The Minnesota Drought of 2021 & 2022

Pooja Kanwar, PhD | Water Policy Consultant

Clean Water Council

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DEPARTMENT OF NATURAL RESOURCES

Drought in Minnesota

Crop-loss figures are conflicting for season stunted by drought

By Warren Wolfe
Staff Writer

The 1976 drought, which parched large sections of Minnesota farmland, cut the value of state crops by $1.45 billion.

Or was it a loss of $1 billion—or $850 million—or $541 million—or even a gain of $188 million?

State officials have been using the $1.45-billion loss figure since late last fall, when the estimate was made by the Farmers Union Drought Aid Task Force, which polled officials of all 87 counties.

But new government reports on the value of 1976 crops offer several other ways to calculate the difference between the potential value of last year's crop if there had been normal weather and the actual value of the crop harvested.

And while the figures do not disprove the task force's estimate, they do show that the loss may have been less than was thought.

"The important thing is not so much what the actual dollar loss was," said Bill Walker of Red Wing, Minn., chairman of the Governor's Drought Aid Task Force. The task force was started last summer by the Farmers Union and Gov. Rudy Perpich made it a state task force earlier this month.

"What the task force tried to show was the severity of the situation farmers are facing," Walker said. "I really don't care if you come up with $900 million or $1 billion or $1.45 billion. You get into figures that high and you know farmers are hurting."

The value of a crop-loss estimate is that it offers a measure of the severity of the drought and of the financial problems facing farmers who reaped fewer dollars from their harvests last year than expected.

It also can be used to prove to politicians that they need to help farmers by altering disaster-aid programs or government policies.

In fact, that is precisely how the task force figures were used.

It is not a measure of farm income, however, because a farmer's marketing year extends from harvest to harvest, so that much of the grain sold in 1976 actually was harvested in 1975.

The main problem in calculating the difference between the poten-

Crops continued on page 18C

$1.5-billion state crop loss estimated

By JOE BLADE
Minneapolis Star Staff Writer

Because of the drought, Minnesota farmers will lose about $1.5 billion in income they could have expected this year under ideal growing conditions, Minnesota Agriculture Commissioner Jon Wefald has estimated.

That would bring total farm income from crops in the state to about $1.9 billion, about the same as last year, Wefald said today.

Wefald said that if growing conditions had matched those that produced record crops in 1972 and 1973, Minnesota farmers could have received from $3.2 billion to $3.4 billion for their crops.

His estimates released yesterday are considerably below those given for crops as of Aug. 1 by the federal-state crop and livestock reporting service.

"We're saying virtually a month later that we've lost an additional 100 million bushels (of corn)," said Wefald. "The reason for that is the hot, dry, windy weather. Even the crops that looked great three weeks ago are now set back."

Wefald said he made the most recent estimates after talking to county agents, agriculture emergency boards, banks, weather forecasters, a soil specialist and "hundreds of farmers."

He did not check his most recent estimates of crops with the crop and livestock reporting service.

The value for crops given by Wefald was obtained by multiplying the mid-July price for each particular crop by the potential production and his estimate of the production loss.

His figures do not include damage to pastures from drought and income from potatoes, sunflower seeds, fruits and vegetables, seed crops and honey.

Wefald made these loss estimates:

Corn—Exactly half of an estimated potential production of 566.8 million bushels, for a loss of $803.9 million. The all-time record corn harvest in Minnesota was 513 million bushels in 1973. The latest official crop and livestock reporting service estimate was 384.3 million bushels.

Soybeans — 28.8 million bushels of a potential crop of 82.3 million bushels for a loss of $102.5 million. The official forecast was 83.8 million bushels as of Aug. 1.

Hay—A loss of 4.6 million tons of a potential of 8.3 million tons for lost value of $284.1 million. Record production in 1962 was 8.5 million tons. The latest official forecast was for a 1976 harvest of 5.3 million tons.

Wheat—Loss of 28.7 million bushels from a potential harvest of 143.7 million bushels, lost value of $110.3 million. The official forecast is that the 1976 wheat harvest will be a record 124.7 million bushels.

Oats—A loss of 34.8 million bushels from a potential crop of 116.2 million bushels, costing farmers a possible $58.4 million. The official forecast is 80.9 million bushels as of Aug. 1.

Barley, sugar beets, flaxseed and rye losses were estimated to cost farmers $25 million in lost potential harvest.

St. Paul Pioneer Press Tues., April 19, '77

is rolling along at 30,900 cubic feet a second compared with a normal April flow of 96,000 cfs. "Unless we get some really heavy rains we'll get by without any flooding at all," Gustafson said.

At St. Louis, the river must flow faster than 54,000 cfs to maintain the 9-foot deep navigation channel, said James Butery, chief of hydraulics for the St. Louis Corps office. The present rate is 90,000 cfs "so we've got about twice what we need for the moment," he added. " . . . but in April 1976 the flow ranged from 230,000 to 440,000 cfs . . . and the average level for April is 277,000."

Butery added: "Last fall I was predicting if we did not get at

lengthened from eight days to about two weeks.

Parts of southern Illinois and Missouri were flooded briefly in mid-March when thunderstorms dumped from 2 to 9 inches of rain. Most of Illinois received about 50 per cent more rain than normal in March, ending a 12-month period of below-average precipitation.

"Here in St. Louis we've gotten no rain at all in April," Butery said. . . . Now everything is back to below normal."

Barge traffic on the Illinois River is little affected by the drought because the corps releases enough water from Lake Michigan to maintain the river channel.

Minnesota Statute 103G.293

The commissioner shall ***establish a plan*** to respond to drought-related emergencies and to prepare a ***statewide framework for drought response***.

The plan must consider metropolitan water supply plans of the Metropolitan Council prepared under section 473.1565.

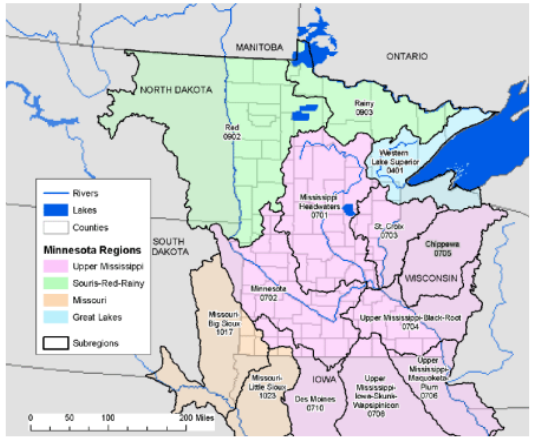
The plan must provide a framework for implementing drought response actions in a staged approach related to decreasing levels of flows.

Permits issued under section 103G.271 must provide conditions on water appropriation consistent with the drought response plan established by this section.

Minnesota Statewide Drought Plan

Minnesota Statewide Drought Plan

This plan provides a framework for preparing for and responding to droughts to minimize conflicts and negative impacts on Minnesota's natural resources and economy.



Statewide Drought Plan watersheds:

- Red 0902
- Rainy 0903
- Western Lake Superior 0401
- Mississippi Headwaters 0701
- St. Croix 0703
- Minnesota 0702
- Upper Mississippi-Black-Root 0704
- Upper Mississippi-Maquoketa-Plum 0706
- Upper Mississippi-Iowa-Skunk-Wapsipinicon 0708
- Des Moines 0710
- Missouri-Little Sioux 1023
- Missouri-Big Sioux 1017

STATEWIDE DROUGHT PLAN MATRIX

Drought Phase/Triggers	State and Federal Actions	Water Users and Suppliers Actions
NON-DROUGHT PHASE A significant portion of the watershed (see map) is not under drought conditions according to the U.S. Drought Monitor. The U.S. Drought Monitor is a weekly index depicting the location and intensity of drought conditions using a blend of quantitative and qualitative indicators. Drought conditions referenced in this plan are keyed to the U.S. Drought Monitor. http://drought.unl.edu/dm/monitor.html	➢ Develop/maintain precipitation, stream flow, ground water and water quality monitoring programs. ➢ Conduct state and regional water studies and coordinate actions. ➢ Assist water suppliers and other users in developing conservation measures. ➢ Continue and improve water conservation education.	➢ Develop/update/implement water supply plans (including drought preparedness and response and water conservation programs). ➢ Adopt conservation rate structures and ordinances. ➢ Establish mutual aid agreements, interconnections, conservation education, redundant/alternative supplies, etc. ➢ Minimize water supply system losses and improve water use efficiency.
DROUGHT WATCH PHASE A significant portion of the watershed (see map) is "**Abnormally Dry**" or in a "**Moderate Drought**".	➢ Inform Drought Task Force of conditions. ➢ Intensify selected monitoring activities. ➢ Initiate public awareness. ➢ Notify water suppliers of moderate drought conditions. ➢ Monitor Mississippi River flows and coordinate with the U.S. Army Corps of Engineers (USACE) and hydropower facility owners.	➢ Monitor potential conflicts and problems and notify DNR of source conflicts. ➢ Public water suppliers provide conservation information and request customers to implement voluntary measures to reduce water use.
DROUGHT WARNING PHASE A significant portion of the watershed (see map) is in a "**Severe Drought**", or for public water suppliers using the Mississippi River, the average daily flow at the USGS gage near Anoka is at or below 2000 cfs for five consecutive days.	➢ Convene Drought Task Force. ➢ Increase public drought awareness. ➢ Notify water suppliers of severe drought conditions. ➢ Monitor implementation of the Mississippi River System-Wide Low-Flow Management Plan.	➢ Public water suppliers implement appropriate water use restrictions contained in their water supply plans. ➢ Other water users implement appropriate conservation measures. ➢ Public water suppliers implement water use reduction actions with a goal of reducing water use to 50% above January levels. ➢ Dam operators implement the Mississippi river System-Wide Low-Flow Management Plan.
RESTRICTIVE PHASE A significant portion of the watershed (see map) is in an "**Extreme Drought**", or for public water suppliers using the Mississippi River, the average daily flow at the USGS gage near Anoka is at or below 1500 cfs for five consecutive days.	➢ Notify water suppliers of extreme drought conditions. ➢ Closely monitor river flows. ➢ Continue drought awareness efforts to encourage conservation.	➢ Follow MDNR allocation restrictions. ➢ Public water suppliers implement water use reduction actions with a goal of reducing water use to 25% above January levels. ➢ All appropriators conserve water and minimize non-essential water uses.
EMERGENCY PHASE A significant portion of the watershed (see map) is in an "**Exceptional Drought**", or highest priority water supply needs are not being met, or there are threatened or actual electricity shortages due to cooling water supply shortages, or for public water suppliers in the Twin Cities, the average daily flow of the Mississippi River USGS gage near Anoka is at or below 1000 cfs for five consecutive days.	➢ Advise Governor on need for emergency declaration. ➢ Minnesota Division of Homeland Security and Emergency Management implements MN Emergency Operations Plan (MEOP). ➢ Consider request to the USACE for the release of water from the Mississippi River Headwaters Reservoirs.	➢ Public water suppliers implement mandatory water use reduction actions with a goal of reducing water use to January levels. ➢ Limit water used based on highest priorities defined in **Minnesota Statutes 103G.261**. ➢ Implement measures consistent with an emergency declaration. ➢ Provide bottled water, hauled water, and sanitations supplies to users, as needed.

