



Design and Findings of the Drought Tournament Gaming Activity

Jeff Brislawn and Courtney Black
AMEC Environment and Infrastructure

2012 CWCB Drought Conference
September 19, 2012



Presentation Overview

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- Colorado's first "Drought Tournament"
 - ▣ September 18, 2012
- Tournament Background and Objectives
- Tournament Development and Design
- Summary of Yesterday's Events
- Future Directions and Conclusions



A new and innovative approach towards drought preparedness and planning



Tournament Objectives

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- Educate participants on the multidisciplinary and multi-sector implications of drought
- Encourage collaboration among those with various backgrounds
- Introduce the concept of the “gaming forum” as a tool to
 - ▣ Engage stakeholders
 - ▣ Develop relationships
- Collect information for future planning purposes
- Create an environment that is engaging, competitive and **FUN!**



Background

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- How did this idea develop?
 - ▣ Agriculture and Agri-Food Canada
 - “Society must plan for climatic extremes to avoid high social, economic, and environmental costs”
- Decision-support framework developed
 - ▣ Help institutions address drought preparedness
 - ▣ Use gaming format to identify gaps and vulnerabilities in plans
 - ▣ *Competition drives engagement*



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada



Background

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- Two tournaments developed and held in Canada

- February 2011
- March 2012
- Upcoming Nov 2012



- Engaging Preparedness Communities Drought Workshop in Chicago June 2011

- Knowledge sharing workshop sponsored by NIDIS and NDMC
- Attended by AMEC and CWCB staff
- Presentation on Tournament by Harvey Hill, Agriculture and Agri-Food Canada

Background

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- What occurred to develop the game in Colorado?
 - ▣ Expert Panel/Steering Committee
 - CWCB and NIDIS
 - AMEC
 - Referees
 - ▣ Meeting held to review draft materials
 - ▣ Simulation Day held where NIDIS, NDMC and Agriculture and Agri-Food Canada played the game
 - Materials and gaming process finalized



Sponsors and Contributors

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□ Sponsors

- ▣ Colorado Water Conservation Board (CWCB)
- ▣ National Integrated Drought Information System (NIDIS)



□ Contributors

- ▣ National Drought Mitigation Center (NDMC)
- ▣ Agriculture and Agri-Food Canada, Science and Technology Branch



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Players/Teams

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- Representing six sectors
 - Agriculture
 - Municipal & Industrial
 - Energy
 - Environment
 - Recreation and Tourism
 - Social
- Representatives with various backgrounds from all over the State
- Five teams of five persons each representing a “Basin Drought Committee”



Participants

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- Colorado River Water Conservation District
- Colorado Tourism Office
- Colorado Public Utilities Commission
- Colorado Division of Parks and Wildlife
- CSU Extension
- Denver Water
- Governor's Energy Office
- Tri-State Generation & Transmission Assoc.
- City of Aurora
- Colorado Springs Utilities
- City of Thornton
- Colorado Farm Bureau
- Colorado Water Trust
- San Luis Valley Irrigation District
- Colorado River Outfitters Association
- Western Water Assessment
- Metro Wastewater Reclamation District
- Colorado Environmental Coalition

Facilitators, Referees and Fans



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- Facilitators
 - ▣ Master of Ceremonies
 - ▣ Master Scorekeeper/Tournament Architect
- Referees
 - ▣ NDMC (3),
 - ▣ Agriculture and Agri-Food Canada (1)
 - ▣ AMEC (1)
- Fans
 - ▣ Observers from States of Texas and Oklahoma
- Sponsors
 - ▣ CWCB and NIDIS staff helped with team facilitation



Key Elements of the Tournament Design

12

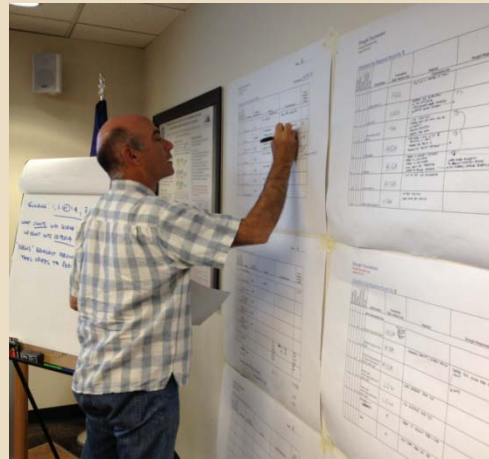
- Fictitious (yet believable) basin needed to maintain political neutrality
- Realistic drought scenario development
- Realistic water budget development
- Pre-determined mitigation and response strategies
 - ▣ Including associated cost for each
- Budget framework
- Scoring framework



Key Elements of the Tournament Design (Continued)

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- Identification of a diverse group of players
- Make it interesting, fun and engaging
 - ▣ Identify incentives for competition(i.e. prizes!)
- Simulation day
 - ▣ Testing with NIDIS, CWCB and Agri-Food Canada
- Refinement of materials



Chance Basin Design

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- Features are similar to Colorado watersheds
- Incorporates multiple sectors
- Naming of geographic features and water users customized for gaming purposes
- Historic Colorado hydrologic and climate data transposed onto the basin
- Water budget developed using Colorado weather patterns (inflows), demands and outflows from the basin



Drought Scenario Development

15

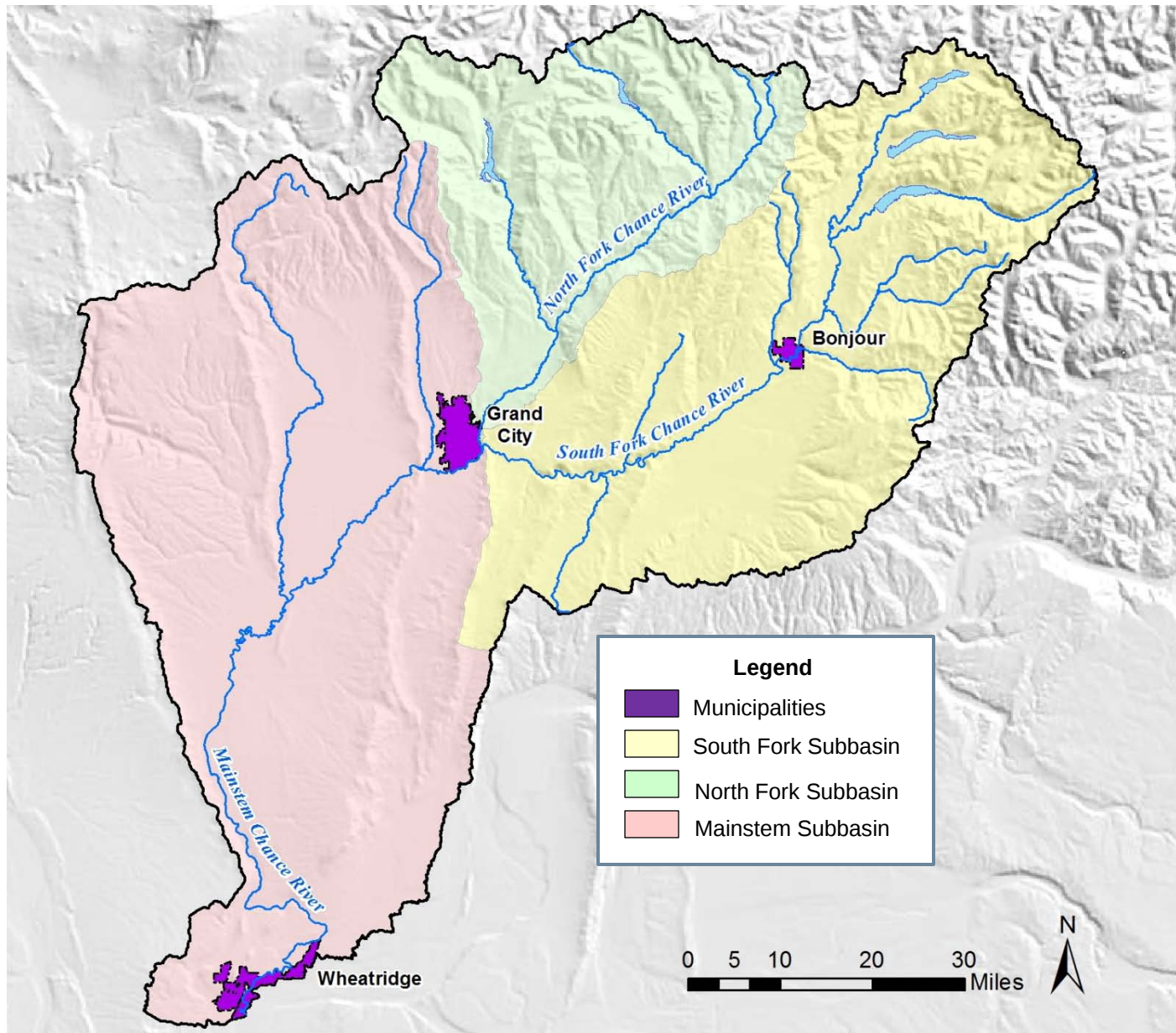
- Used CRWAS stochastic hydrologic sequences for three drought scenarios
- Applied natural streamflows and climate data from the Colorado River Basin to Chance Basin
- Drought indicators
 - Reservoir levels - based on simulated demands in the water budget
 - Rainfall – PRISM
 - Snowfall – Snotel Data
 - Drought Monitor, SPI, SWSI, CO Palmer Index etc.



