

Republican River Basin Drought Planning Exercise

Andy Pedley | Nebraska Department of Natural Resources



Basin-Wide Plan Action Item 2.8.1

Republican River Basin-Wide Plan

Jointly developed by the Upper Republican, Middle Republican, Lower Republican, and Tri-Basin Natural Resources Districts and the Nebraska Department of Natural Resources

2019



Action Item 2.8.1 Organize and participate in a basin-wide drought planning exercise

NeDNR and the NRDs will organize and participate in a drought planning exercise for the Basin. A drought planning exercise is a workshop or other activity that brings together parties with expertise in various aspects of droughts to plan and prepare for managing drought. Some areas of focus for this exercise will be:

- Increasing understanding of the needs for and logistics of storing water for use during a drought,
- Evaluating existing and potential new management actions to determine the long-term availability trends that provide carry-over storage to meet crop-water needs during drought, and
- Developing metrics that could be used to evaluate whether conservation of water for future use during a drought is successful.

2020 Exercise Framework

Exercise Type	Description
Workshop	Requires fewer resources, encourages collaboration and coordination among stakeholders, and encourages participation of the general public.
Tabletop	Requires fewer resources, good for education and training, encourages consensus building, collaboration, and coordination among stakeholders, good for plan evaluation and modification.
Game	Moderately expensive to use, encourages collaboration and coordination among stakeholders, and encourages participation of the general public.
Functional	Most expensive to use, good for already existing plans, has limited interaction with experts, more realistic and tense, good for emergency response.

*Chose a hybrid of workshop and tabletop formats.

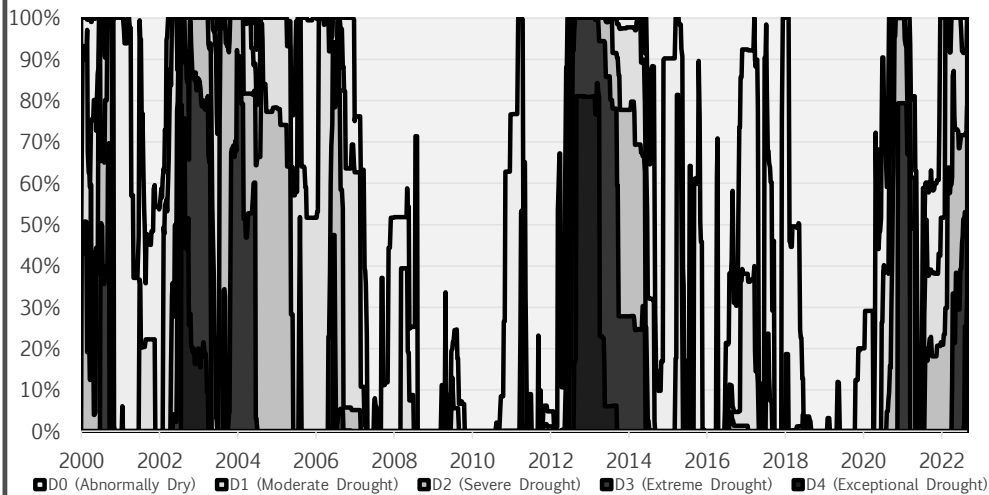
2021 Drought Impacts Research

- In 2021 a Drought Impacts Survey was developed and administered
- Survey results helped to steer the direction of exercise scenarios

Drought Impacts Category	Drought Impact Areas of Focus
Crop production	Water for irrigation, crop stress, crop disease and reduced crop yield
Livestock production	Reduced grazing, increased mortality, and increased animal stress
Domestic water supply	Water quality issues and low/dry well water level
Public health	Declines in air quality (due to dust, pollen or smoke), stress (mental health issues)
Households	Less water for gardens and increased power bills
Fire	Increased wildfires, property damage and bans on fireworks or controlled burns
Business and industry	Closed businesses and bankruptcy, reduction in production and sales
Recreation and tourism	Reduced water activities, public recreation areas closed and reduced hunting and fishing
Wildlife	Invasive plant and animal species, change in migration, wildlife foraging near people and wildlife disease or mortality