Responsibilities, Plans and Actions Related to Drought Planning

Minnesota Statewide Drought Plan

Legislation enacted in 1990 mandated the Department of Natural Resources (DNR) to prepare a drought plan. Minnesota Statutes (MS), Section 103G.293 states:

> "The commissioner shall establish a plan to respond to drought-related emergencies and to prepare a statewide framework for drought response. The plan must consider metropolitan water supply plans of the metropolitan council prepared under section 473.156. The plan must provide a framework for implementing drought response actions in a staged approach related to decreasing levels of flow. Permits issued under 103G.261 must provide conditions on water appropriation consistent with the drought response plan established by this section."

The attached Drought Plan table outlines the staged approach for implementing drought response actions.

Major Participants

State, Federal and local agencies, along with water users and suppliers in Minnesota, all have responsibilities before and during times of drought. In addition to ongoing studies and coordination efforts, the primary responsibilities of the major participants are:

- MN DNR – DNR Waters is responsible for maintaining and updating the StatewideDrought Plan, monitoring and communicating drought conditions, as well as for convening the State Drought Task Force. DNR Waters regulates water use by permit (water appropriation) and by requiring Water Supply Plans for public water suppliers serving more than 1,000 people. Other DNR divisions monitor drought impacts on forestry, wildlife and fisheries.
- Metropolitan Council – the Metropolitan Council is responsible for development of a regional master water supply plan for the seven-county metropolitan area and reviews local water supplies as part of community comprehensive plans.
- U.S. Army Corps of Engineers – the USACE operates reservoirs in 3 river systems in Minnesota primarily for commercial navigation, flood control and/or navigation (Minnesota River, Red River of the North and the Mississippi River). The Mississippi River headwaters reservoirs have been studied for purposes of water releases during times of drought. Under the USACE operations plans, emergency releases may be done only under certain conditions to meet health and safety needs and in consultation with the federal Bureau of Indian Affairs, the Minnesota Chippewa Tribal government, and the MN DNR. The USACE also helps with preparedness and equipment.
- Water Users and Suppliers – local communities and water users must implement conservation measures as required by DNR Waters and Met Council.
- Governor of Minnesota – the Governor is empowered to declare a critical water deficiency by executive order. (103G.291 Subd.1)

Other Participants and their capabilities

Department of Public Safety, Homeland Security and Emergency Management (HSEM) – Public information and response coordination
Pollution Control Agency – Public information, response procedures, exercise capabilities, data collection
National Weather Service – Weather and hydrologic forecasts and warnings
Department of Agriculture – Assistance with crop and other farming-related drought issues
Department of Health – Public Water Supply
Board of Water and Soil Resources (BWSR) – technical and financial assistance to agricultural producers

Related Plans

- Local Water Supply Plans – address projected demands, adequacy of the water supply system and planned improvements, existing and future water sources, natural resource impacts or limitations, emergency preparedness, water conservation, supply and demand reduction measures, and allocation priorities. Met Council oversees those in the 7-county metro area.
- Mississippi River System-Wide Low-Flow Management Plan – A plan conceived by the DNR, the USACE and the hydropower facilities along the Mississippi River upstream of St. Paul, the primary purpose of which is to help ensure run-of-river operations during low flow periods and coordination among the hydropower facility operators.
- MN Emergency Operations Plan (MEOP) – The MEOP addresses drought as well as other natural hazards. The plan responds to potential emergencies (nuclear power plants, etc.) as they relate to extreme drought conditions.

STATE DROUGHT TASK FORCE

Purpose and Role

The State Drought Task Force is convened, as defined in the Restrictive Phase of the Drought Table, to provide coordination and communication between agencies and institutions affected by drought and to provide a central source for the news media. The Task Force could also be called together at other times as needed to serve as a forum for discussion of drought management plans and policies. In cases of more localized drought conditions, the Director of DNR Waters may bring appropriate parties together on a Regional Drought Task Force for the same purposes.

Members

DNR Waters	Director/Assistant Director
DNR Waters	State Climatologist
DNR Wildlife	Director
DNR Forestry	Wildfire Suppression Supervisor
Board of Water and Soil Resources	Executive Director
Department of Agriculture	Director, Agronomy & Plant Protection
Department of Agriculture	State Statistician
Department of Health	Director, Drinking Water Protection
Department of Public Safety	Director, Homeland Security and Emergency Mgmt
Department of Transportation	Director, Environmental Services
Minnesota Planning	Director, Local Planning Assistance
Pollution Control Agency	Director, Environmental Outcomes
University of Minnesota	Climatologist/Meteorologist, Extension Service
Metropolitan Council	General Manager, Environmental Services
National Weather Service	Meteorologists-in Charge
North Central River Forecast Center	Hydrologist-in-Charge, Chanhassen
U.S. Army Corps of Engineers	Chief, Water Control Section
U.S. Department of Agriculture	Executive Director, MN Farm Service Agency
U.S. Department of Agriculture	State Conservationist, NRCS
U.S. Geological Survey	Director, Minnesota Water Science Center
American Waterworks Association	Water Utilities Council
Association of Minnesota Counties (AMC)	Executive Director
Hospitality Minnesota	Executive Vice President

Last modified: April 29, 2009 - MNDNR Division of Waters

Drought Planning Team

- Internally - led by Ecological and Water Resources staff
  - Climatology
  - Water Conservation
  - Communications
  - Permitting
  - Hydrology
  - Leadership and Management
- Externally – partner agencies, impact sectors across the state
- Drought task force

Drought of 2021

- Worst drought since 1988
- Impacts
  - Lake Levels
  - Stream Flows
  - Permit Suspensions
  - Well Interferences
  - Livestock and Rangelands
  - Burning Restrictions
  - Recreation
    - Boat Launches
    - Waterfowl hunters

The Story of the 2021/2022 Drought

- Background
- The Climate Science of Drought
- Groundwater and Well Interferences
- Warren Case Study
- Appropriations and Permit Suspensions
- Water Conservation
- Your Stories

DEPARTMENT OF NATURAL RESOURCES

Minnesota Drought Summary: A Tale of Two Droughts?

Luigi Romolo PhD

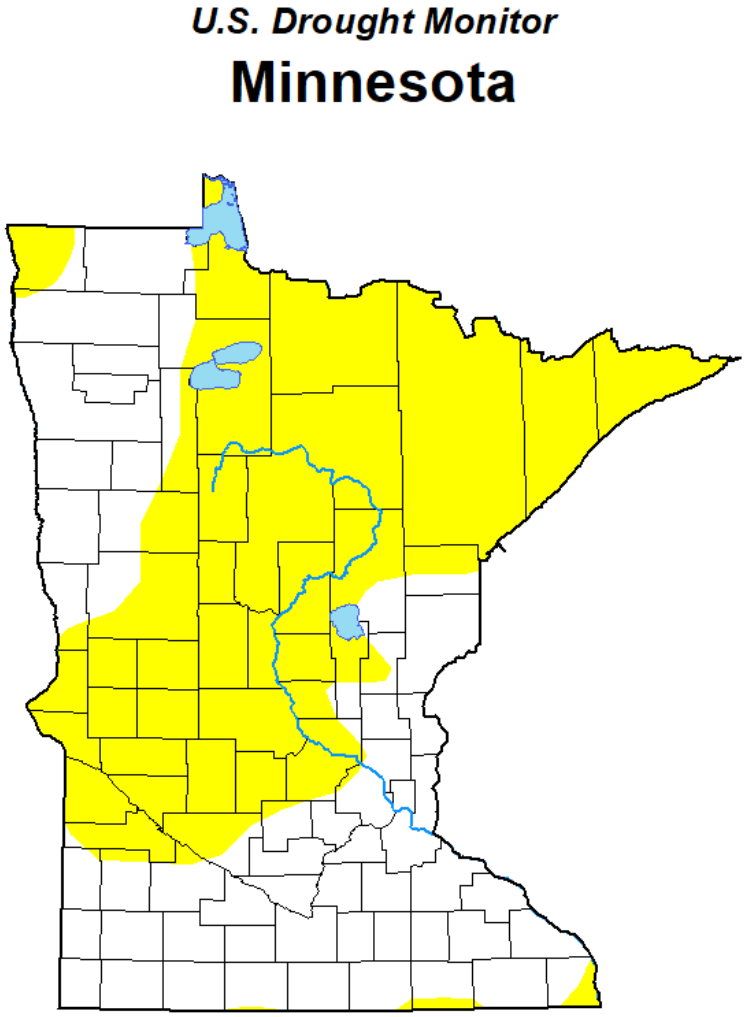
Minnesota State Climatologist

Overview

- Summary of 2021 Drought
- Current drought

Photo Credit: Pete Boulay

Minnesota had been in drought for a while



May 26, 2020
(Released Thursday, May. 28, 2020)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	43.88	56.12	0.00	0.00	0.00	0.00
Last Week *05-21-2020*	48.54	51.46	0.00	0.00	0.00	0.00
3 Months Ago *02-27-2020*	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year *01-02-2020*	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year *10-03-2019*	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago *05-30-2019*	92.83	7.17	0.00	0.00	0.00	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