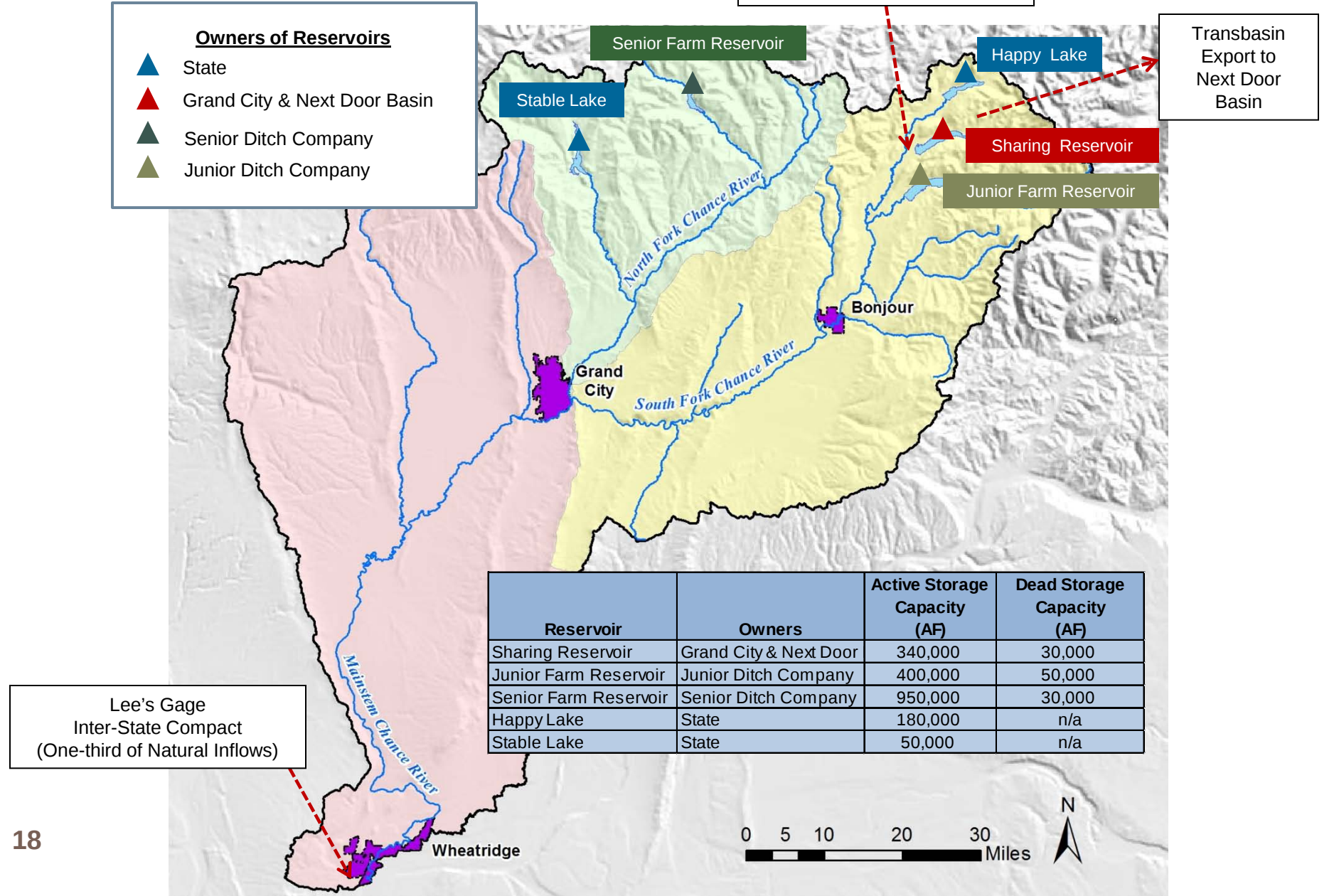
Overview of Chance Basin



Chance Basin



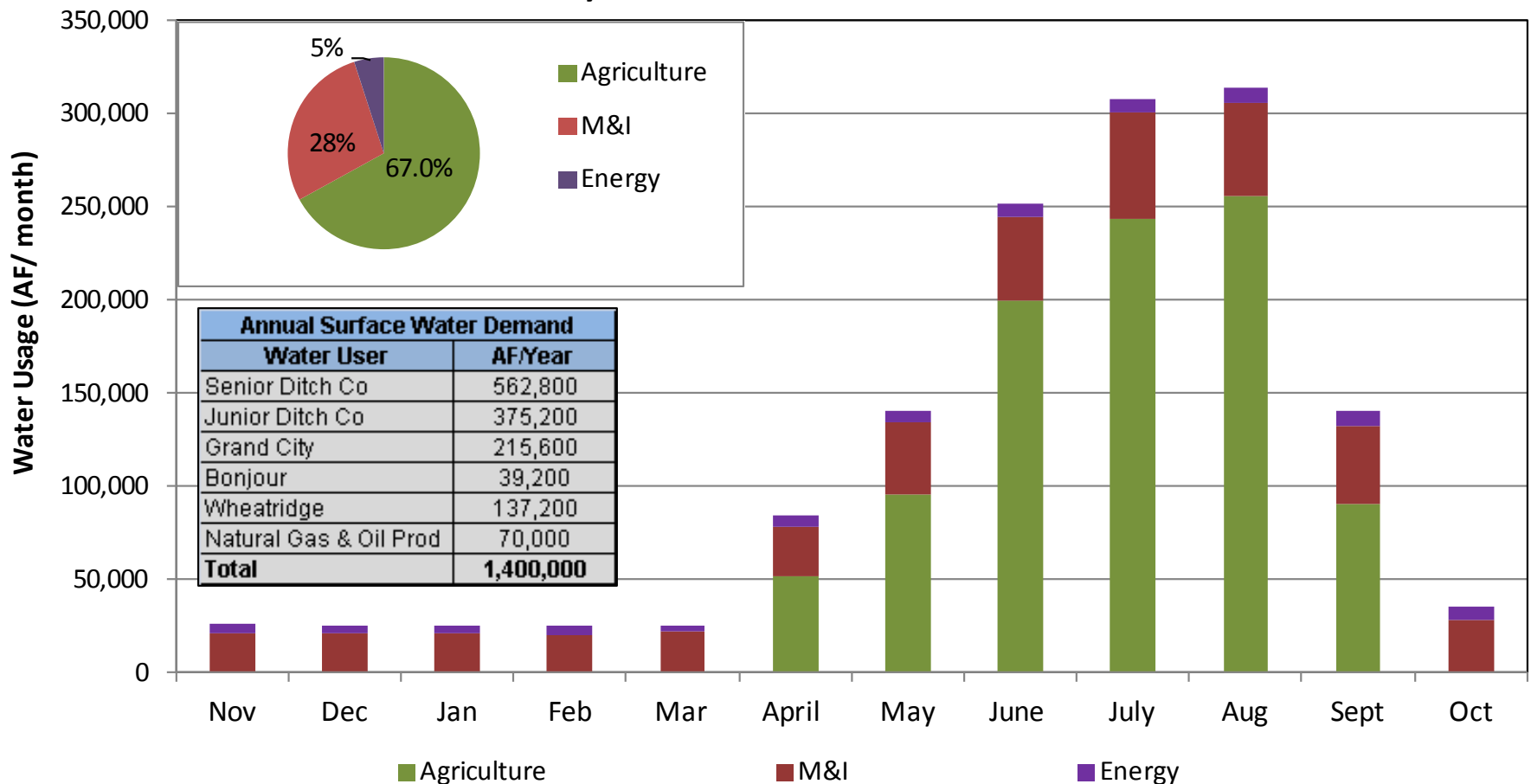
Chance Basin Supplies



Consumptive Use in Normal Year

19

Monthly In-Basin Surface Water Demand

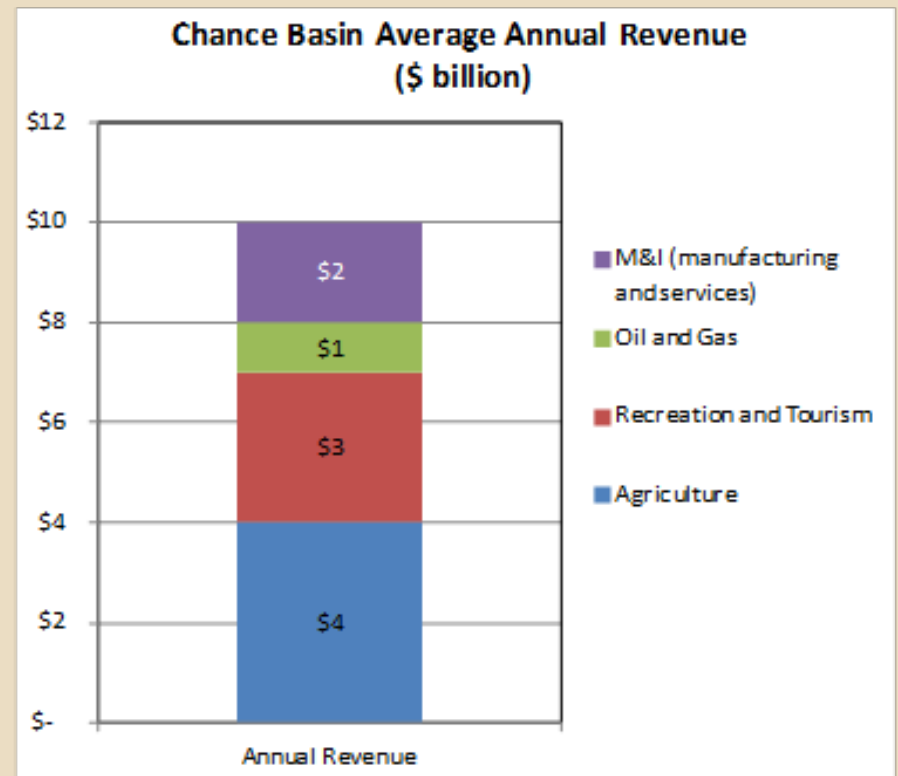


* Note: This chart does not include alluvial well pumping which is replaced by out-of-basin supplies.

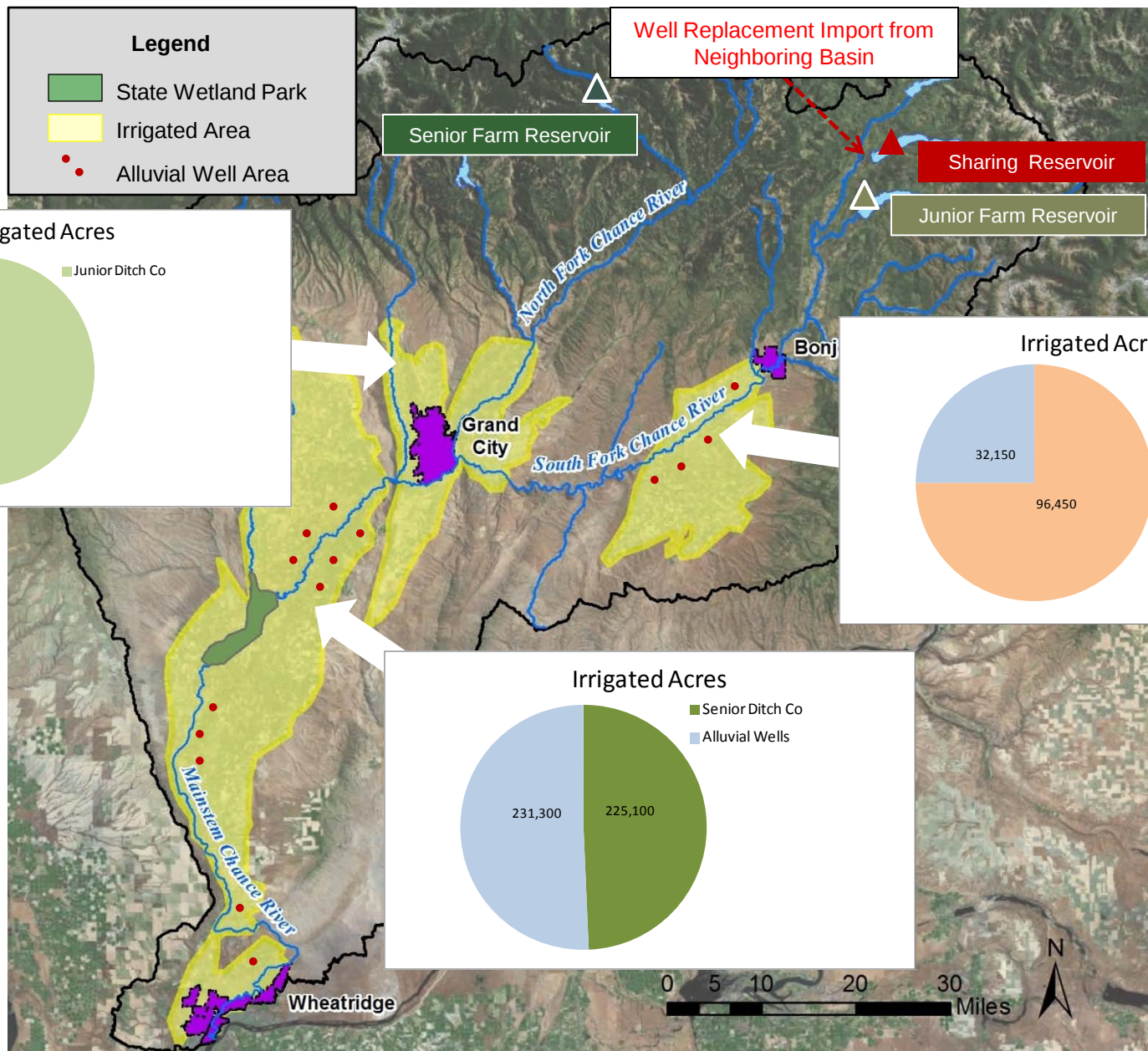
Sectors

20

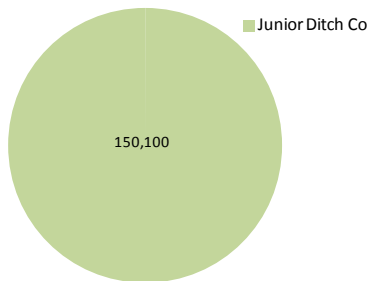
- Agriculture
- M&I
- Environment
- Recreation and Tourism
- Energy
- Social