2021 Climate Research

Percent of Republican Basin in Drought
U.S. Drought Monitor 2000-2022



Nebraska

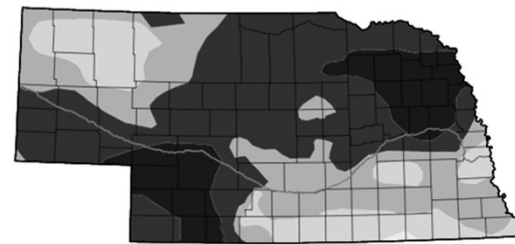
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Map released: Thurs. November 10, 2022

Data valid: November 8, 2022 at 7 a.m. EST

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

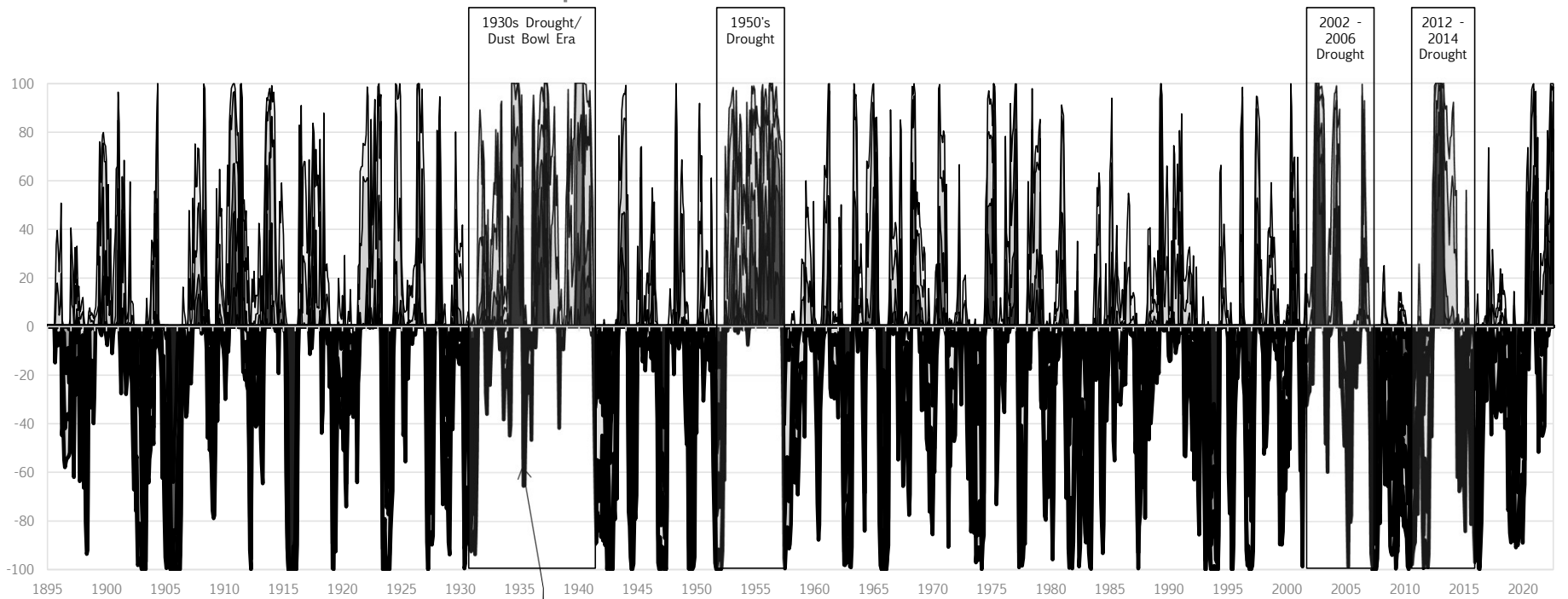


Authors