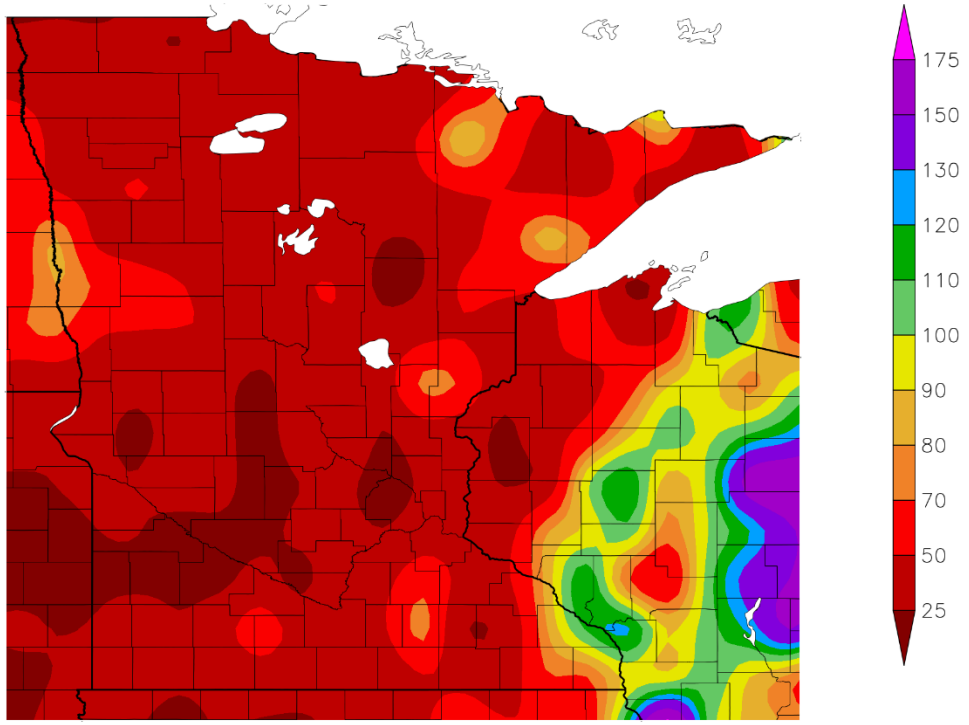
Author:
Curtis Riganti
National Drought Mitigation Center

droughtmonitor.unl.edu

Source: National Drought Mitigation Center

June 2021 was 7th driest and 3rd warmest going back to 1895

Percent of Normal Precipitation (%)
6/1/2021 – 6/30/2021



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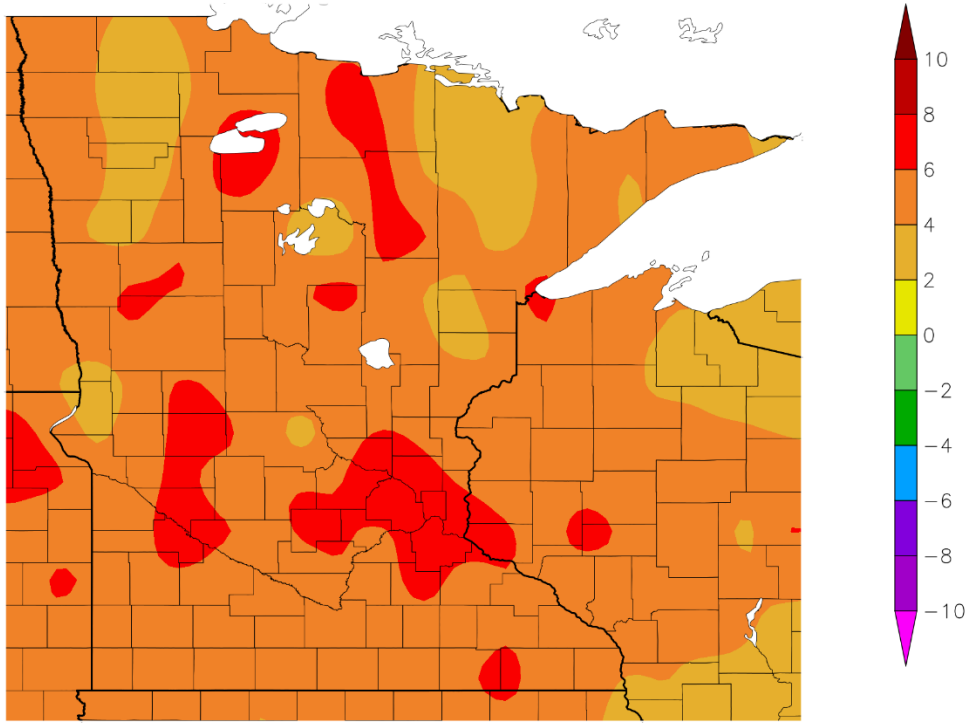
NOAA Regional Climate Centers

Departure from Normal Temperature (F)
6/1/2021 – 6/30/2021



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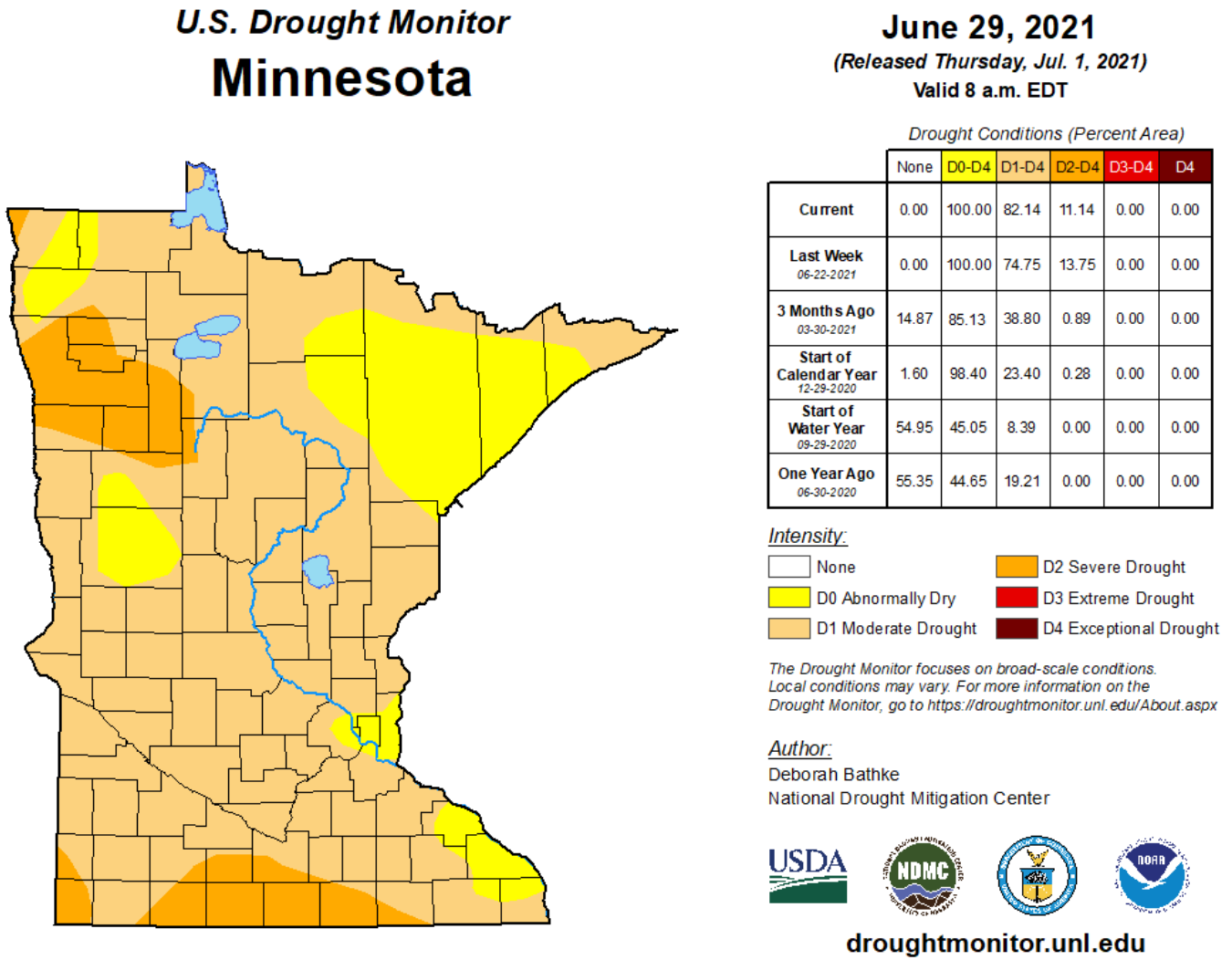
NOAA Regional Climate Centers