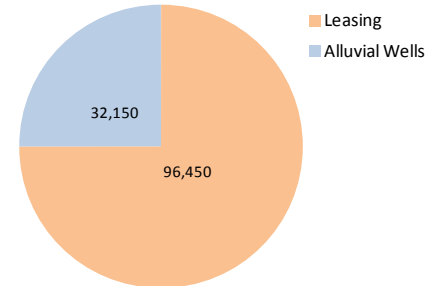
Irrigated Agriculture



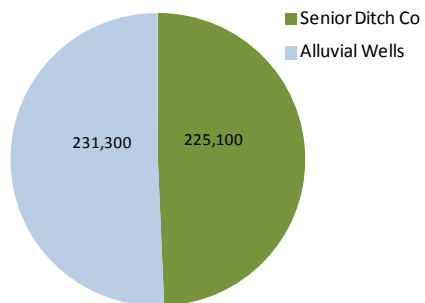
Irrigated Acres



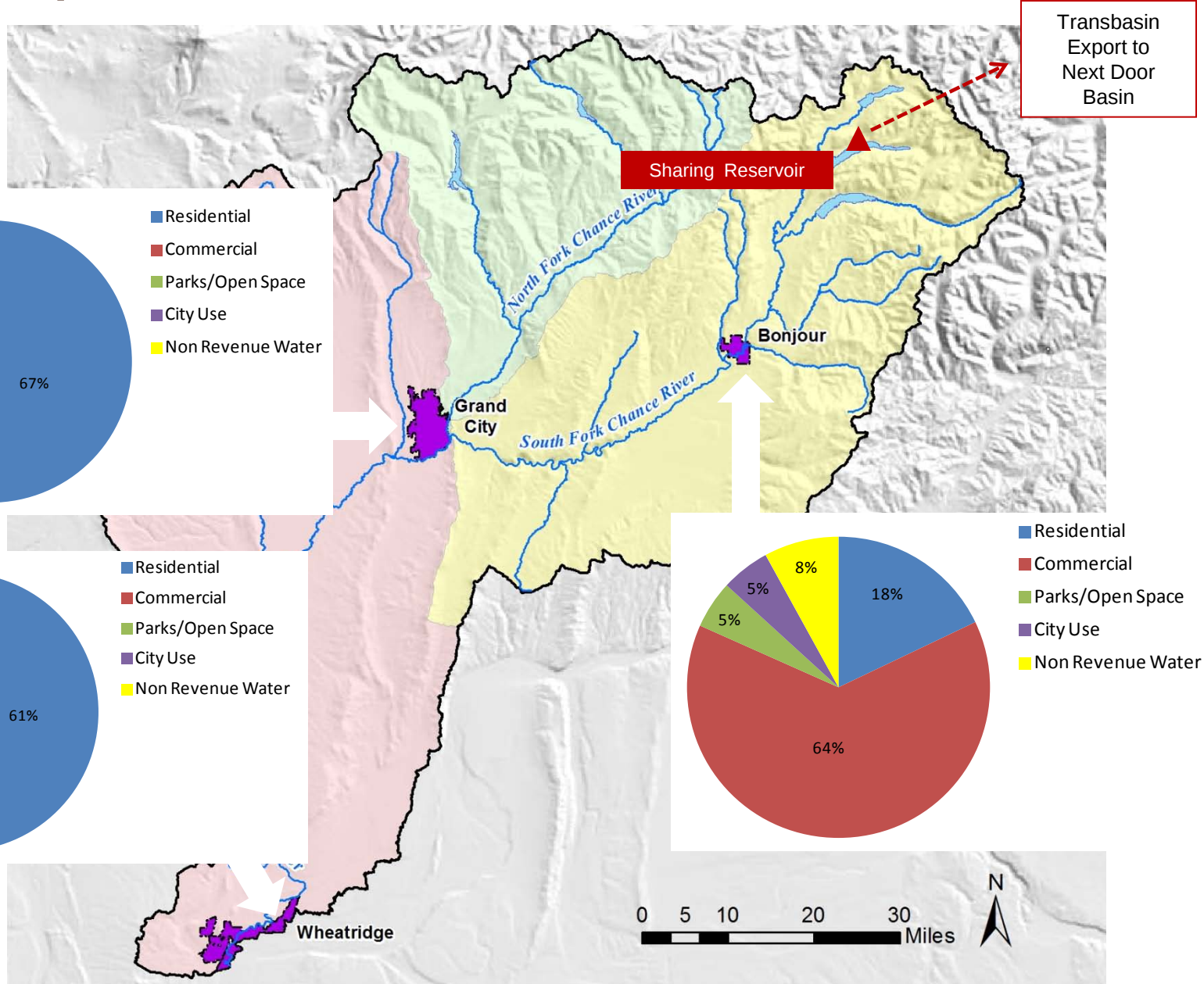
Irrigated Acres



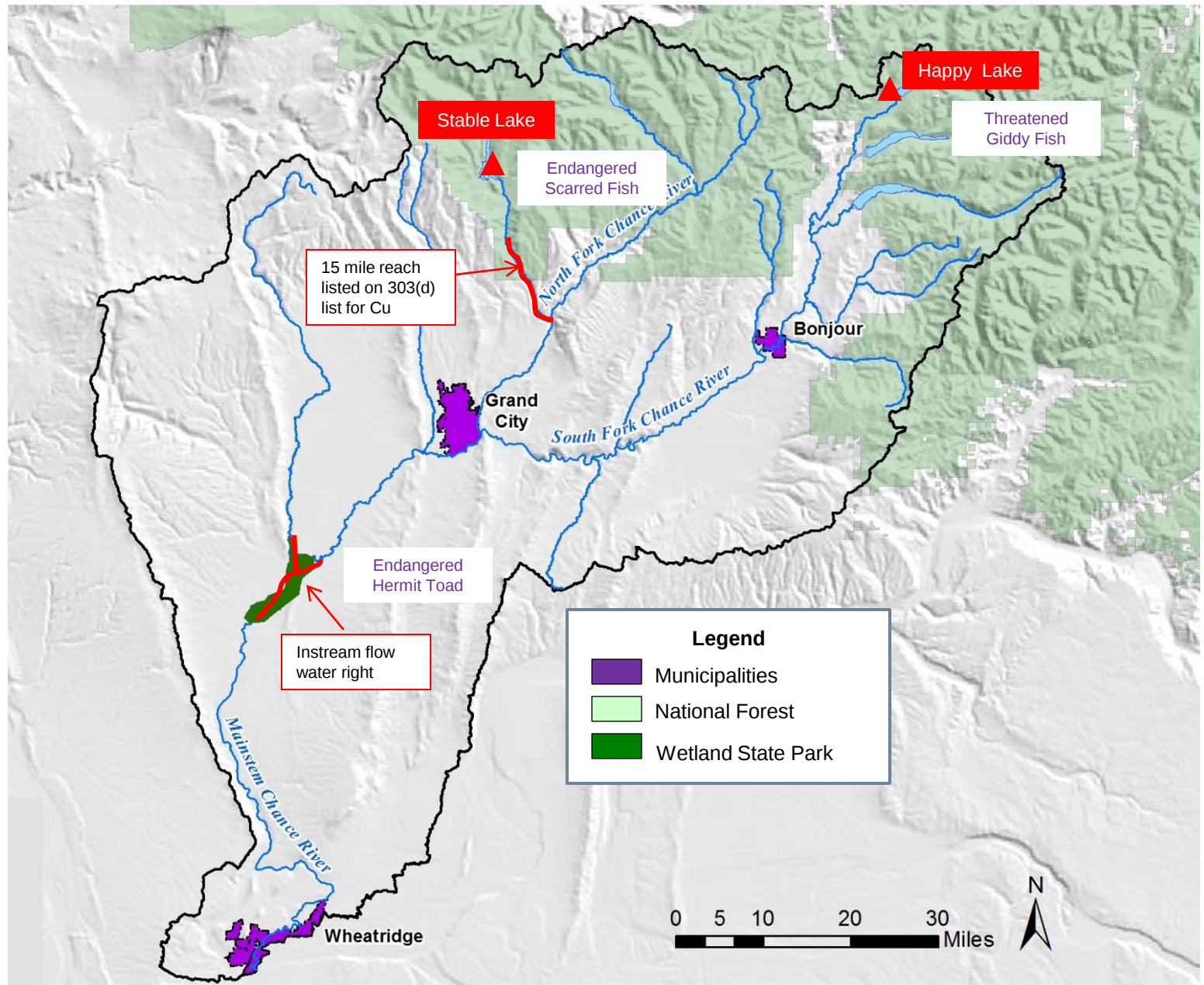
Irrigated Acres



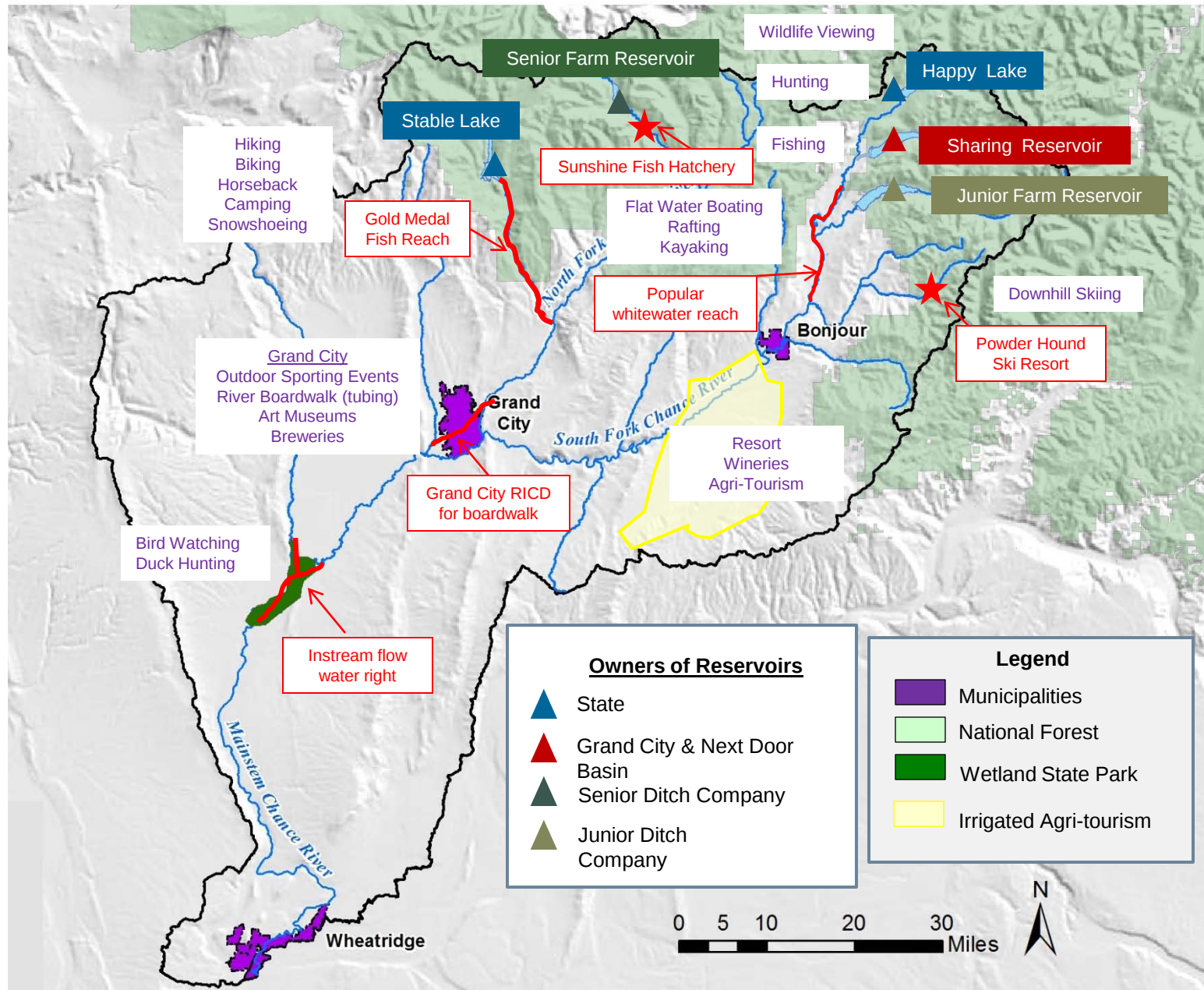
Municipal and Industrial



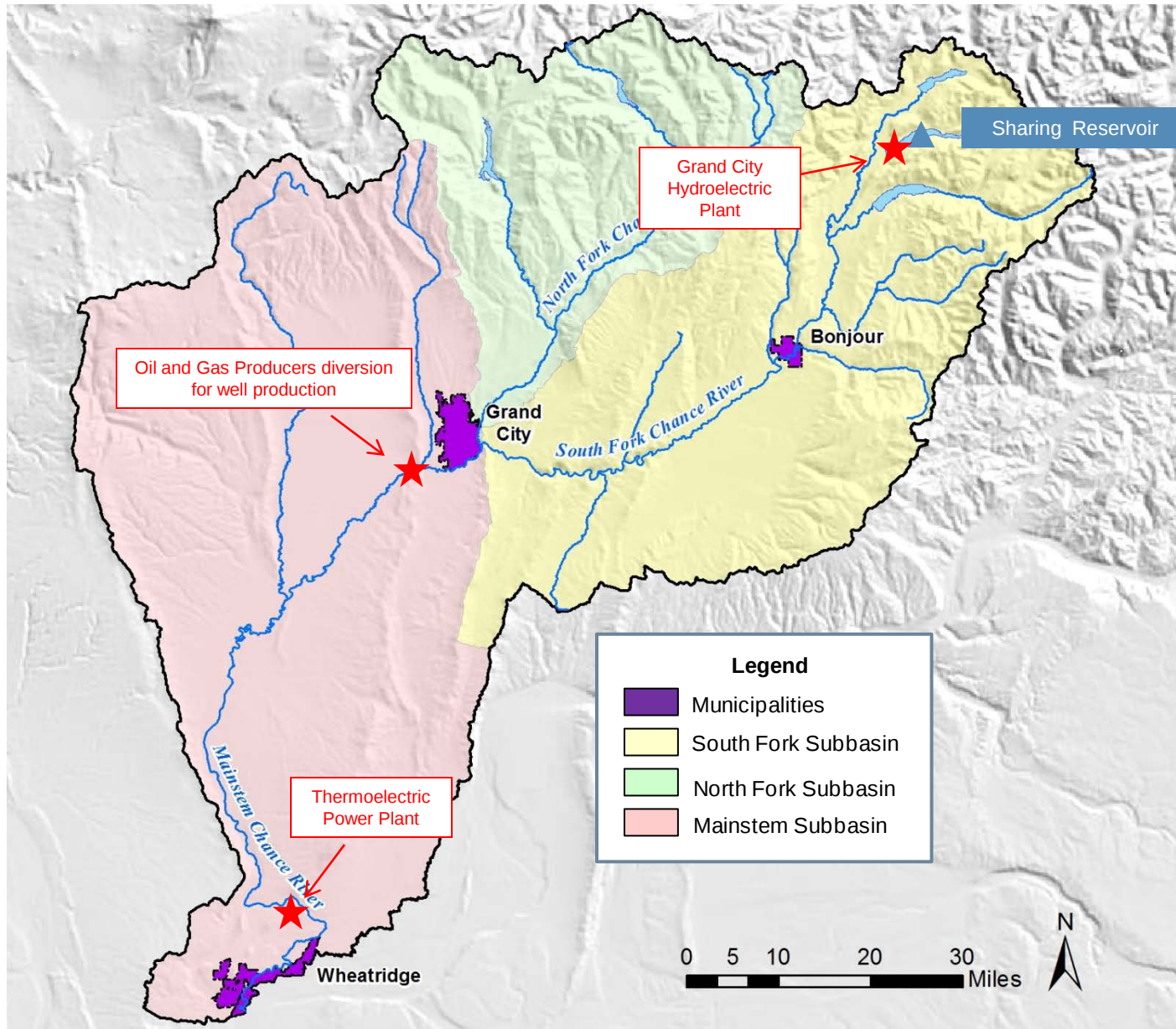
Environment



Recreation and Tourism



Energy

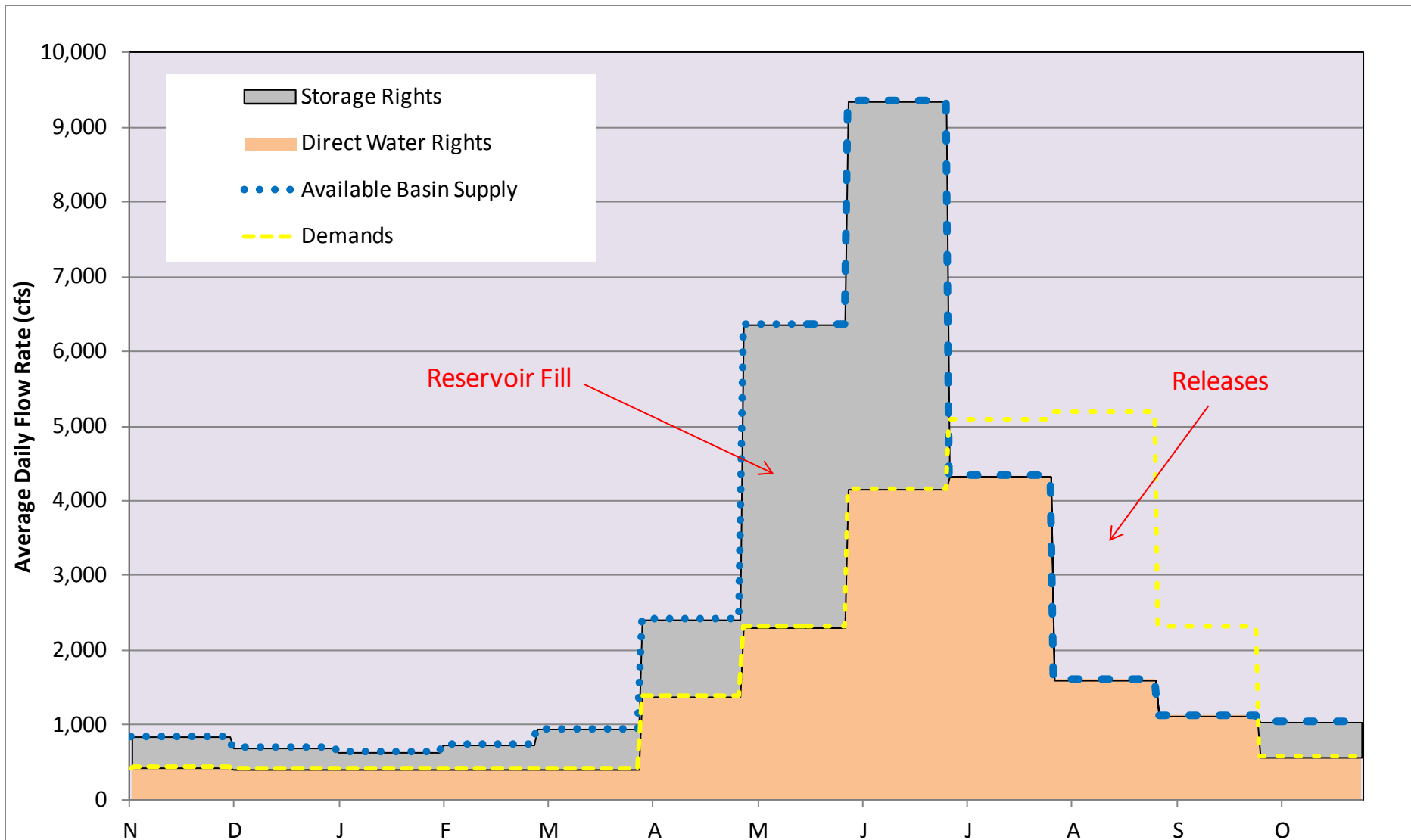


Appropriation System

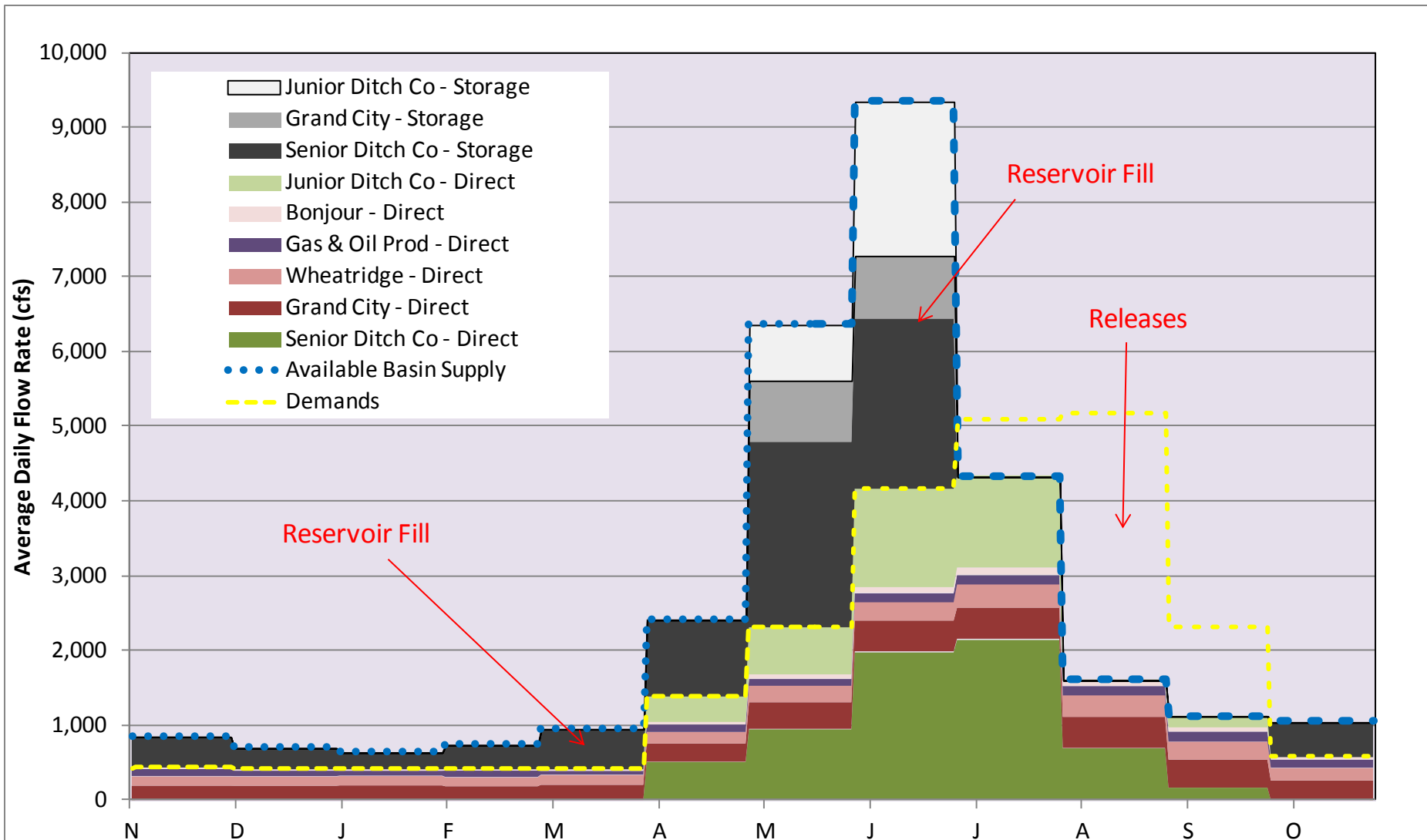
26

Water Rights	Priority Year	Period Diversion	Administration No.
Inter-State Compact	1842	year-round	001.0
Next Door Basin (transbasin diversion)	1850	year-round	002.0
Federal Reserve Right (Stable Lake)	1851	year-round	003.0
Federal Reserve Right (Happy Lake)	1851	year-round	004.0
Direct Flow Rights			
Senior Ditch Company	1852	April 1 - Sept 31	005.0
Grand City	1860	year-round	006.0
Oil and Natural Gas Producers Corp	1890	year-round	007.0
Wheatridge	1900	year-round	008.0
Bonjour	1945	year-round	009.0
Junior Ditch Company	1946	April 1 - Sept 31	010.0
Storage Rights			
Senior Ditch Company	1950	year-round	012.0
Grand City	1955	year-round	013.0
Junior Ditch Company	1960	year-round	014.0
Well Permits			
Well Users Cooperative	1976	year-round	015.0
Snowmaking Rights			
Powder Hound Ski Resort	1979	Oct - April	016.0
Instream Flow Rights			
Wetland State Park instream flow right	1980	year-round	017.0
Grand City RICD	1997	June 1 - Sept 31	018.0