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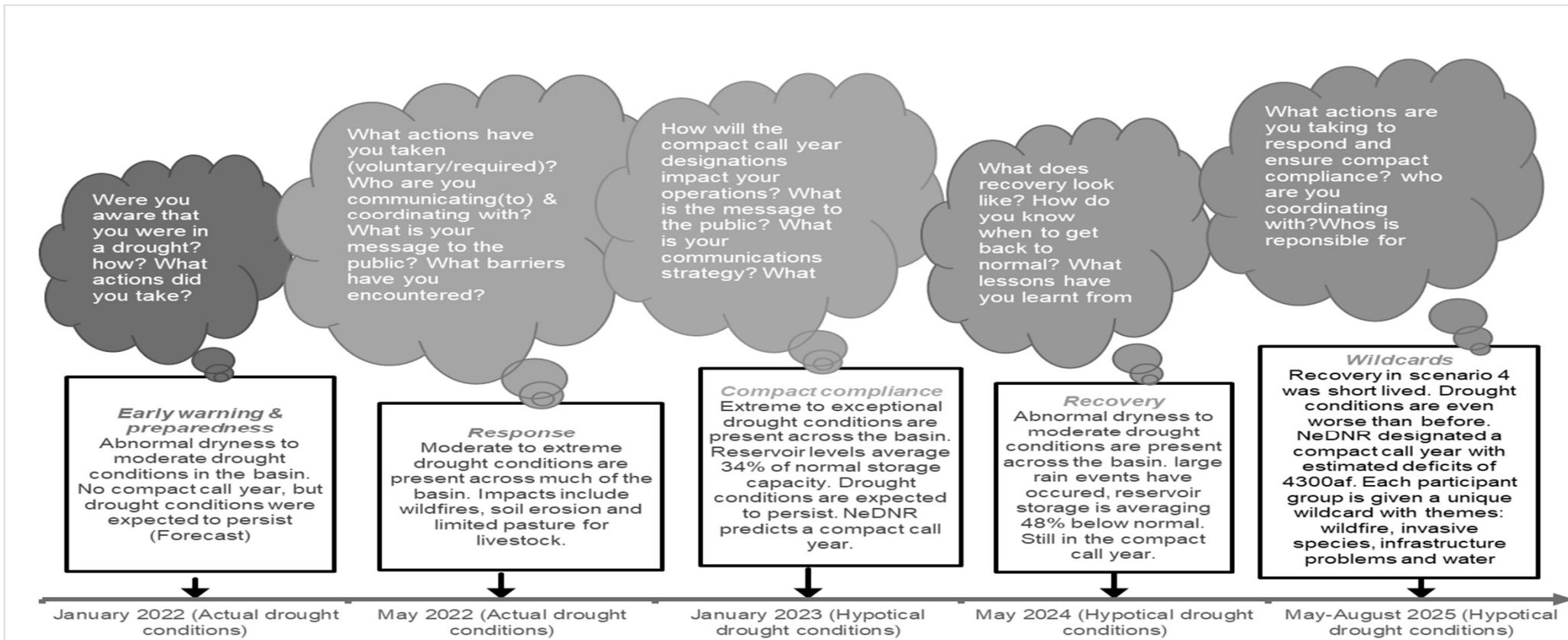
Standard Precipitation Index (SPI) Republican River Basin 1895-2021



Flood of 1935

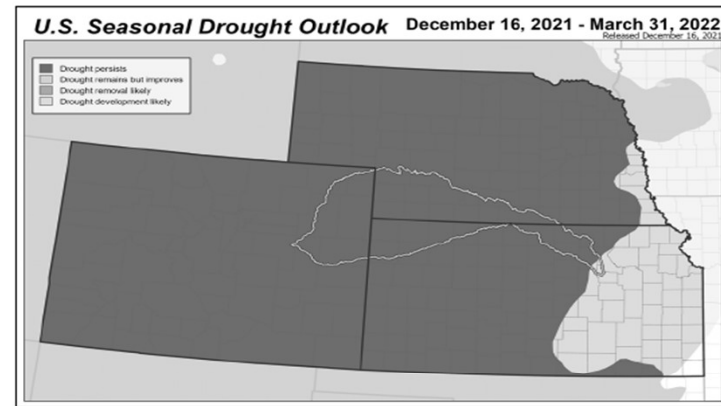
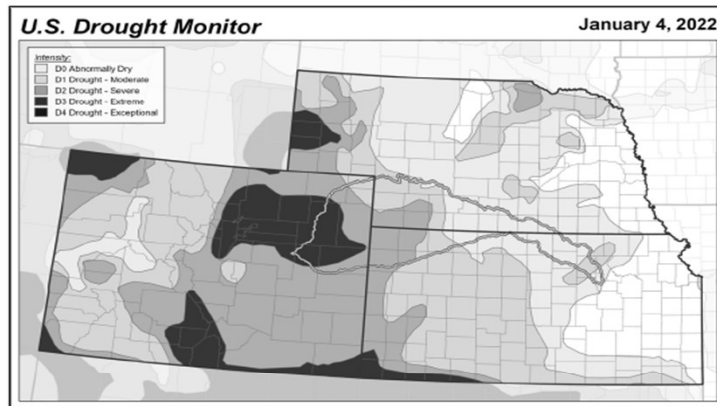
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- W0 (Abnormally Wet)
- W1 (Moderate Wet)
- W2 (Severe Wet)
- W3 (Extreme Wet)
- W4 (Exceptional Wet)