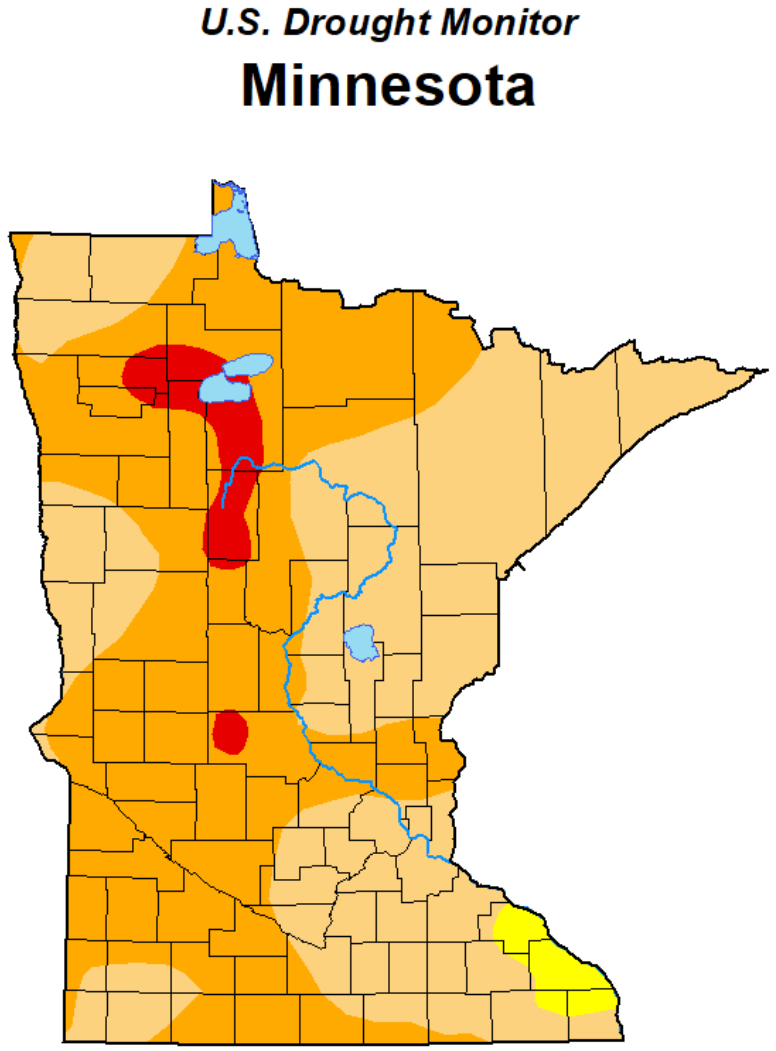
Lack of Rain and Warm Temps is the recipe for drought



Source: National Drought Mitigation Center

By July 31, 2021 things got even worse

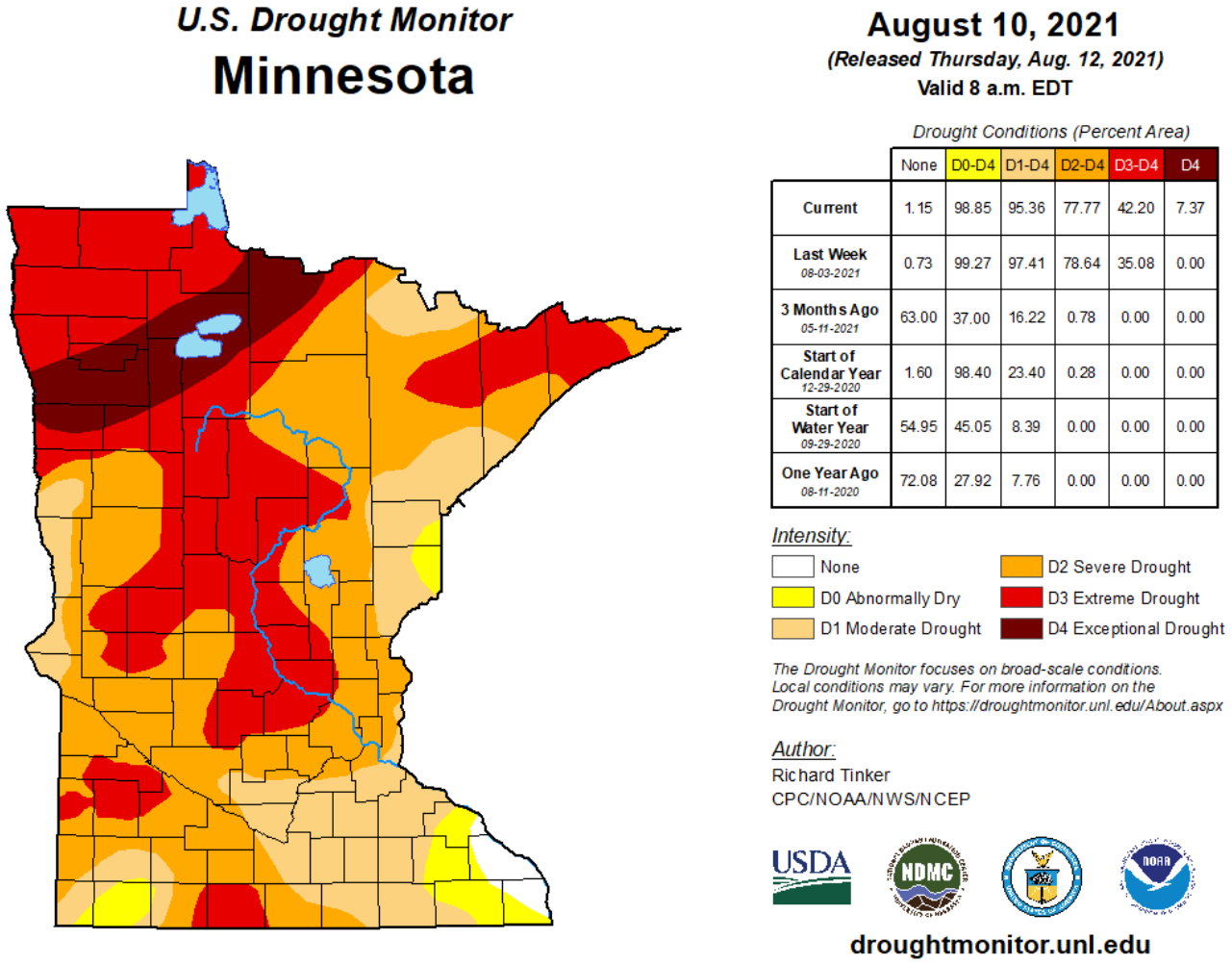
- Impacts
  - Hay shortages
  - Corn 4% good to excellent (76% on June 1)
  - Soybeans 43% good to excellent (76% on June 1)
  - Reduced Streamflow (most basins in reduced flow or minimized flow
  - Low lake levels
  - Tourism



Source: National Drought Mitigation Center

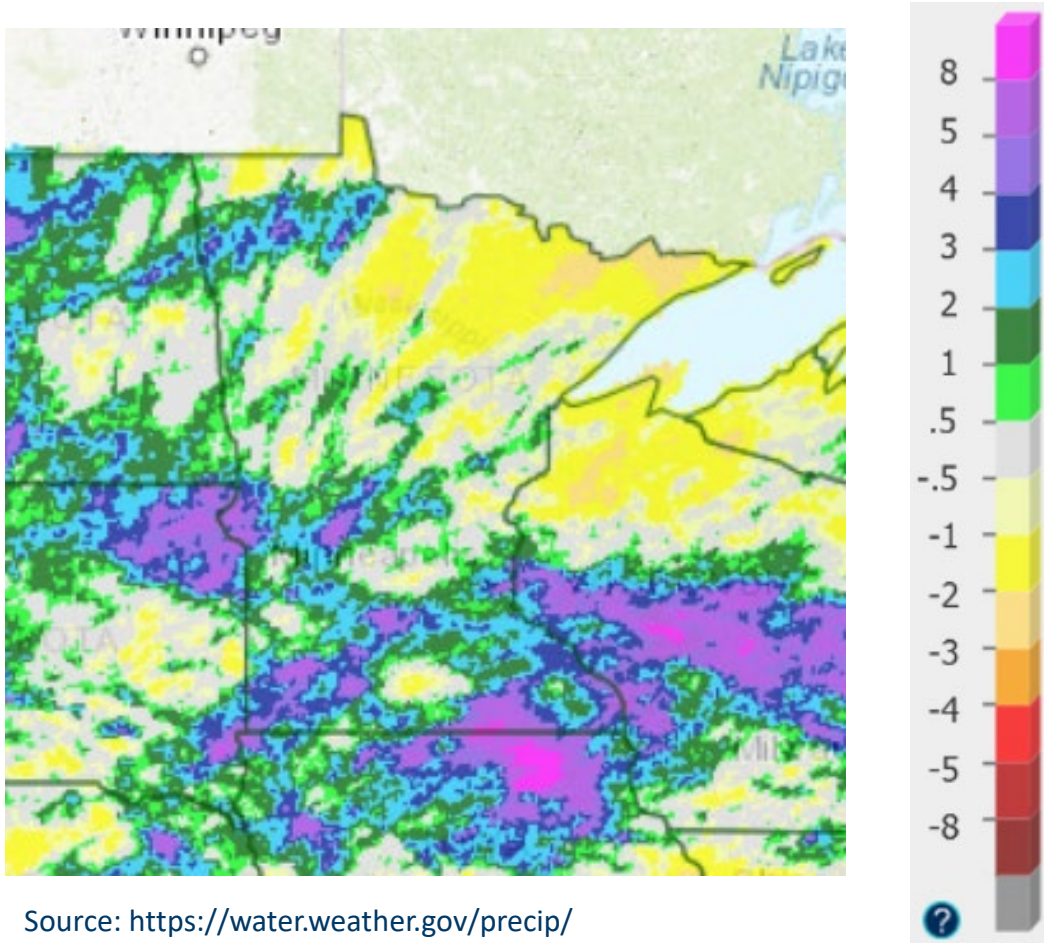
…and worse

- First instance of exceptional drought in Minnesota since the inception of the USDM Drought Map.
- Over three quarters of the state in severe drought or worse.