Water Usage in Normal Year



Water Usage in Normal Year

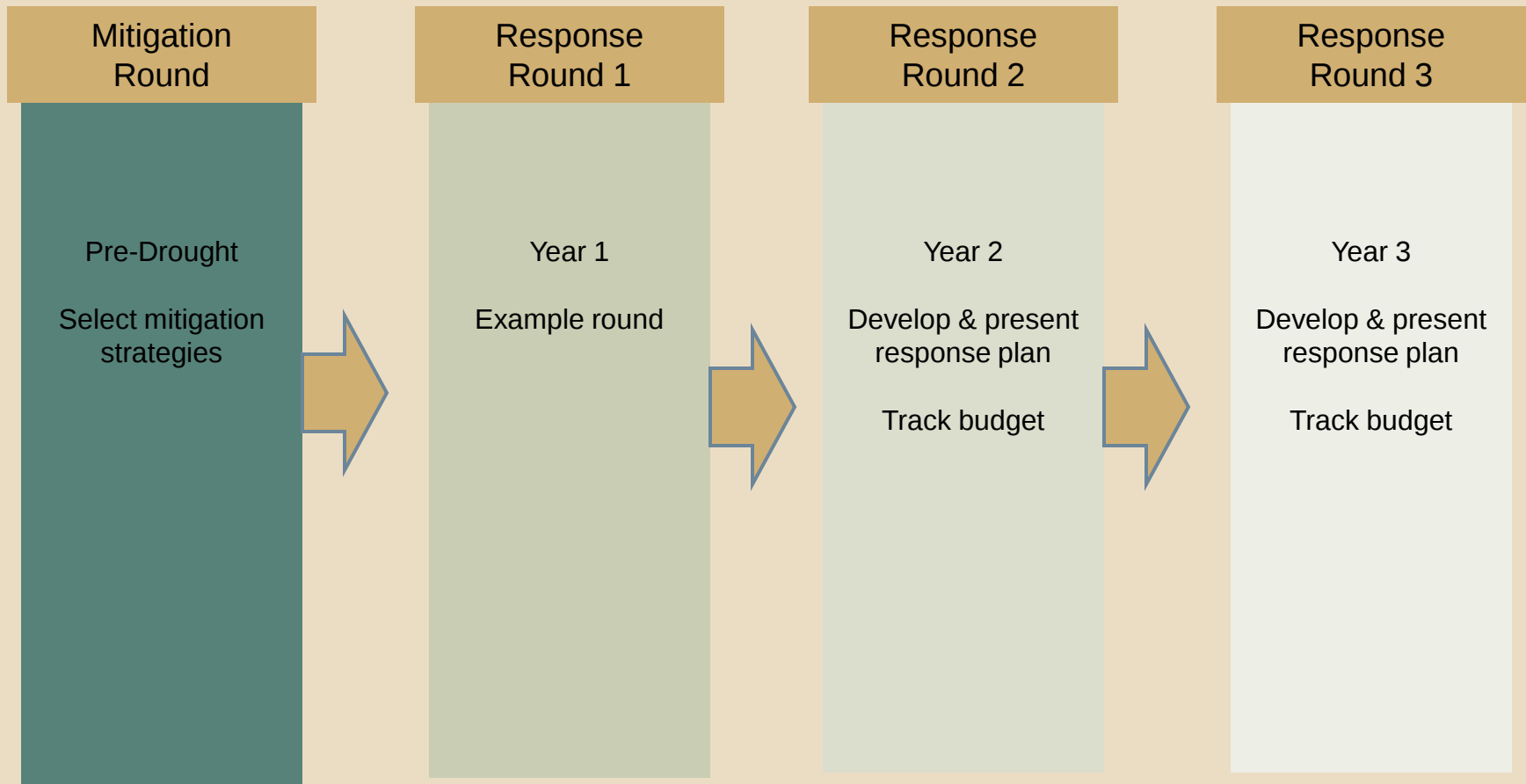


Playing the Tournament



Tournament Rounds

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Mitigation vs. Response Rounds

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- Drought Mitigation
 - ▣ Action taken prior to a drought
 - ▣ FEMA definition - Any SUSTAINED action taken to reduce or eliminate long-term risk to human life and property from hazards
- Drought Response
 - ▣ Actions taken during a drought
 - ▣ Temporary in nature



Mitigation Round

Drought Tournament

September 18, 2012

Mitigation Round

Colorado Drought Conference
Tournament Materials

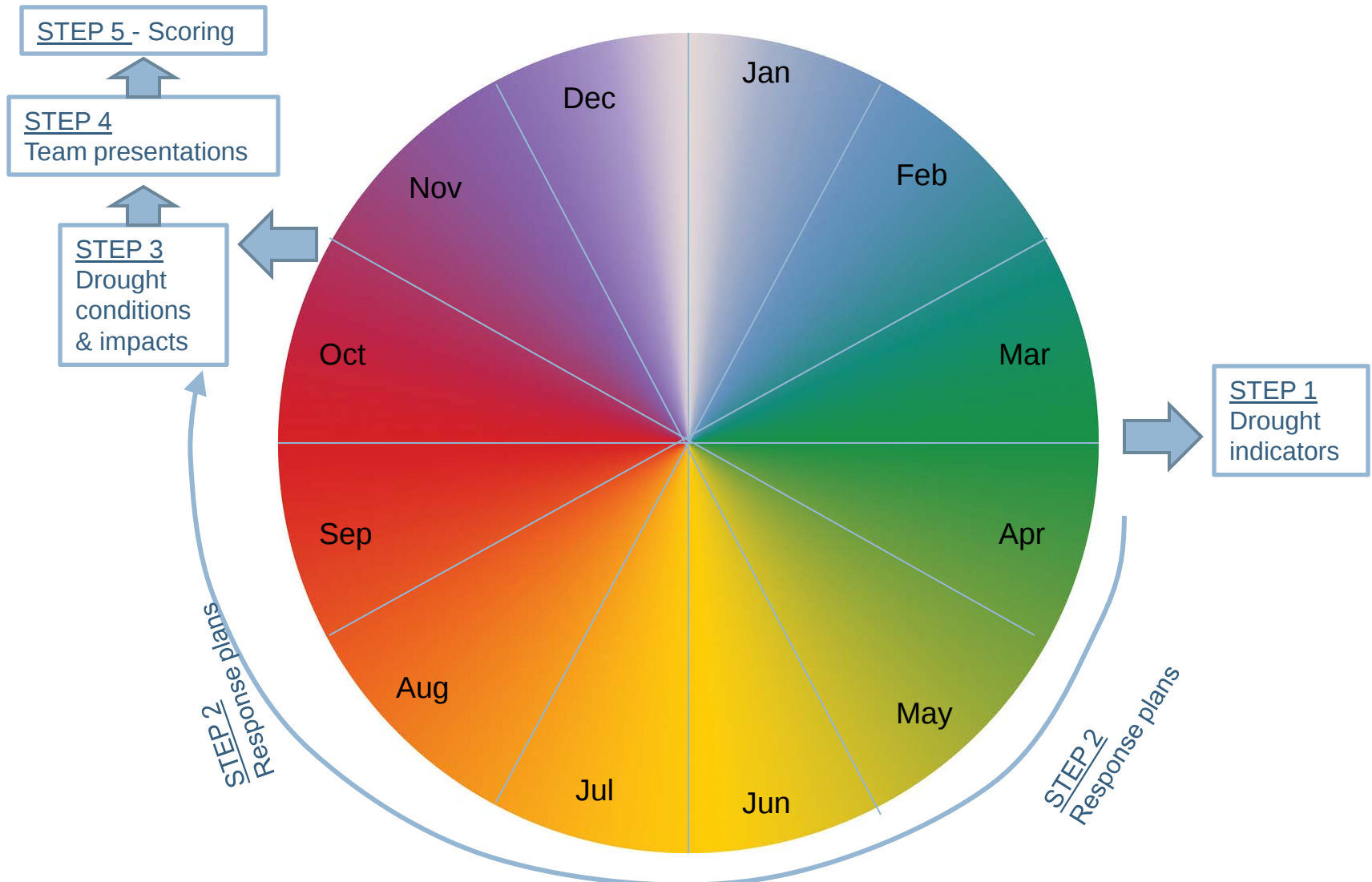
Pre-Drought Mitigation Round - Mitigation Strategies

Mitigation Strategy	Description	Cost (\$ - in thousands)	Notes
Wetland State Park instream flow	The Environmental Water Trust has a leasing program providing out-of-basin senior agricultural water rights for instream flow purposes in dry years. The water right is very senior (administraton no. 004.5) and is available in all drought years from April through October.	\$1,000	May legally use the water right once every three years. (This may be used in either Round 2 or Round 3).
Drought reserve funds	Each water user in the basin collectively contributes to a drought reserve fund designated for the implementation of response strategies during a drought. This additonal funding of \$6 M may be used during one round of the tournament to increase a team's budget and consequently its ability to implement response strategies.	\$2,000	The funds may be used to respond to drought impacts among all sectors.(This may be used in either Round 2 or Round 3).
Bonjour drought supply	Bonjour does not have storage rights and therefore has entered an agreement where under drought conditions, supplies may be released from Stable Lake to meet 100% of Bonjour's needs. Note: This strategy will injure the endangered Scarred Fish.	\$3,000	This agreement may only be used once in a 3-year period. (It may be used in either Round 2 or Round 3).
Drought monitoring	The Basin Drought Committee invests in drought indicator monitoring equipment and collection of drought impact data in advance of the drought. These new data provide beneficial information beyond the standard temperature, precipitation, snowpack, storage and drought indice data.	\$2,000	Provides 1/10th of a point at the end of Round 2 and Round 3. Note: The winning team on Simulation Day won by 1/10th of a point.
Pre-drought water leasing arrangements	A systematic approach to leasing supplies is developed in the Basin in advance of the drought. This improves efficiency and reduces the administrative costs necessary for leasing.	\$4,000	Obtain 20% discount for all leasing arrangements. (This may be used in Rounds 2 and Round 3).
M&I water efficiency (conservation)	Wheatridge implemented water efficiency activities (conservation activities) prior to the drought. These activities lowered their annual demands by 30%.	\$2,500	Obtain 30% discount for the cost of leasing supplies to Wheatridge. If the water banking arrangement strategy is selected the 30% discount would be in addition to the 20% discount. (This may be used in Round 2 and Round 3).



Response Rounds

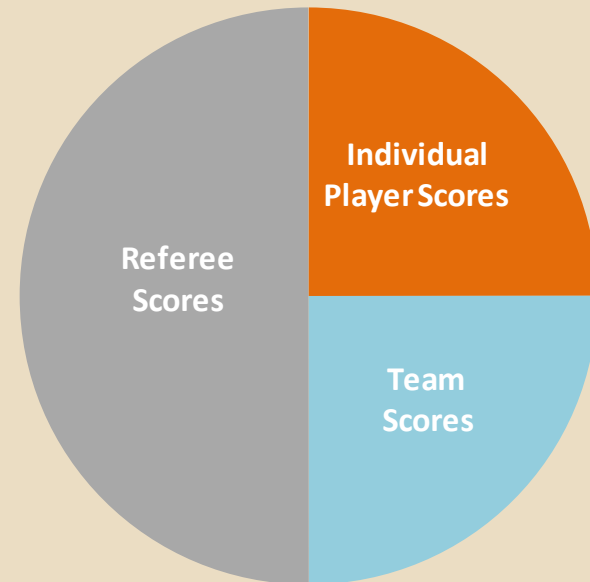
33



Scoring Process

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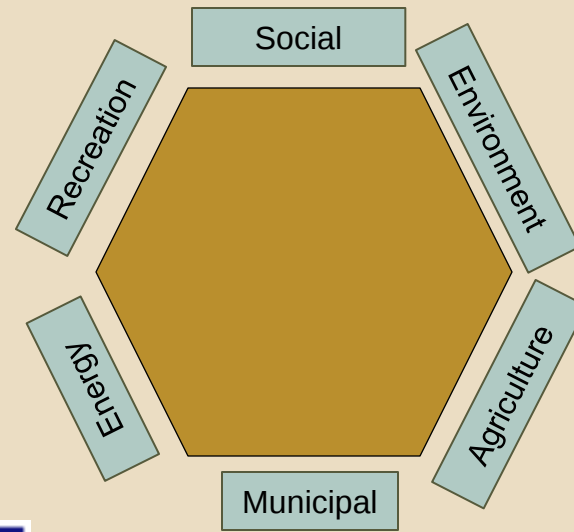
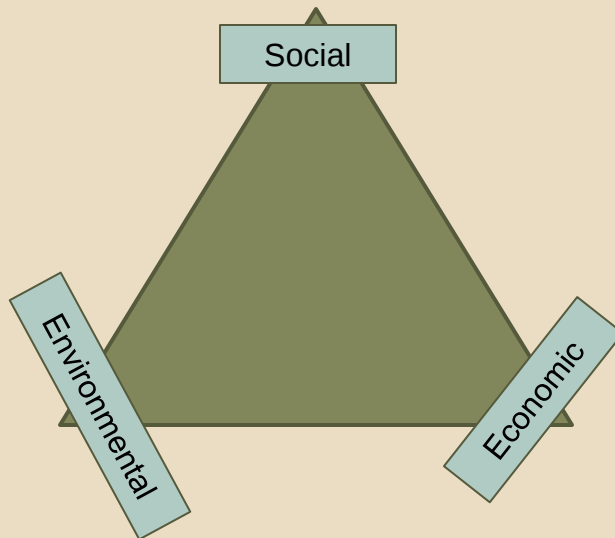
- Weighted Scoring
 - ▣ 50% - Referees scores
 - ▣ 25% - Team scores
 - ▣ 25% - Individual player scores



Scoring Criteria

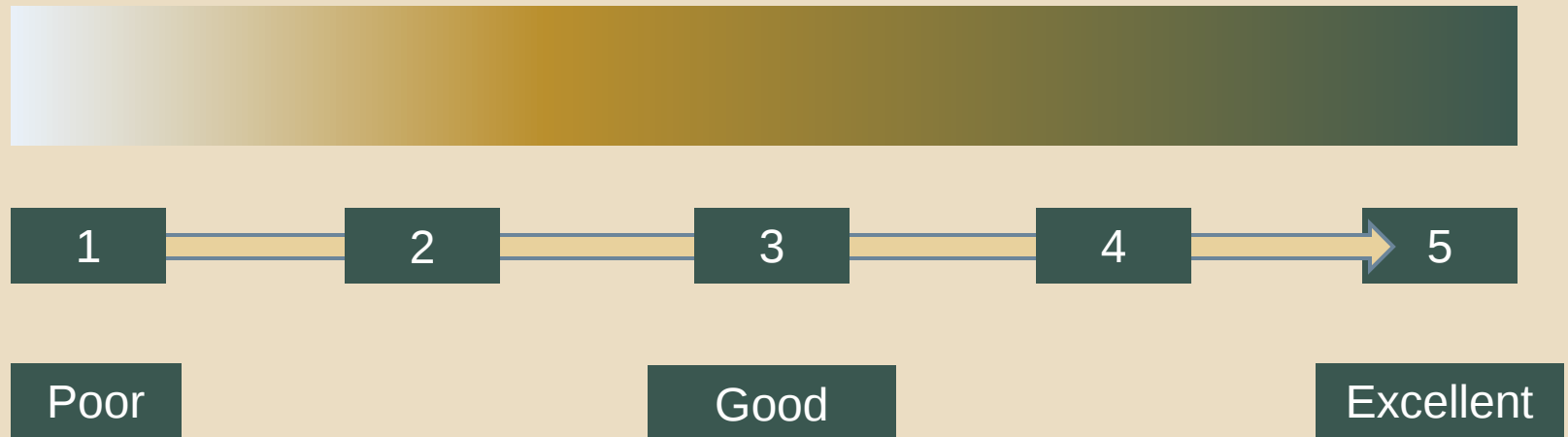
35

- Vulnerability and potential impacts
- Captured impacts
- Response strategies



Scoring Scale

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Scoring Process

Drought Tournament

September 18, 2012

Practice Response Round 1

Colorado Drought Conference
Tournament Materials

Individual Player Scorecards

Name of Player

[a] Example

Round

[b] Example

Name of Team

[c] Example Team

Criteria	Teams [d]				
	Team 1	Team 2	Team 3	Team 4	Team 5
Assessment of vulnerabilities and identification of potential impacts. How accurate are the teams' vulnerability assessments and how comprehensive is their potential impact list?	5	5	5	5	2
Capture key impacts following the irrigation season in November. Do the response plans address the key impacts?	4	4	3	4	2
Thoroughness of response plan. How well did the response strategies address potential impacts?	4	1	2	1	1
Average of Scores [e]	4.3	3.3	3.3	3.3	1.7

[a] Enter your team name

[b] Enter round

[c] Enter team name

[d] Enter scores following each teams' presentation

[e] Take average of criteria scores



Note: Scores should be in whole numbers on a scale of 1 to 5.