2021 Scenario Development

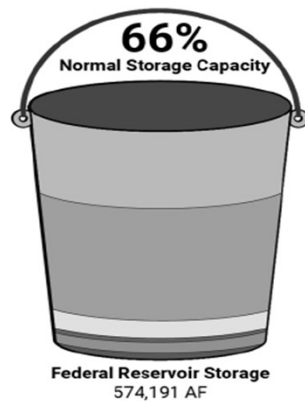


2022 Drought Scenario Exercise

Scenario 1: January 2022



Harlan County Lake Normal Storage: 342,560 AF	82% Full
Swanson Lake Normal Storage: 112,214 AF	41% Full
Enders Reservoir Normal Storage: 44,500 AF	18% Full
Harry Strunk Lake Normal Storage: 37,141 AF	76% Full
Hugh Butler Lake Normal Storage: 37,776 AF	42% Full



Narrative:

Fall of 2021 had record warm temperatures, and by January 2022 areas of the Republican Basin were facing conditions ranging from abnormally dry to extreme drought. The Seasonal Drought Outlook for the early part of 2022 was showed the majority of CO, NE and KS in either persistent drought or with drought expected to develop.

The 2022 Forecast of Allowable Depletions in the Republican River Basin did not indicate that 2022 would be a Compact Call Year and as a result no actions were required for Compact compliance.

2022 Drought Scenario Exercise

Scenario 1: January 2022

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1900-2000 Average	Average Monthly Temp [°F (anomaly)]	24.0	29.1	38.3	50.1	60.5	70.7	76.6	74.5	65.2	53.0	38.0	27.1
	Average Monthly Precip [Inches (anomaly)]	0.46	0.67	1.35	2.24	3.66	3.79	3.26	2.91	2.27	1.42	0.93	0.57
2021	Average Monthly Temp [°F (anomaly)]	30.9 (6.9)	17.2 (-11.9)	45.4 (7.1)	49.5 (-0.6)	60.3 (-0.2)	74.0 (3.3)	75.5 (-1.1)	76.0 (1.5)	29.5 (4.3)	55.0 (2.0)	43.9 (5.9)	35.7 (8.6)
	Average Monthly Precip [Inches (anomaly)]	0.79 (0.33)	0.70 (0.03)	6.10 (4.75)	1.34 (-0.90)	5.74 (2.08)	1.61 (-2.18)	3.55 (0.29)	3.82 (0.91)	2.54 (0.27)	1.51 (0.09)	0.30 (-0.63)	0.15 (-0.42)

Drought Conditions:

- December 2021 was the warmest December on record (127 years)
- August, September, October and November of 2021 were also relatively warm
- August, September and October was slightly wetter than average
- November and December were drier than average

Impacts:

- What (if any) drought impacts did you see in January of 2022?