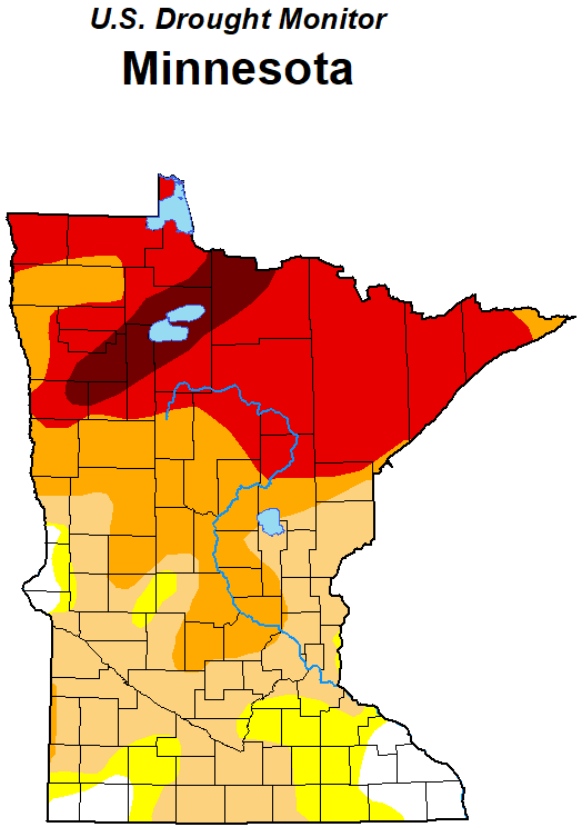
Source: National Drought Mitigation Center

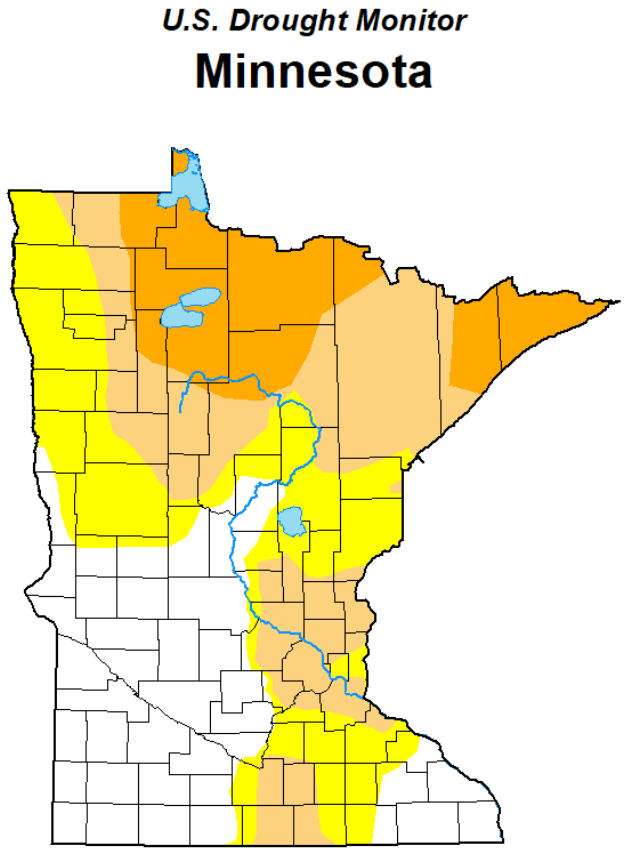
We got some drought relieving rainfall in late August 2021



Source: https://water.weather.gov/precip/

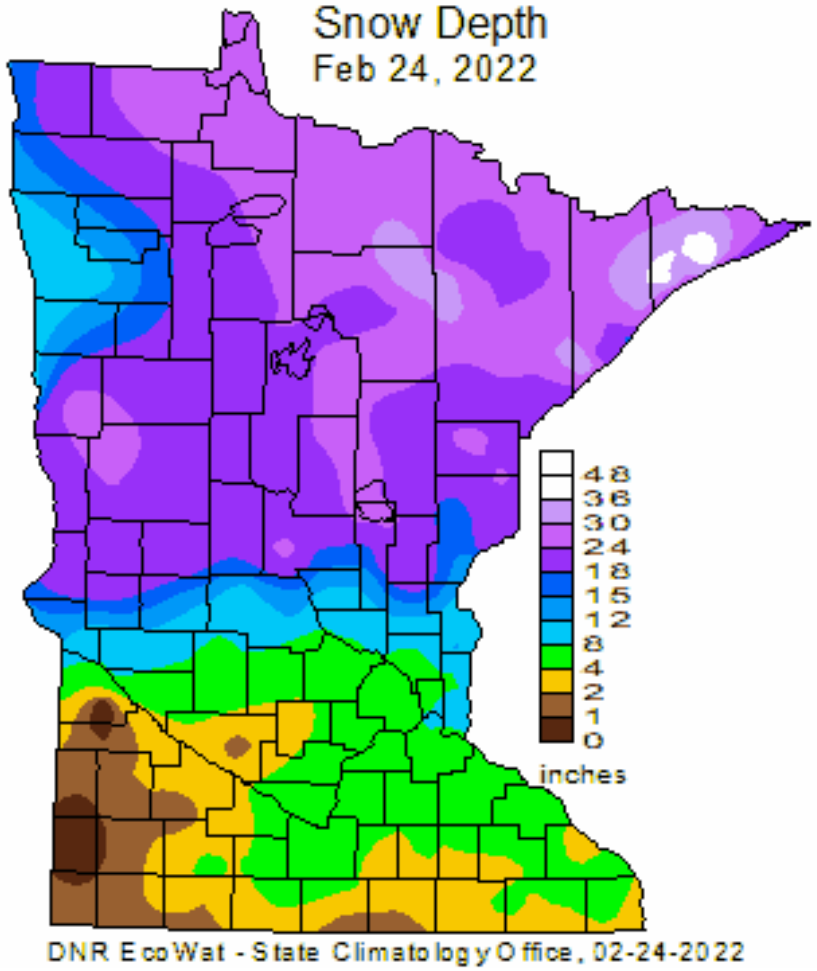
More rainfall in the fall helped improve the drought

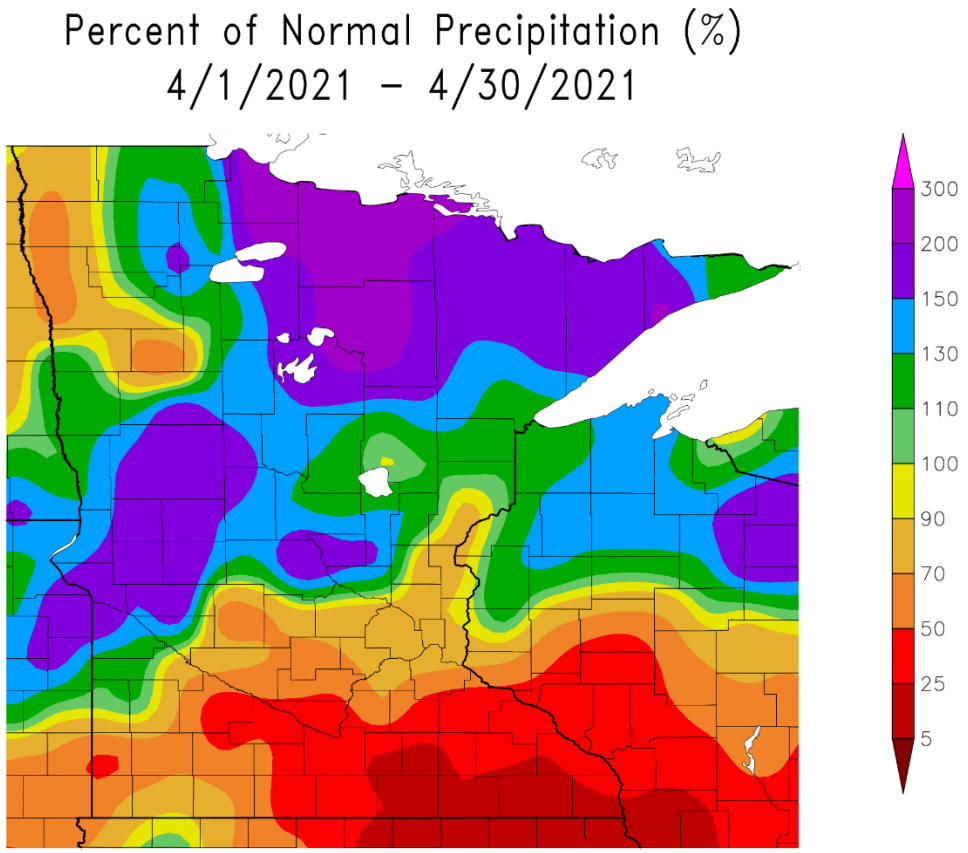




Source: National Drought Mitigation Center

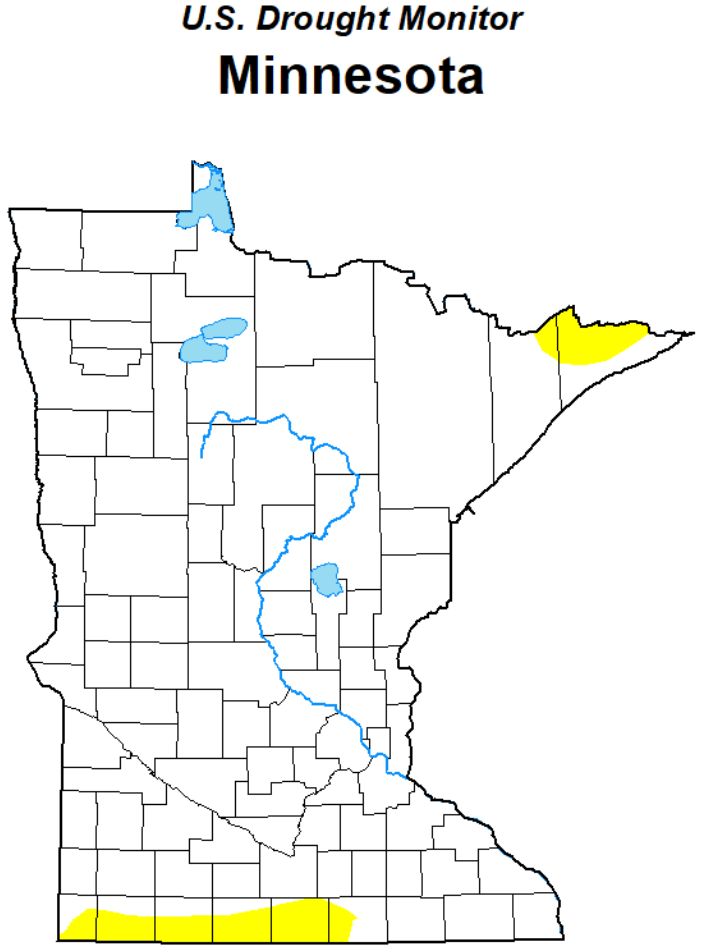
More improvement over the winter and spring





By early May 2022, the drought was over….or was it?