5 = Excellent

3 = Good

1 = Poor

ROUND 2 OVERVIEW



Round 2: End of April 2022

CHANCE TIMES

Your biannual dose of local watershed news

April 2022

April Response Round 2

News Highlights

Drought Predicted to Persist

Predictions indicate that drought is here to stay this year. While last year we had sufficient storage to meet many of our basin needs, our supplies could be severely stressed this year.

Major Upcoming Events

- Kayak Internationals Upstream of Bonjour
- First Annual Uncle DooLittle's Paddle Boat Competition at River Walk
- National Pro Golf Championship in Bonjour
- Little League Nationals in Grand City

Drought Concern Heightening Among Owners of Vineyards and Orchards

"If we cannot keep our vineyards and orchards alive, we not only lose a year's worth of crop revenue, but our entire livelihood. Unlike field crops, we have a very high capital investment in our trees and vineyards which have to stay alive." This was spoken by Helen Frasier, manager of Orchard Farms about ten miles south of Bonjour. This area traditionally relies on alluvial groundwater and leasing arrangements with Grand City for their water supplies. Grand City may opt to forgo some or all of their water leasing arrangements this year in order better secure their municipal supplies. Charles Smith, City manager for Grand City has stated, "We are evaluating our current situation and have not yet decided on whether we will be leasing this year." A decision is anticipated within the next few weeks.

Leasing Snow

Powder Hound Ski Resort's junior snow making right was not in priority this year, yet they were able to arrange a last minute deal with Grand City to lease enough water in order to open three quarters of their terrain for the holiday season. Above normal snow conditions in February and March enabled the resort to open 90% of their terrain for early spring skiing.

Well Replacement Supply Cut In Half

Last year Neighboring Basin was able to provide 100% of their quota for 700,000 AF of replacement supply to the Well Users Coop. However, discussions with Next Door Basin this year indicate that the quota may be reduced to 50%, resulting in a supply of only 350,000 AF. George Burns, a corn farmer downstream of Grand City is nervous: "With such a reduction in the replacement supply, a large number of us alluvial groundwater pumpers could be cut-off since we will not be able to make up our stream depletions. I solely rely on pumping. Without water, I cannot grow my corn and without my crop, I cannot make a living this year."

Round 2 News Highlights

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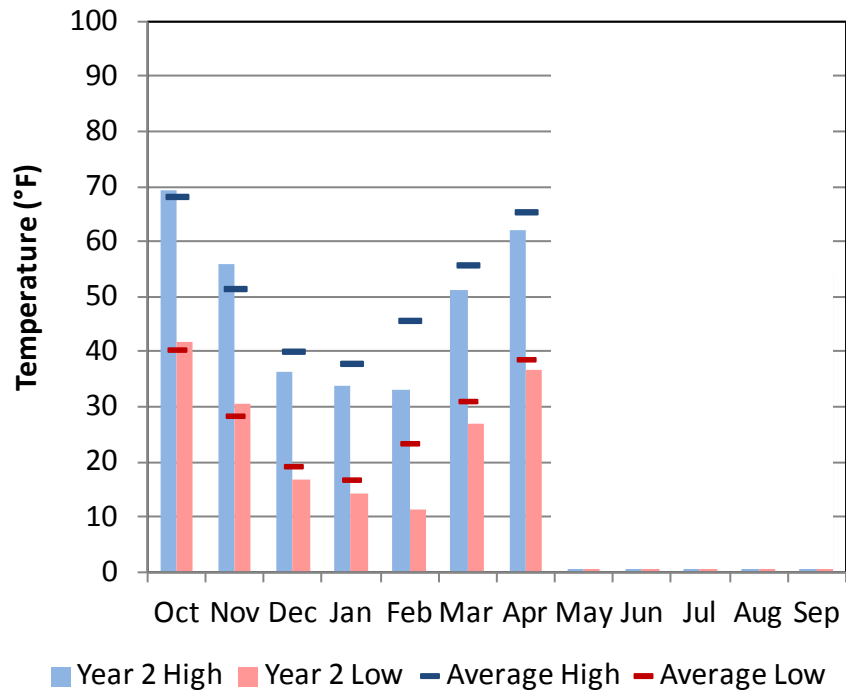
- Drought predicted to persist
- Drought concern heightening among vineyards and orchards
- Powder Hound Ski Resort leasing snow
- Well replacement supply cut in half



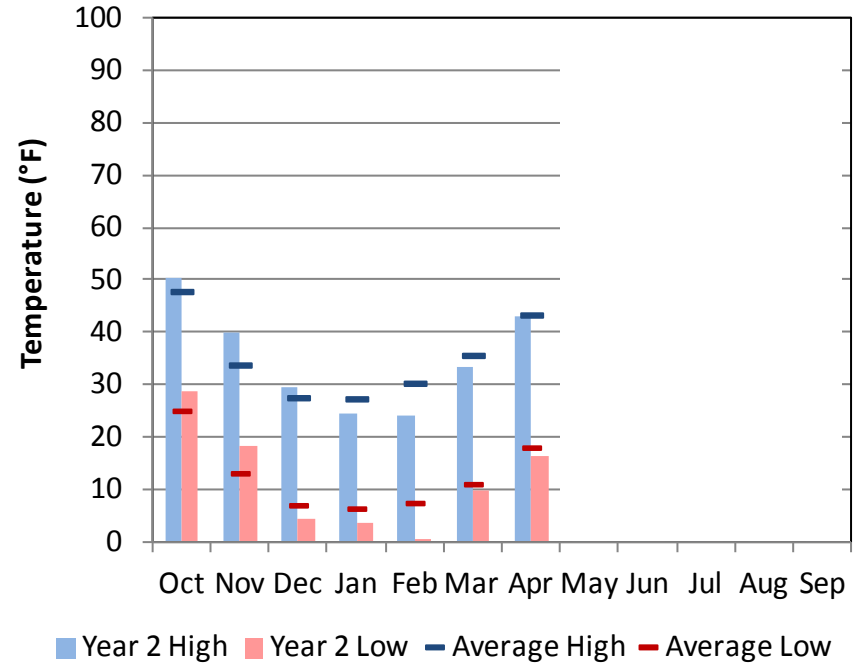
Temperature

41

**Temperature Recorded at Wheatridge
EI - 4,600 ft**



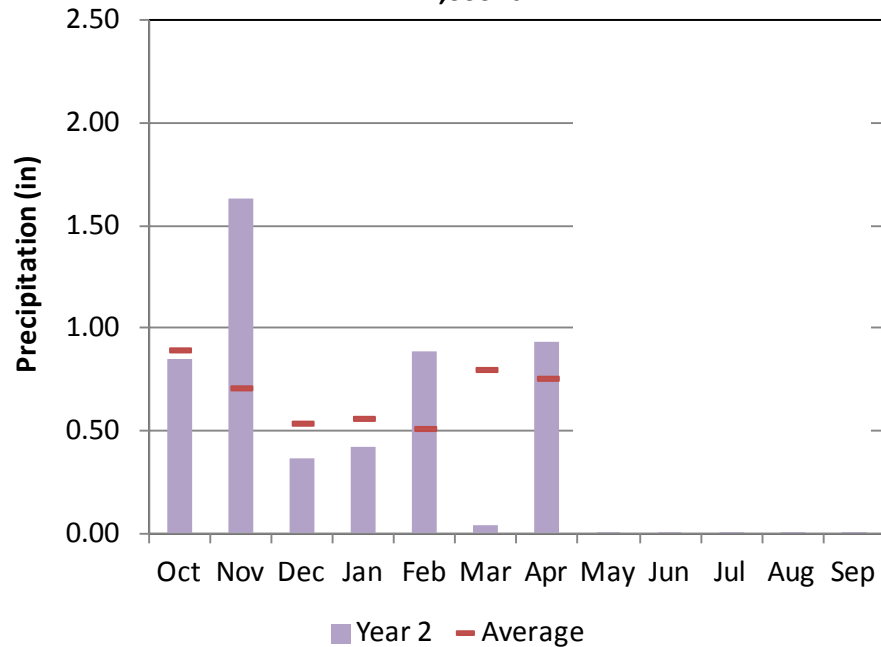
**Temperature Recorded at Powder Hound Ski Resort
EI - 8,200 ft**



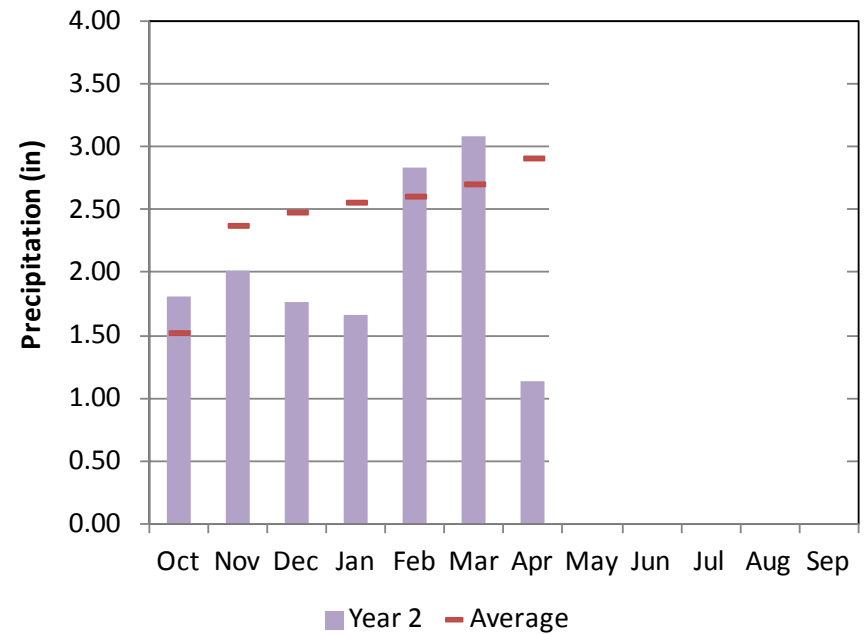
Precipitation

42

**Precipitation Recorded at Wheatridge
EI - 4,600 ft**



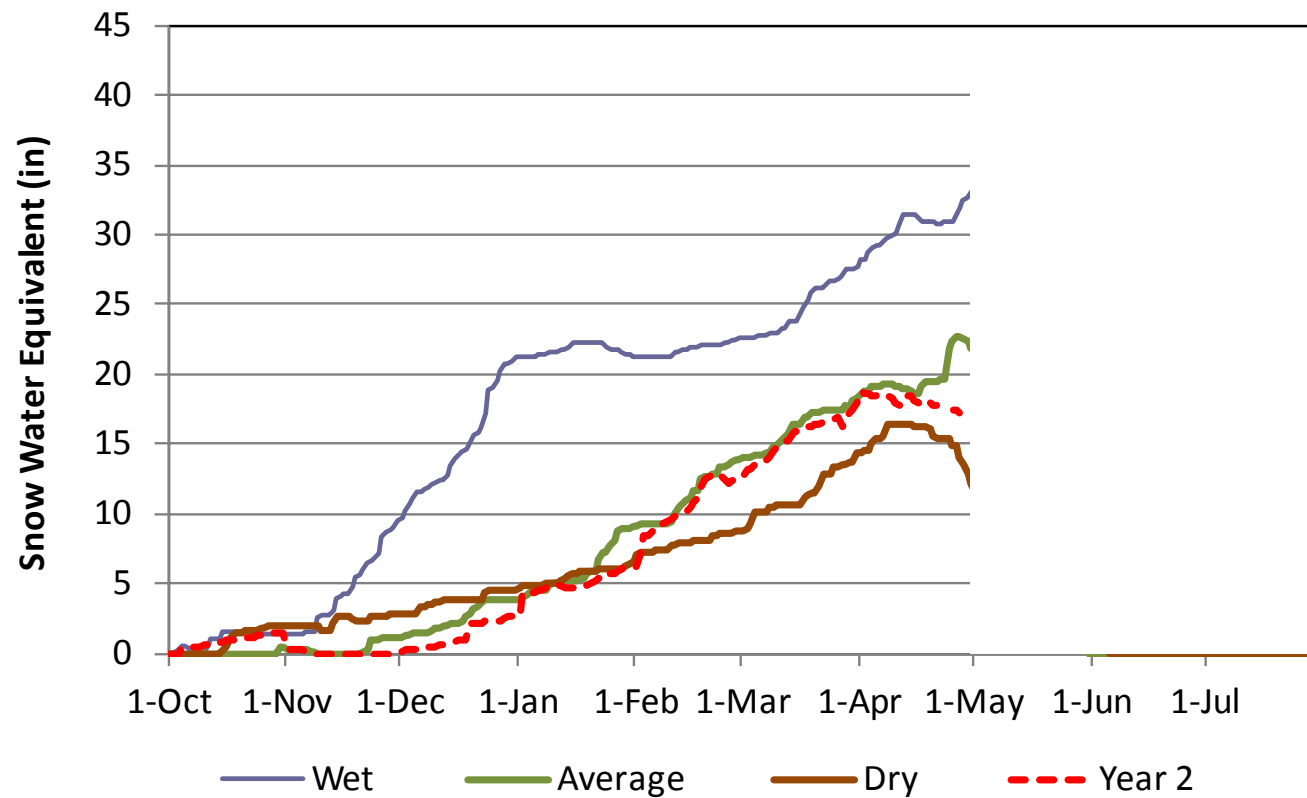
**Precipitation Recorded at Powder Hound Ski Resort
EI - 8,200 ft**