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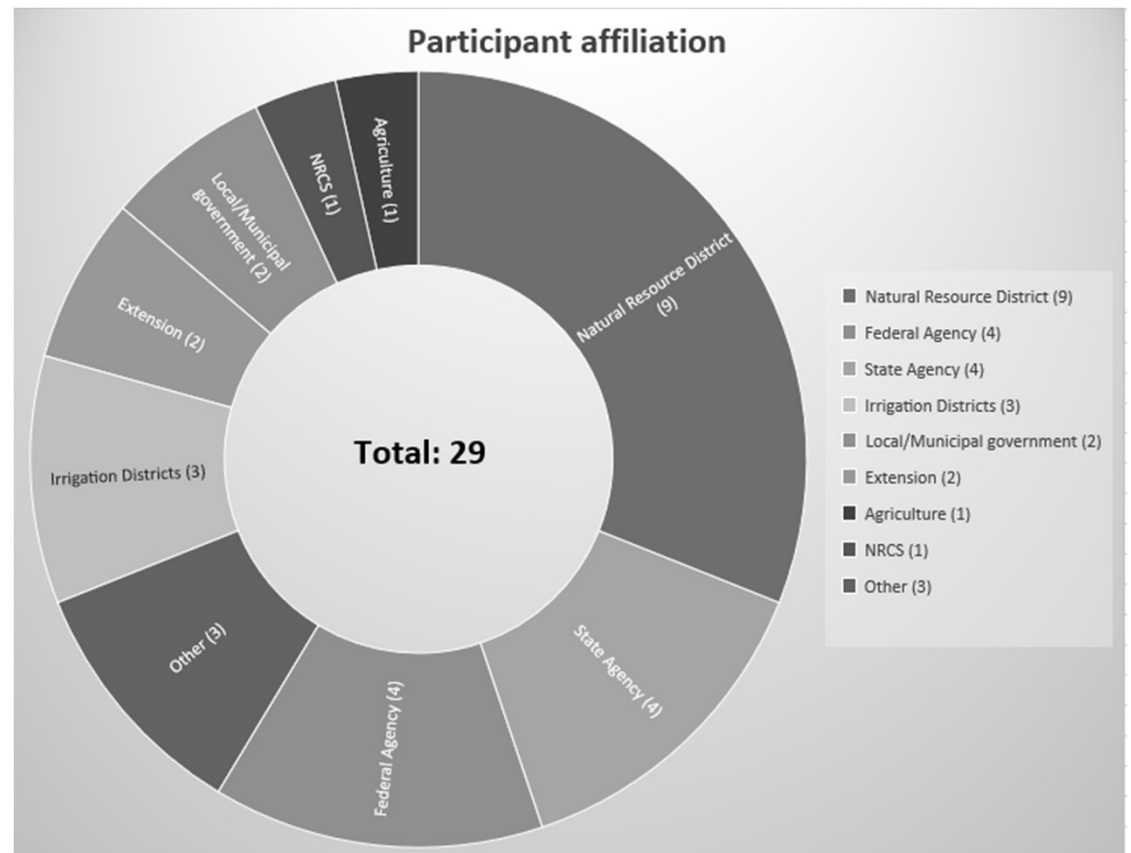
2022 Drought Scenario Exercise (Scenario 5: Wildcards)

- Wildcard #1: Widespread Wildfire
- Wildcard #2: Invasive Species
- Wildcard #3: Infrastructure Problems
- Wildcard #4: Public Water Systems Issues

2022 Exercise Participation

Participants were recruited from the following sectors:

- Republican Basin NRD staff and directors
- Municipal water suppliers
- Farmers and ranchers
- Rural water districts
- Business owners/representatives
- Emergency Management Professionals
- Nebraska Department of Natural Resources staff and director
- Irrigation Districts
- Nebraska Department of Environment and Energy
- US Bureau of Reclamation
- Nebraska Department of Agriculture



2022 Findings, Outcomes and Recommendations

Findings:

- Existing policy (Compact, Basin-Wide Plan, Integrated Management Plans, etc) appears to be adequate for managing water quantity.
- Drought happens. We should plan for it accordingly instead of treating it like a disaster.
- Communication is important.
 - Who needs to be talking to whom?
 - How is information disseminated to the public?

Outcomes:

- Many outcomes yet to be realized
- Started a conversation about Statewide drought planning

Recommendations:

- Proceed with development of a Basin-Wide Drought Plan
 - Cost share funding available through USBR WaterSMART program
 - Will help to improve drought communication in the Basin
 - By using USBR WaterSMART funding, the Basin will be eligible for future grants

Next Steps

- Final project report (December 2022)
- USBR WaterSMART grant application (February 2023)
 - Basin-Wide Drought Contingency Planning
- Basin-Wide Drought Dashboard (ESRI)
 - Drought Impacts Reporting Tool



THANK YOU

Andy Pedley

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