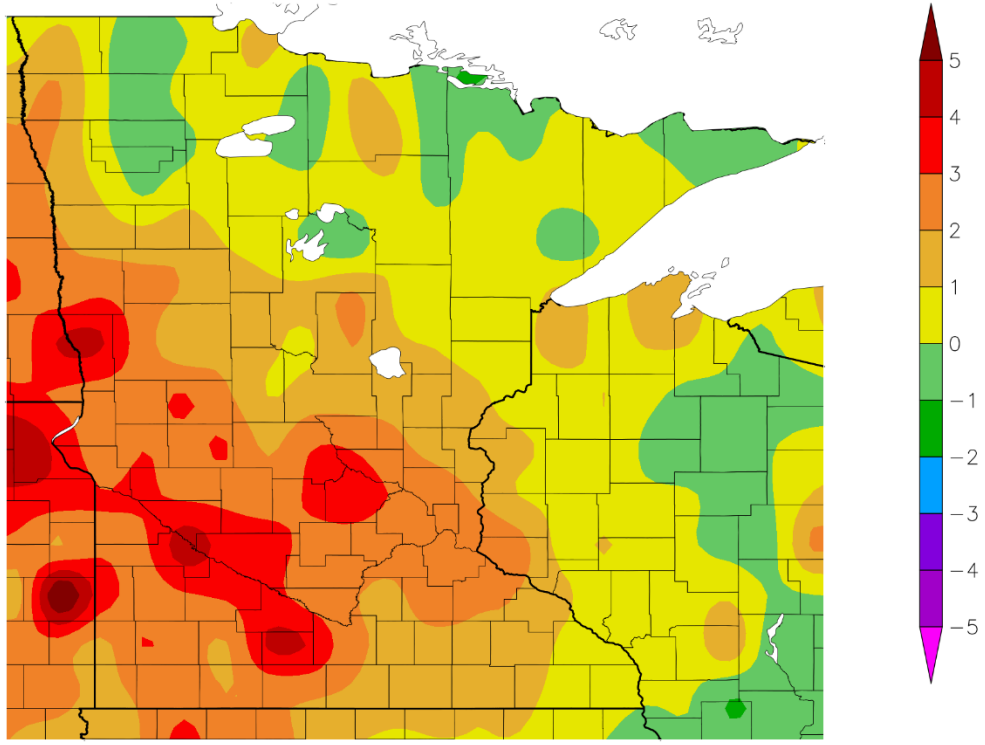
- Drought ended in May 2022.
- Proved to be the worst drought since 1988 for the state, worse than 1988 in some areas.
- First drought since 1988 that encompassed the entire growing season.



Source: National Drought Mitigation Center

June 2022 was very dry and very warm in southern Minnesota

Departure from Normal Temperature (F)
6/1/2022 – 6/30/2022



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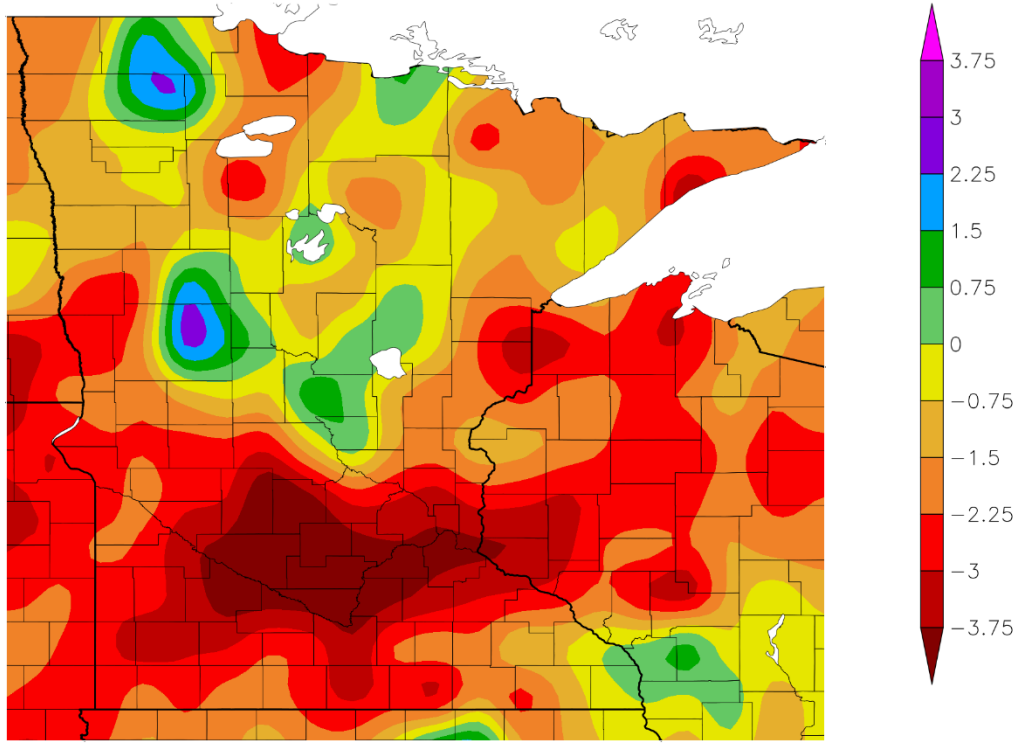
NOAA Regional Climate Centers

Departure from Normal Precipitation (in)
6/1/2022 – 6/30/2022



Generated 7/20/2022 at HPRCC using provisional data.

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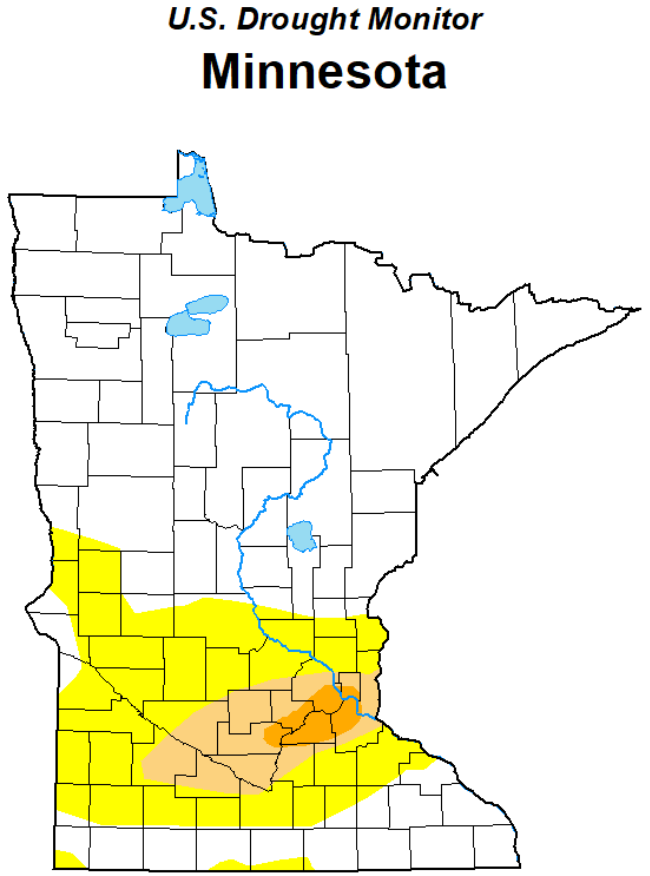
Drought….again?? Not surprising