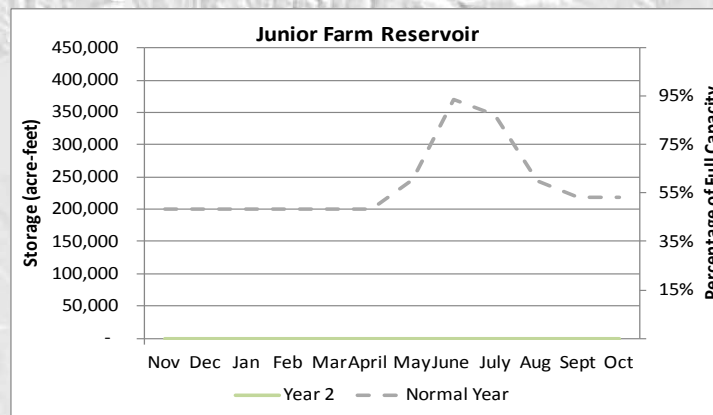
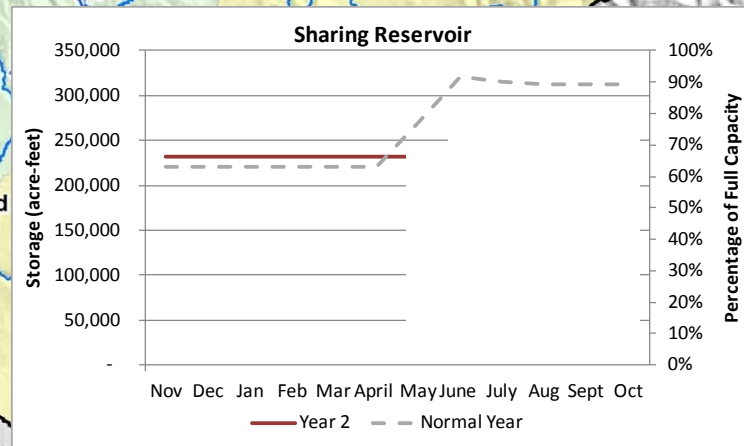
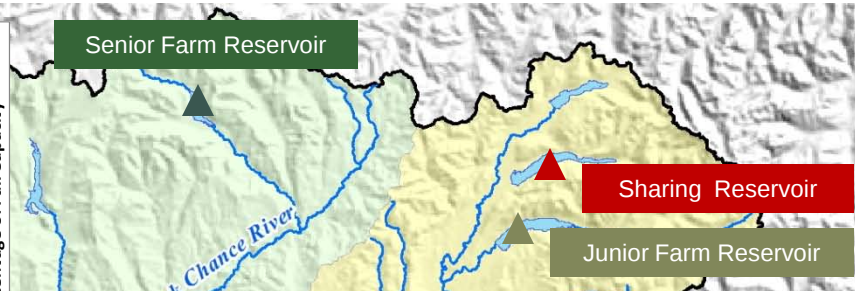
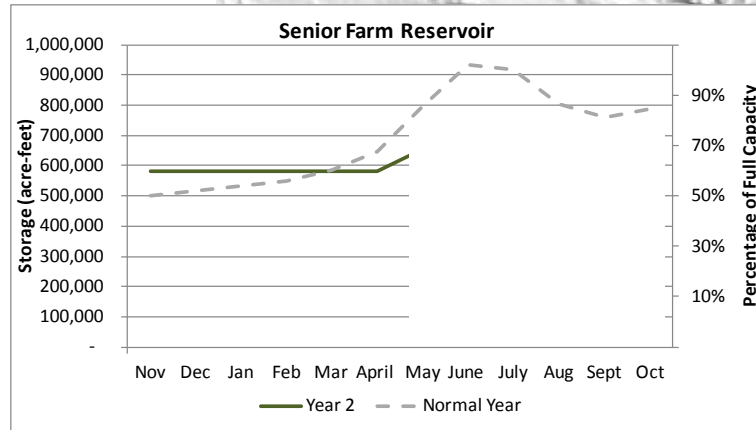
Snowpack

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Cumulative Snowpack at Powder Hound Ski Resort



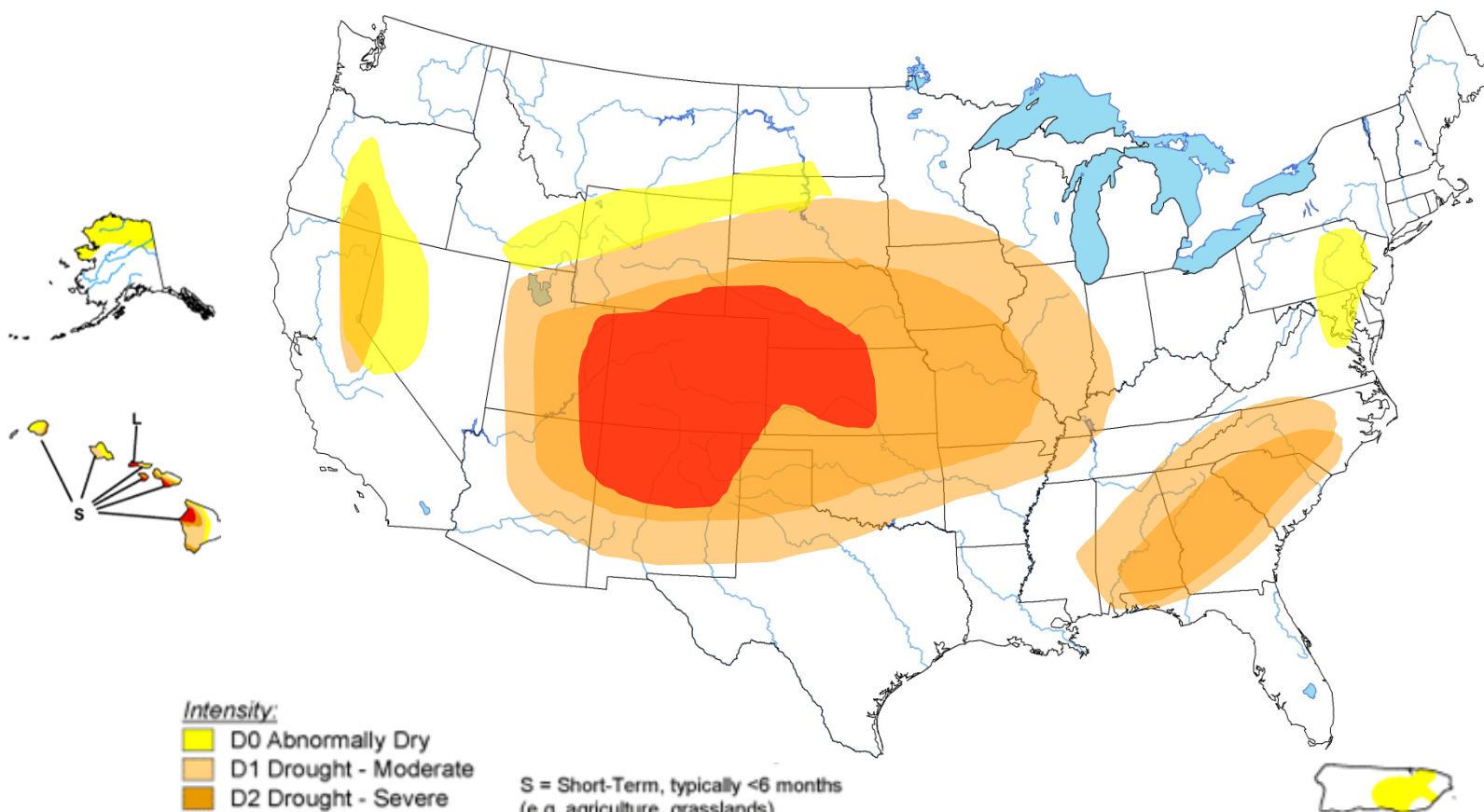
Storage



U.S. Drought Monitor

April 30, 2022

Valid 8 a.m. EDT



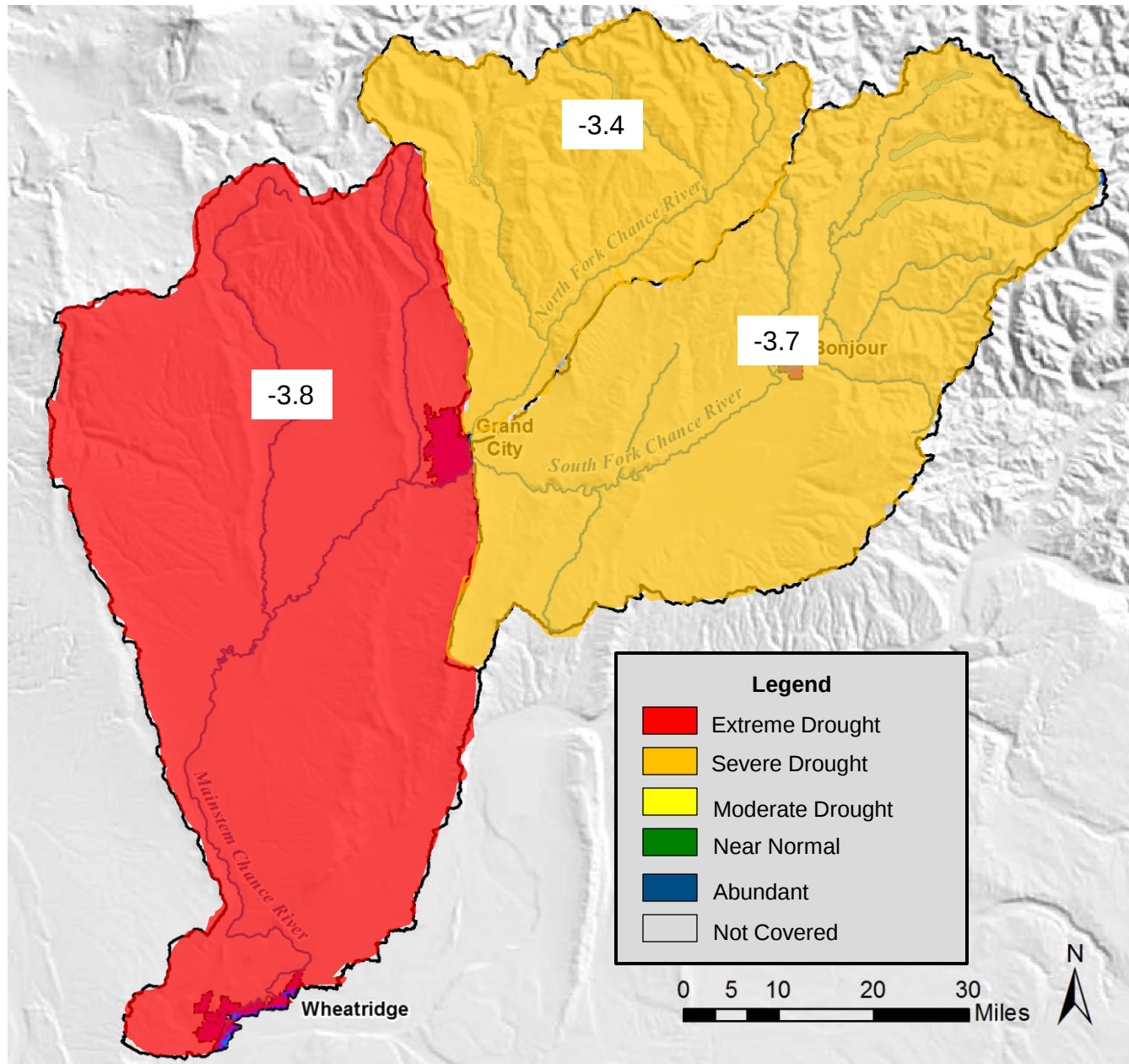
*The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. See accompanying text summary
for forecast statements.*

<http://droughtmonitor.unl.edu/>



Released: April 30, 2022

Surface Water Supply Index



Feb

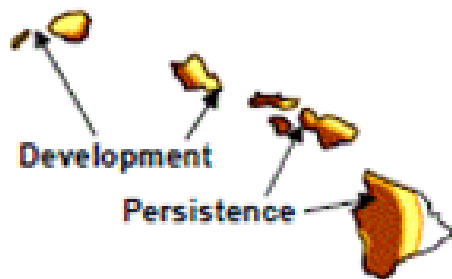


U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

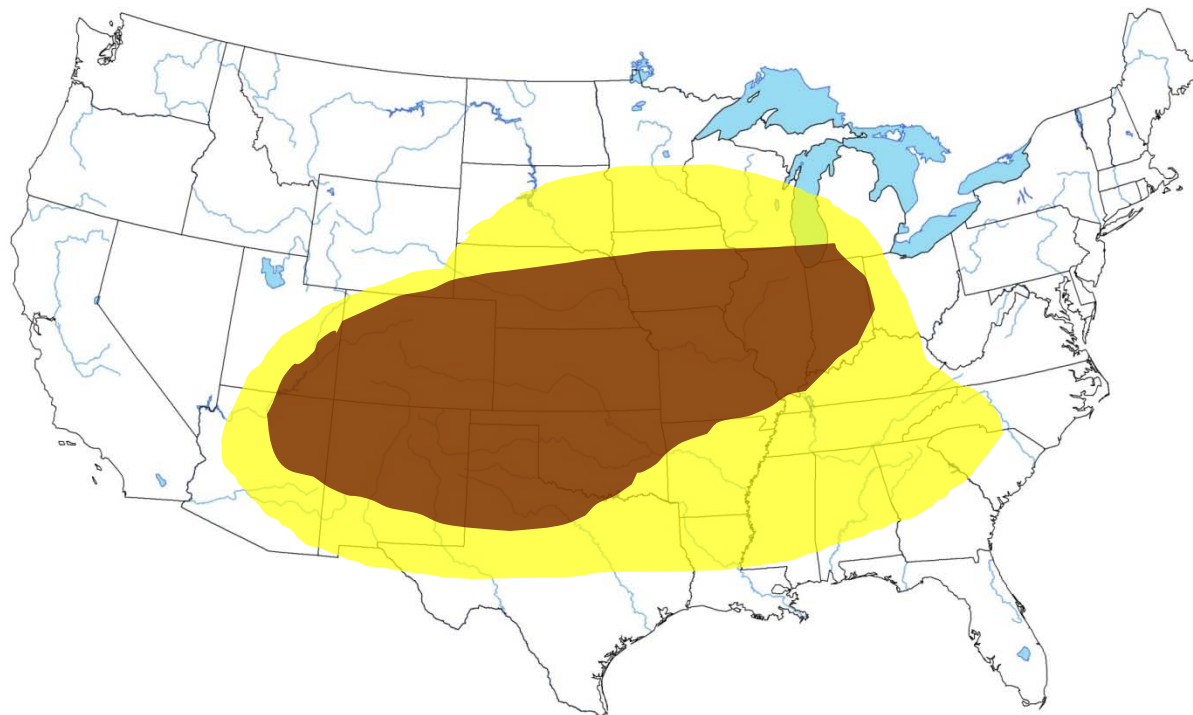
Valid for April 30 – July 31

Released November 1



KEY:

-  Drought to persist or intensify
-  Drought ongoing, some improvement
-  Drought likely to improve, impacts ease
-  Drought development likely



No Drought
Posted/Predicted



Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events – such as individual storms – cannot be accurately forecast more than a few days in advance. Use caution for applications – such as crops – that can be affected by such events. “Ongoing” drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

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Round 2: Break-Out



Response Strategies

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Drought Tournament
September 18, 2012
Response Round 2

