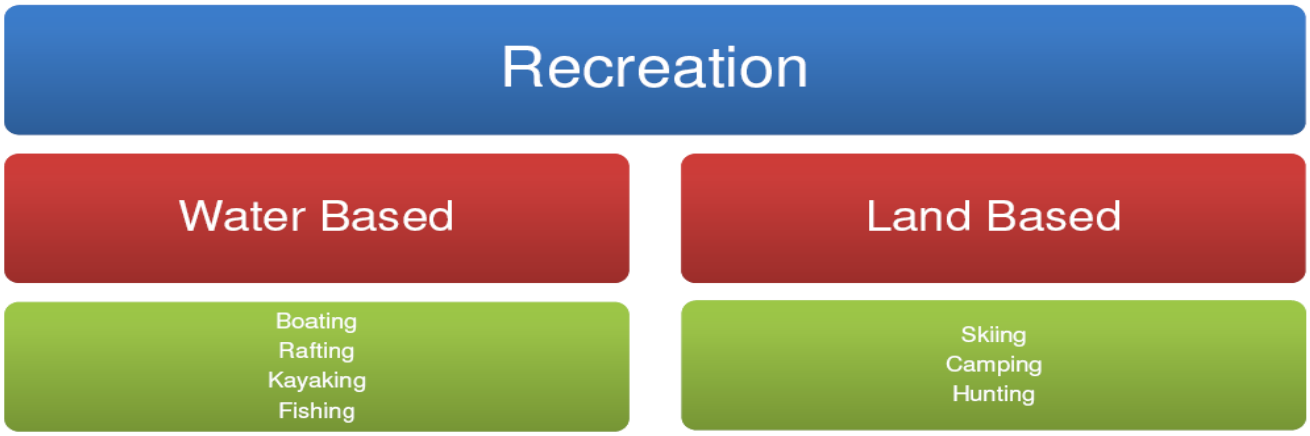
Draft Priority Recommendations

- Develop Impact Assessment/Monitoring Improvements
- Continued Education and Outreach
- Climatalogic data collection at mid and lower elevations
- Construction of water storage facilities on State lands
- Mandate drought planning at the local level
- Encourage use of more efficient irrigation systems – Agricultural and Municipal
- Create a sustainable funding source for implementing recommendations in drought plan
- Continue assimilation of climate change data/science

Sector Analysis Example



Key Impacts	Key Adaptive Capacities and Mitigation Strategies
Public perception of drought decreases recreational tourism	Work with PR firms and media to control message, emphasize the positive
Low water levels: ■ Streamflow too low for rafting or kayaking ■ Reservoir levels too low for boating ■ Impaired fish populations	Rafting operations can diversify services and modify season length
Fire restrictions resulting in less interest in camping	
Land use restrictions to protect sensitive plant species	
Decline in skier visits due to lack of snow	■ Work with PR firms and media to control message, emphasize the positive ■ Ski resorts can market other ski town activities
Watering restrictions for golf courses	■ Increase irrigation efficiency by changing irrigation methods or timing (water at night, for example) ■ Increase use of xeriscaping and drought resistant grasses