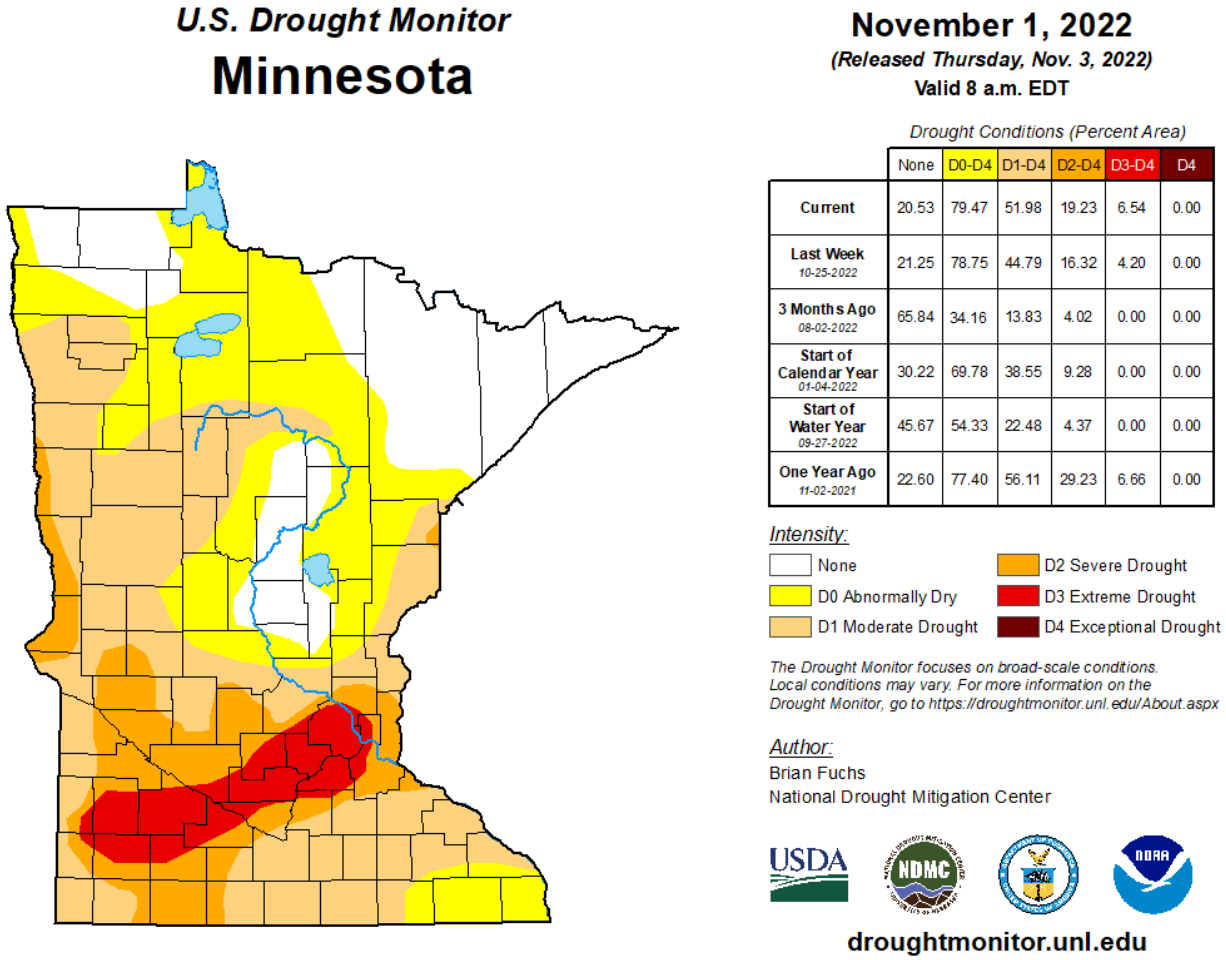
- You are never more vulnerable to drought than that moment when you first recover from drought.
- Lake levels
- Soil Moisture
- Ground Water



Source: National Drought Mitigation Center

2022 Drought Worsens

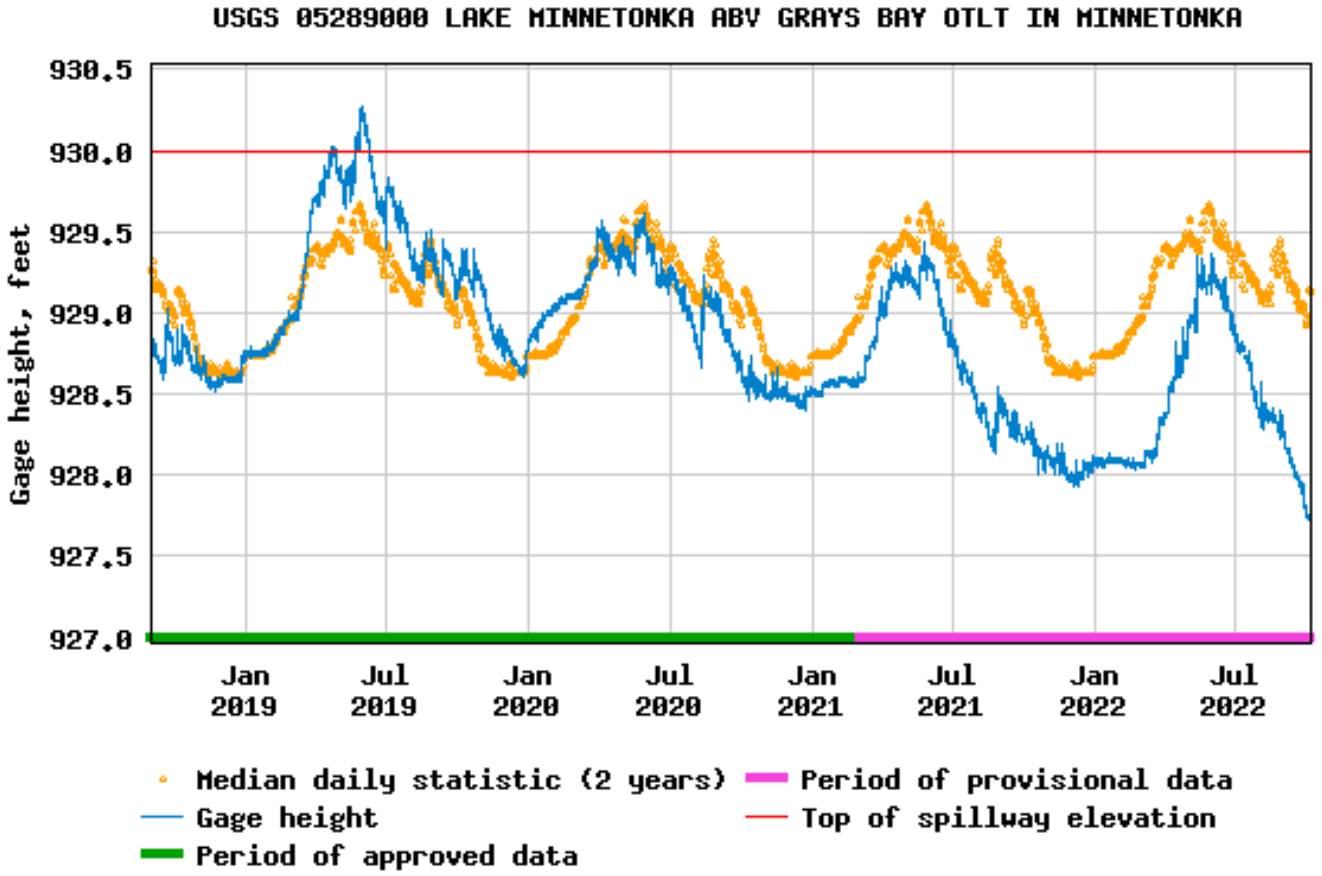
- Lack of rainfall in the south, particularly in the seven county metro area has lead to a worsening of drought conditions.
- Impacts mostly to lakes and rivers.
- Some minor agricultural impacts.



Source: National Drought Mitigation Center

Lake Minnetonka

- Lower than it was in 2021.
- As of Dec 13, 2022: 927.34’.
- Driest September on record for the Twin Cities.
- Previously low levels of Lake Minnetonka:
  - October 1, 2009 (927.78')
  - October 27, 2000. (927.37')
- January 19, 2023 (927.64’)



Source: USGS.gov

Drought has a memory

- Drought of 2021 really started with dryness in 2020 and less snow storage during the winter.
- If water shortages are not replenished over the winter, it could pose consequences for the growing season.
- It is important to remember that drought is a naturally occurring part of our climate.
- Regardless of how wet and how moist our soils are, you are never really more than 4 to 6 weeks away from the start of what could be the worst drought we've ever seen.

DEPARTMENT OF NATURAL RESOURCES

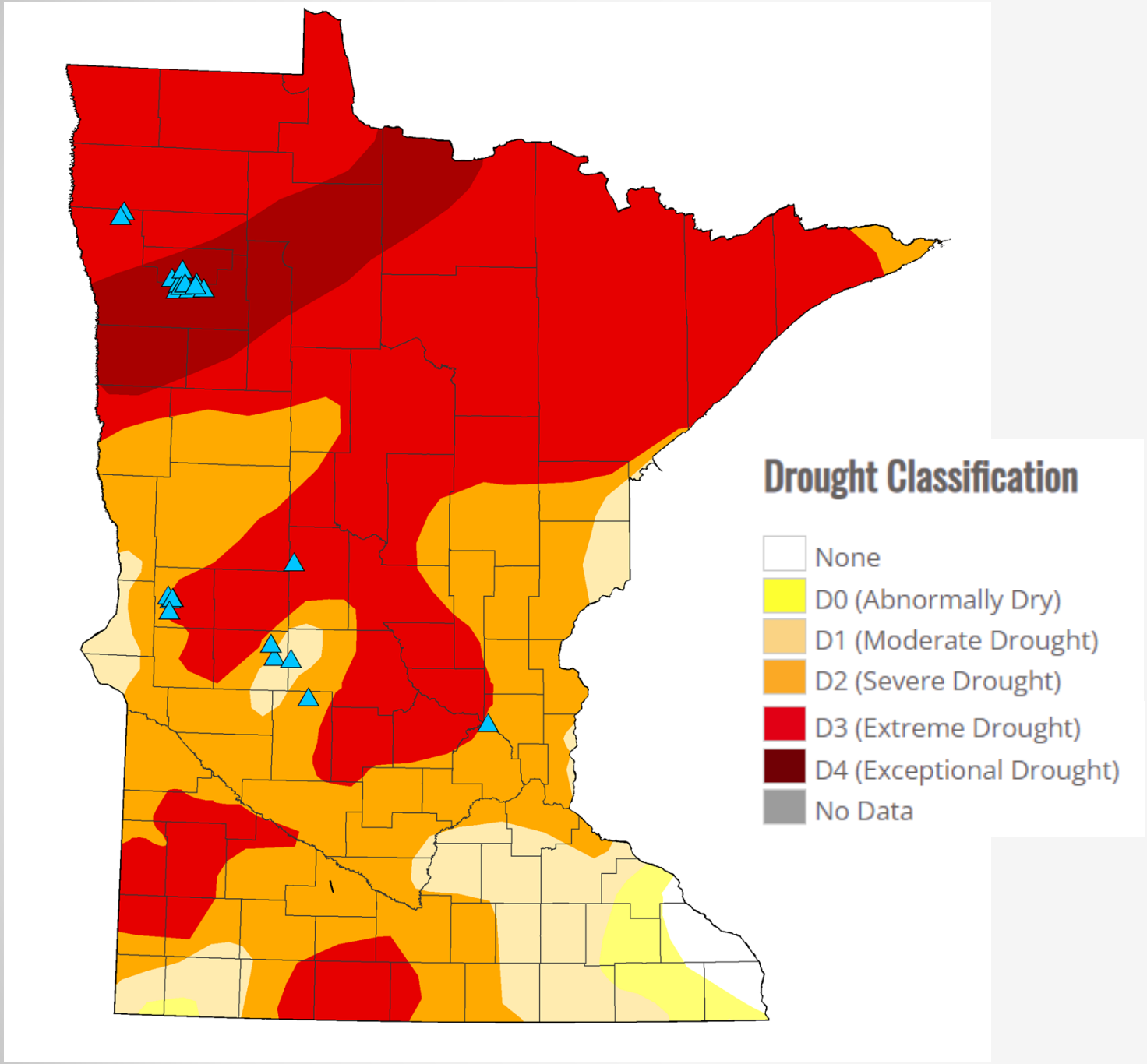
Thank You!