Colorado Drought Conference
Tournament Materials

Round 2: Response Strategies

Use	Not at Risk (No Drought Response Strategy)	At Risk (No Drought Response Strategy)	At Risk (With Drought Response Strategy)	Option No.	Response Strategy	Description	Costs to Implement Strategy (\$ - in thousands)
X	X	X	X	T1	Leasing In-Basin Supplies	Leasing of In-Basin water stored in Shafter Reservoir and Senior Farm Reservoir	See leasing table (In-Basin)
X	X	X	X	T2	Leasing of Next Door Basin or Neighboring Basin replacement supplies	Leasing of Out of Basin Next Door supplies that typically stored in Shafter Reservoir and exported to Next Door Basin. Maximum of 10,000 A/F may be diverted per year	See leasing table (Next Door Basin)
X	X	X	X	T3	Leasing of Neighboring Basin replacement supply	Leasing of Neighboring Basin replacement supply that is typically used to replace after well depletions. This water would be used for alternative beneficial purposes other than replacement	See leasing table (Neighboring Basin)
X	X	X	X	T4	Inter-state compact negotiations	Negotiations on inter-state compact to loosen the "one-third rule" for temporary drought rules	See leasing table (Interstate compact)
X	X	X	X	T6	Utilize dead storage in Junior Farm Reservoir (50,000 A/F)	Install pump to utilize water in the "dead storage" of Junior Farm Reservoir. Sufficient to meeting Sanjour and Natural Gas & Oil Producers needs or all of Wheatridge's needs.	\$3,700
X	X	X	X	T7	Utilize storage in Happy Lake (100,000 A/F)	Sufficient to meet Junior Ditch Co., Wheatridge, Sanjour and Natural Gas and Well Producers for one year. Note: Draining of the lake will significantly impact the endangered Gidley Fish.	\$10,000
X	X	X	X	T8	Utilize storage in Stable Lake (50,000 A/F)	Sufficient to meet Wheatridge, Sanjour and Natural Gas and Well Producers for one year. Note: Draining of the lake will significantly impact the endangered Scoured Fish.	\$5,500
X	X	X	X	G1	Develop underlying Oracle bedrock aquifer for M&I use. Assume sufficient infrastructure in place where supplies can go on-line in one month	Costs include well development, pumping and potable water treatment. Note: High salinity	5 x In-Basin supplies in leasing table
X	X	X	X	G2	Develop underlying Oracle bedrock aquifer for agricultural use. Assume sufficient infrastructure in place where supplies can go on-line in a month	Costs include well development, pumping and distribution of water to delivery point. Note: High salinity	4 x In-Basin supplies in leasing table
X	X	X	X	G3	Wheatridge use of Oracle bedrock supplies	Sufficient to meet all of Wheatridge's indoor needs.	\$1,000 (all of need) \$1,000 (half of need)
X	X	X	X	A1	Outreach on agricultural federal disaster relief programs for businesses, farmers and ranchers.	Need to describe type(s) of program(s) to implement, audience and if applicable, location(s) during your response plan presentation.	\$10
X	X	X	X	A2	Implement existing emergency agricultural programs.	Example: include the NRCIS program to allow cattle to graze on public lands. Brief description of program should be provided during your response plan presentation.	\$15
X	X	X	X	A3	Installation of more efficient agricultural irrigation systems	Example: include sprinkler and drip systems. Need to provide overview of program during your response plan presentation.	\$1 per acre
X	X	X	X	A4	Row-ditch use control with crops	Need to provide overview of program during your response plan presentation.	\$15 per 10,000 acres
X	X	X	X	M1	M&I voluntary water restrictions	Voluntary water restrictions are placed on all customers. Cost is minimal when there is no enforcement.	Free
X	X	X	X	M2	M&I mandatory water restrictions and other response activities.	Mandatory water restrictions are placed on all customers requiring expense for enforcement. (Need to provide overview of restrictions as well as other M&I drought response activities when present response plan).	10 x M&I Base table
X	X	X	X	M3	M&I public outreach campaign	Education campaign focused on encouraging customers to reduce water usage. Need to provide brief overview on program during your response plan presentation.	M&I Base table
X	X	X	X	E1	Energy campaign	Example: an energy campaign could be an energy conservation campaign. Provide an overview on the information and purpose of the campaign during your response plan presentation.	Basin Base table
X	X	X	X	REC1	Recreation/tourism advertisement campaign	Provide an overview on the information and purpose of the campaign during your response plan presentation.	Basin Base table
X	X	X	X	REC2	Infrastructure improvements to recreational facilities	Example: lowering boat ramps	\$5 per location (in per month)
X	X	X	X	REC3	Events on recreational activities	Costs include enforcement. Examples include a hunting ban or fish limit.	Basin Base table
X	X	X	X	REC4	Environmental educational campaigns	Provide brief overview on the information and purpose of the campaign during your response plan presentation.	Basin Base table
X	X	X	X	REC5	Restoration and protection of habitat	Provide overview of habitat focusing on location(s) and main objective during your response plan presentation.	4 x Basin Base table
X	X	X	X	S1	Improvement to health services (mental & physical)	For purposes of the tournament, assume medical services are provided in the Basin office.	\$25
X	X	X	X	S2	Additional stakeholder meetings to coordinate drought response beyond the normal Basin Drought Committee meetings that occur on a bi-annual basis in non-drought years.	10-monthly meetings to coordinate response efforts throughout the Basin. Costs include travel and meeting space.	\$3

Leasing Table (\$ - in thousands)

Recipient of Leased Water	In-Basin Supplies (Junior Ditch Co. and Grand City)		Next Door Basin Supplies		Neighboring Basin Supplies		Interstate Compact Negotiations	
	Meet all of Shortage	Meet Half of Shortage	Meet all of Shortage	Meet Half of Shortage	Meet all of Shortage	Meet Half of Shortage	Meet all of Shortage	Meet Half of Shortage
Junior Ditch Co.	\$12,200	\$6,100	\$30,500	\$15,250	\$24,400	\$12,200	\$61,000	\$30,500
Sanjour	\$1,300	\$700	\$3,750	\$1,875	\$2,600	\$1,300	\$6,500	\$3,250
Wheatridge	\$3,200	\$1,600	\$6,500	\$3,250	\$4,600	\$2,300	\$16,000	\$8,000
Natural Gas & Oil Prod.	\$1,100	\$550	\$2,750	\$1,375	\$2,200	\$1,100	\$5,500	\$2,750
Well Users Coop.	\$17,500	\$8,750	\$43,750	\$21,875	\$35,000	\$17,500	\$87,500	\$43,750
Non-Consumptive Use	\$1,100	\$550	\$2,750	\$1,375	\$2,200	\$1,100	\$5,500	\$2,750

M&I Base Table (\$ - in thousands)

City	Base Costs
Grand City	\$8
Wheatridge	\$5
Sanjour	\$3

Basin Base Table (\$ - in thousands)

Basin	Base Costs
Entire Basin	\$15
Three-Fourths of Basin	\$11
Half of Basin	\$8
One-Fourth Basin	\$6
Include all location	\$3



Worksheets

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Drought Tournament Drought Tournament September 18, 2012

Team Name Example Team

Colorado Drought Conference
Tournament Materials

Mitigation Strategies Implemented This Round

- 1) Wetland State Park instream flow
- 2) Drought reserve funds
- 3) Drought monitoring

Starting Budget \$14,000

Note: Enter dollars in thousands

Drought Reserve Fund Mitigation Strategy \$6,000

Note: Enter \$6,000 if you are using this strategy.
If this strategy is not being used, enter \$0.

Practice Response Round 1

M&I	Agriculture	Energy	Rec/Tourism	Environment	Social	Entity/Feature	Vulnerability (high, medium, low)	Impact(s)	Drought Response(es)	Cost to Implement Strategy (\$ - in thousands)
x					x	Bonjour	high	1) Shortages in water supplies 2) Water restrictions cause outdoor landscaping to be stressed	T1 - in-basin lease w/ Grand City M2 - mandatory outdoor restrictions, commercial car-wash limitations, no new landscaping	T1 - \$1,300 M2 - \$30
	x				x	Junior Ditch Co	high	1) Severe shortages 2) Loss in crop yields & revenue 3) Dry-up of farms	Strategy - focus on irrigated land have instead of leasing A1 - Programs on low water use irrigation techniques A2 - Purchase of hay from Next Door Basin to assist cattlemen	A1 - \$10 A2 - \$15
				x	x	Wetland State Park	medium	1) Reduced streamflows 2) Reduced wetland area	T1 - Enhance flows at key times RE5 - Habitat restoration, concentrate water in ecological sensitive areas	T1 - \$900 RE5 - \$18
		x	x	x		National Forest	medium	1) Low fish populations 2) Increase wildfire risk 3) Wildlife understress	RE3 - Limit of 2 fish per person RE4 1) "do not feed animals", 2) reason for fish limit, 3) promote no fires	RE4 - \$8 (half of basin) RE3 - \$11 (3/4 of basin)

Total Cost of Response Strategies \$2,305

Final Budget \$17,695



Break-Out Session

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Team Response Plan Presentations



Presentations

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Drought Tournament
Response Round 2
September 18, 2012

Team Name All STARS (3)
() = Basin Wide

Mitigation Strategies Implemented:
Drought Monitoring
Pre-drought water conservation

Starting Budget: 13,000
Note: Enter values in thousands

Drought Response Plan

Entity Feature	Vulnerability (high, medium, low)	Potential Impact(s)	Drought Response(s)	Cost to Implement Strategy (\$ in thousands)
Senior Ditch Co	Low	Allocate less than 100% of water	(SR)	
Grand City	Low	Significant impact - lack of water for agriculture	M1 (SR) (RE)	
Natural Gas and Oil Corp	Low	Loss of profitability	(SR)	
Wheatridge	Medium	Outside limitations on water restrictions	M1 (SR) (RE)	
Reservoir	High	High tourism water restrictions	T1 (SR) (RE)	
Junior Ditch Co	High	Senior issues low supply loss of crop water	A1 A2 (SR)	

Drought Tournament
Response Round 2
September 18, 2012

Team Name All STARS

Drought Response Plan

Entity Feature	Vulnerability (high, medium, low)	Potential Impact(s)	Drought Response(s)	Cost to Implement Strategy (\$ in thousands)
Well Users Cooperative	High	Loss of crop revenue loss of capital investment loss of livestock	T1 (SR)	8500
Dry Land Agriculture	High	Loss of crop revenue loss of livestock loss of feed	A1 A2 (SR)	10
Wetland State Park	Medium	Lower flows decrease water quality	RE5 (SR) (RE)	12
Grand City Recreational in Channel Diversions	Medium	Minimal impact potential impact to tourism	(SR)	
Stable and/or Happy Lake	Medium	Lowest impact loss of higher water temps impact to endangered species	RE4 (RE)	15
Power House Ski Resort	Low	Minimal impact loss of season	(SR) (RE)	

Round 2: November 2022

CHANCE TIMES

Your biannual dose of local watershed news

November 2022

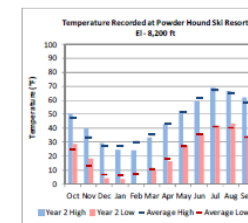
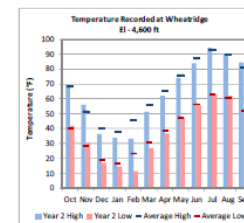
Nov Response Round 2

Drought Conditions

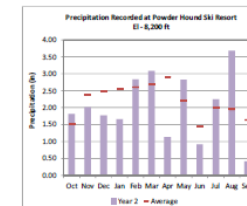
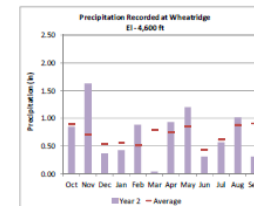
Climate Data

Temperatures in the high country were relatively normal this spring and summer. Spring and early summer temperatures were below normal on the southern plains and were average or above average during the latter half of the summer.

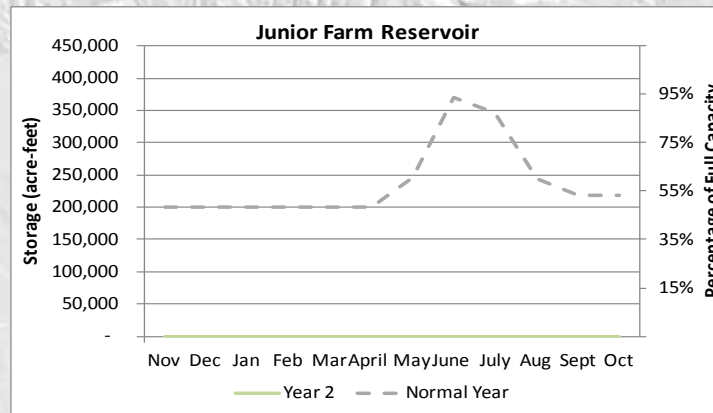
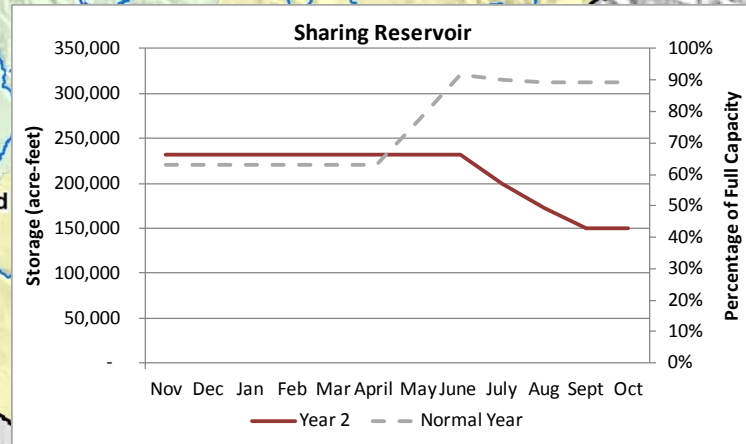
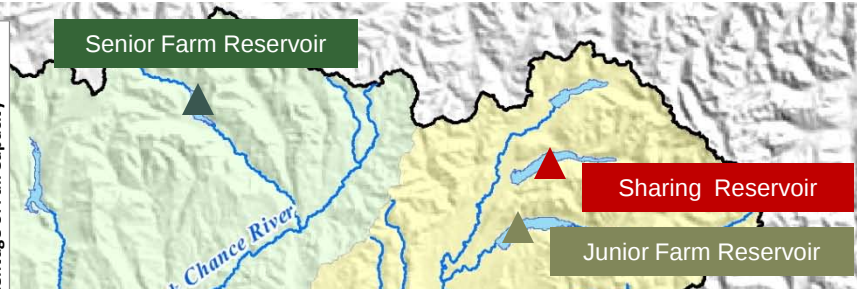
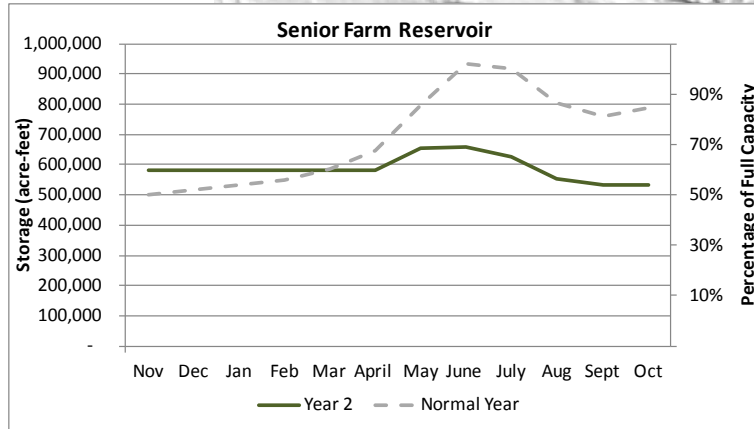
Page | 1



May was a promising month for both the southern plains and high country with precipitation exceeding average conditions. However this was followed by a drier month in June. August was a very wet month for the high country, which was a welcome, but temporary, relief.



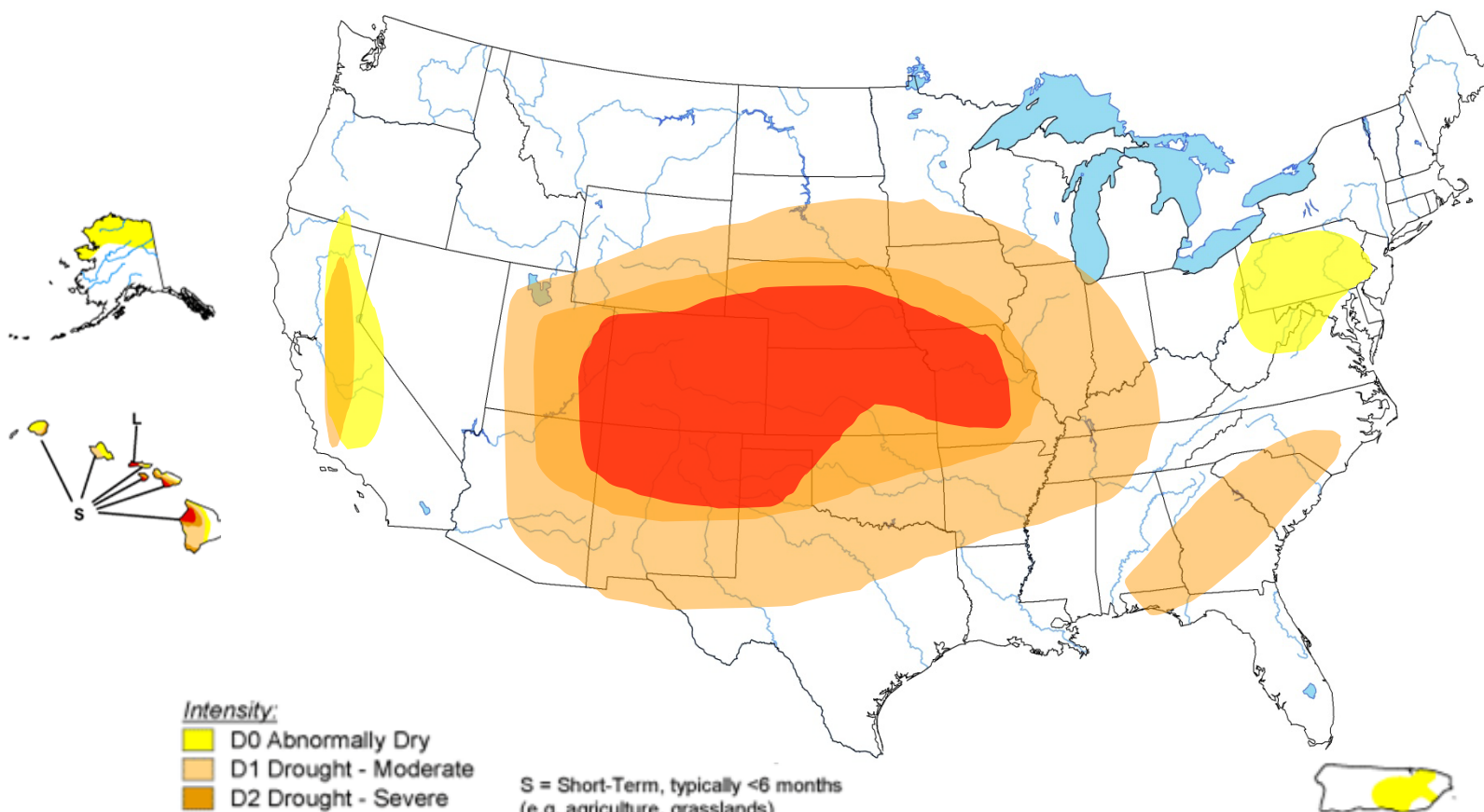
Storage



U.S. Drought Monitor

November 1, 2022

Valid 8 a.m. EDT



Intensity:

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

S = Short-Term, typically <6 months
(e.g. agriculture, grasslands)

L = Long-Term, typically >6 months
(e.g. hydrology, ecology)

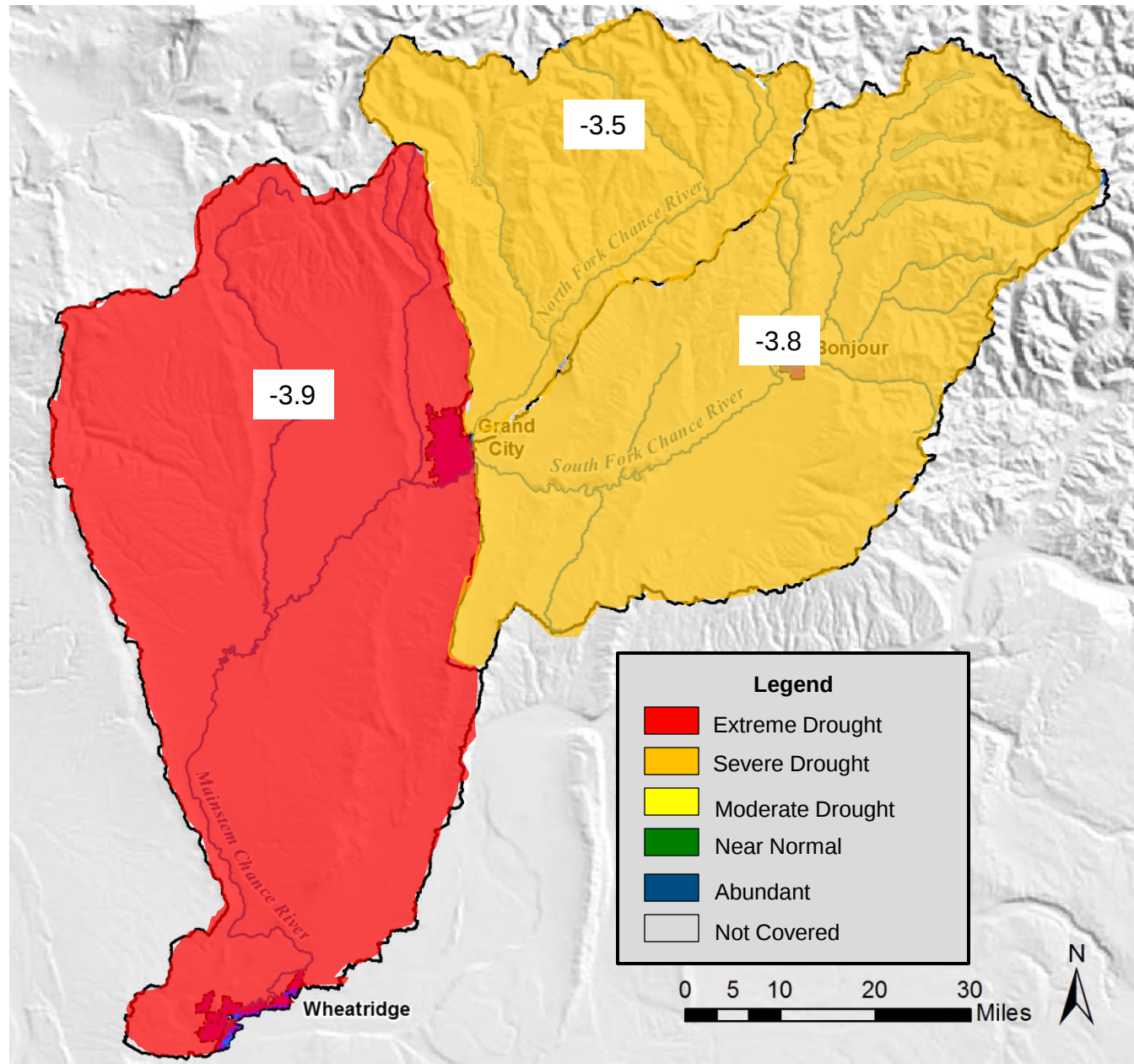
*The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. See accompanying text summary
for forecast statements.*

<http://droughtmonitor.unl.edu/>



Released: November 1, 2022

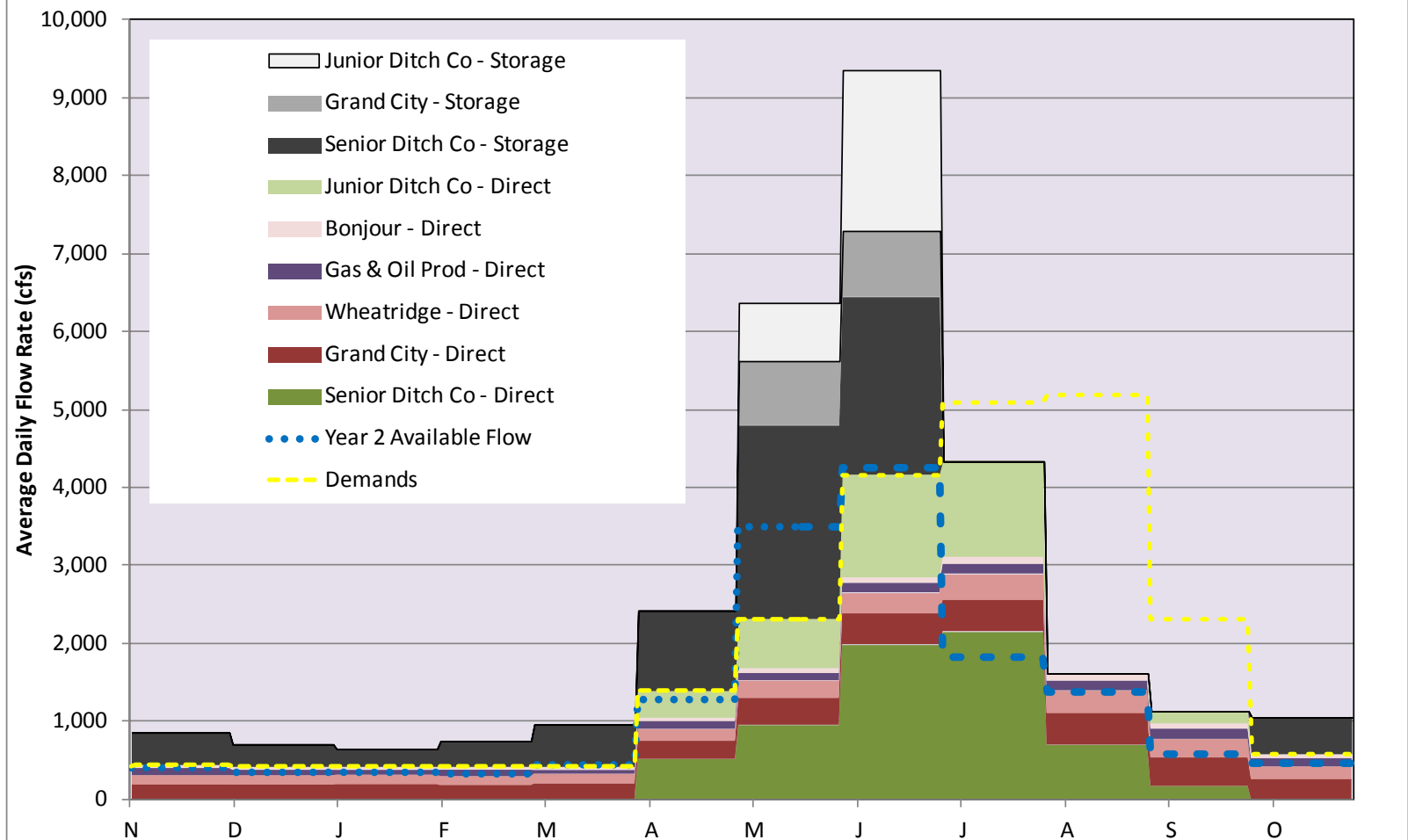
Surface Water Supply Index



Nov

Shortages and the Appropriation System

Water User	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Senior Ditch Co	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Junior Ditch Co	0%	0%	0%	0%	0%	35%	0%	0%	100%	100%	100%	0%
Grand City	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bonjour	87%	100%	100%	100%	0%	0%	0%	0%	100%	100%	100%	0%
Wheatridge	0%	29%	31%	43%	0%	0%	0%	0%	100%	100%	100%	0%
Natural Gas & Oil Prod	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	0%
Well Users Coop	0%	0%	0%	0%	0%	0%	50%	50%	50%	50%	50%	0%



Key Drought Impacts

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- Poor air quality from local and regional wildfires
 - ▣ Respiratory ailments
- Low reservoir levels
 - ▣ Marina and boating impacts
 - ▣ Reduction in camping
- Decrease in M&I revenue
 - ▣ Increase in water rates
- Temporary shut-down of powerplant
 - ▣ blackouts



Tournament Results

Drought Tournament

Response Round 3

September 18, 2012

Team Name Drought Scouts (#4)

Mitigation Strategies Implemented

- 1) Predrought Leasing Arrangements
- 2) Drought Reserve Funds
- 3) M+I Water Efficiency

Lessons Learned

1)

Innovative Strategies

1)

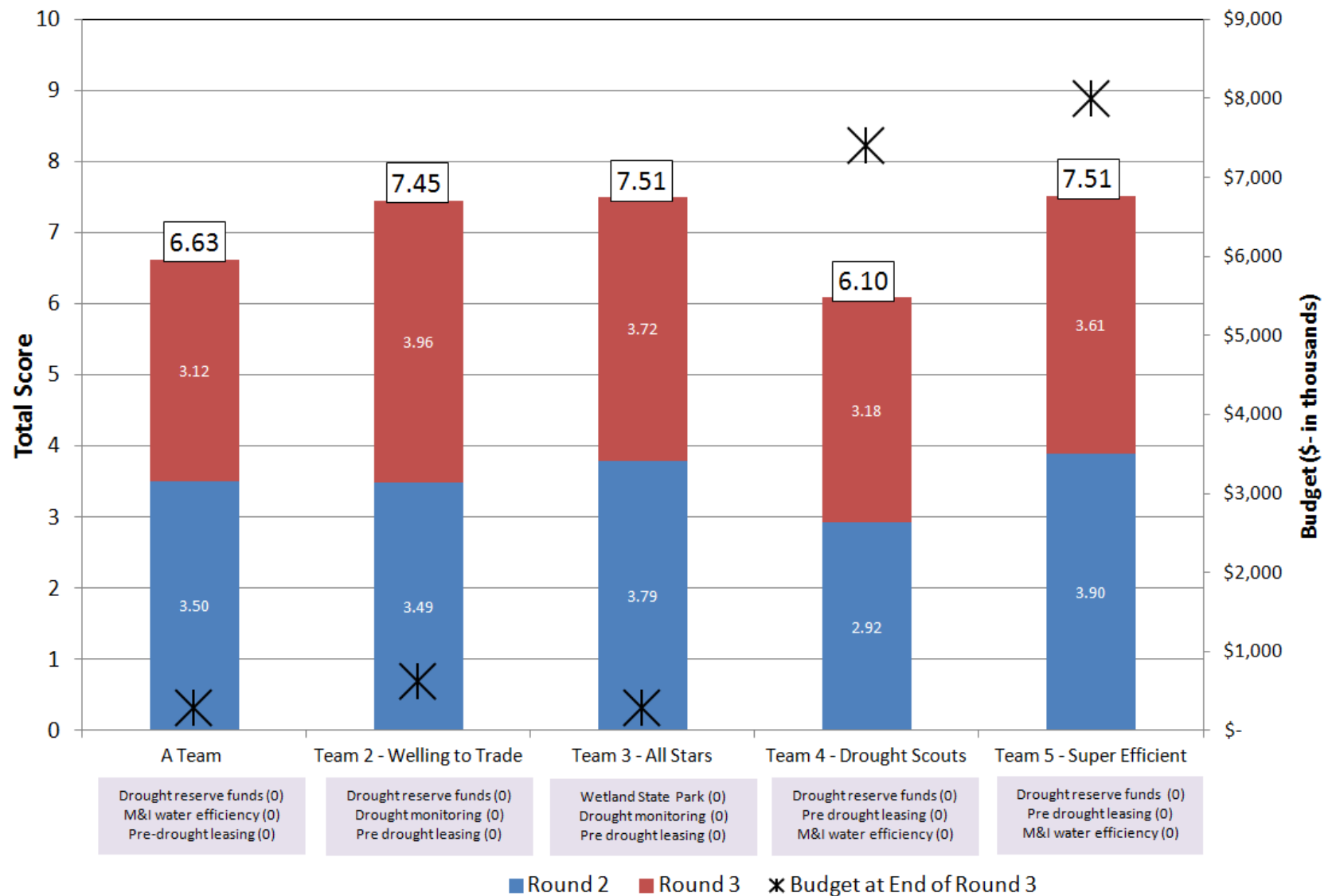
2)

3)

And the winner (s) is (are).....

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Score Tally - End of Round 3



Tournament Observations and Lessons Learned

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- Excellent collaboration and engagement of players
 - ▣ “Interdisciplinary teams can arrive at better solutions”
 - ▣ Teams considered drought issues “holistically”
- Characterization of complexities and issues realistic
- Consistency of mitigation options chosen by teams
 - ▣ drought mitigation fund and leasing arrangements
- Breakout time limits were challenging, yet focusing
- When drought conditions worsened it was all about tradeoffs and compromises
- Re-emphasized the importance of planning in advance vs. responding during the crisis

Future Possibilities/Enhancements

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- Use as basis for drought plan development or local drought “boot camp” as a motivator to develop a plan
- Incorporate lessons learned into next State Drought Mitigation and Response Plan update
- Develop games to engage stakeholders in specific water districts, basins, or other states
- Incorporate “visualization” and technology enhancements
- Link adaptation options to economic benefits
- Simplify the scoring to referee’s only
- Use for climate change adaptation planning

Conclusion

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- The drought gaming forum strengthens collaborative decision-making
 - ▣ Framework creates a forum for multi-sector discussion
- Encourages proactive risk management
 - ▣ Scenario planning under uncertainty (climate, political, economic, etc.)
- Provides “safe environment” and to debate politically-sensitive adaptation options and foster innovation
- Promotes educational awareness
 - ▣ Provides a fun, competitive environment to learn and think of new ideas about drought adaptation



COMMENTS, OTHER OBSERVATIONS AND QUESTIONS?