Drought and well interference in northwest Minnesota

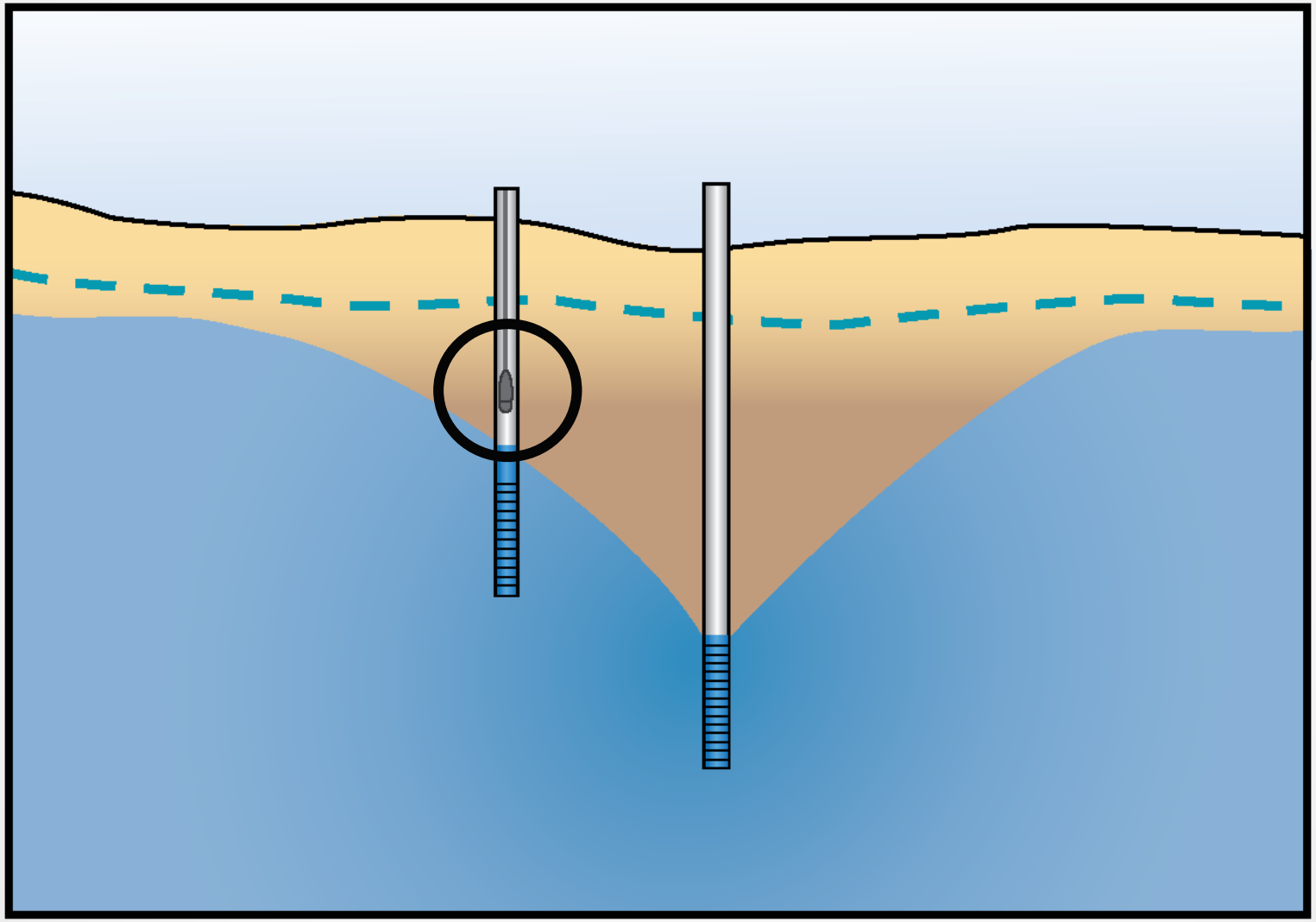
Ellen J Considine, PG | Hydrologist Supervisor

DEPARTMENT OF NATURAL RESOURCES

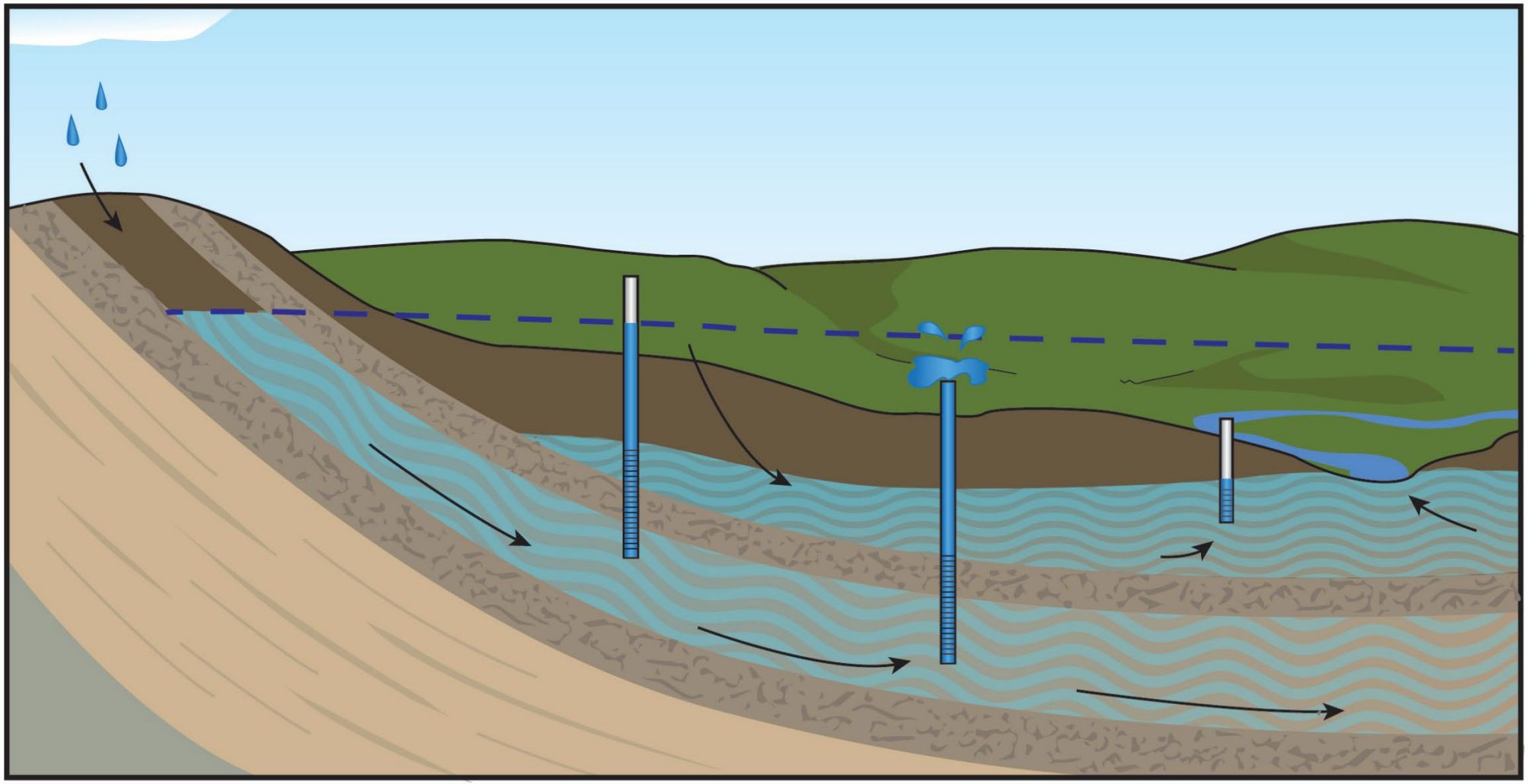
2021 drought



Well interference



Drought and groundwater



Takeaways

1. High groundwater use → well interference
   - Drought = 1 to 2 feet
   - Pumping = 5 to 50 feet

Takeaways

1. High groundwater use → well interference
   - Drought = 1 to 2 feet
   - Pumping = 5 to 50 feet
2. Well interference is hardest on disadvantaged people
   - Elderly, low-income, disabled

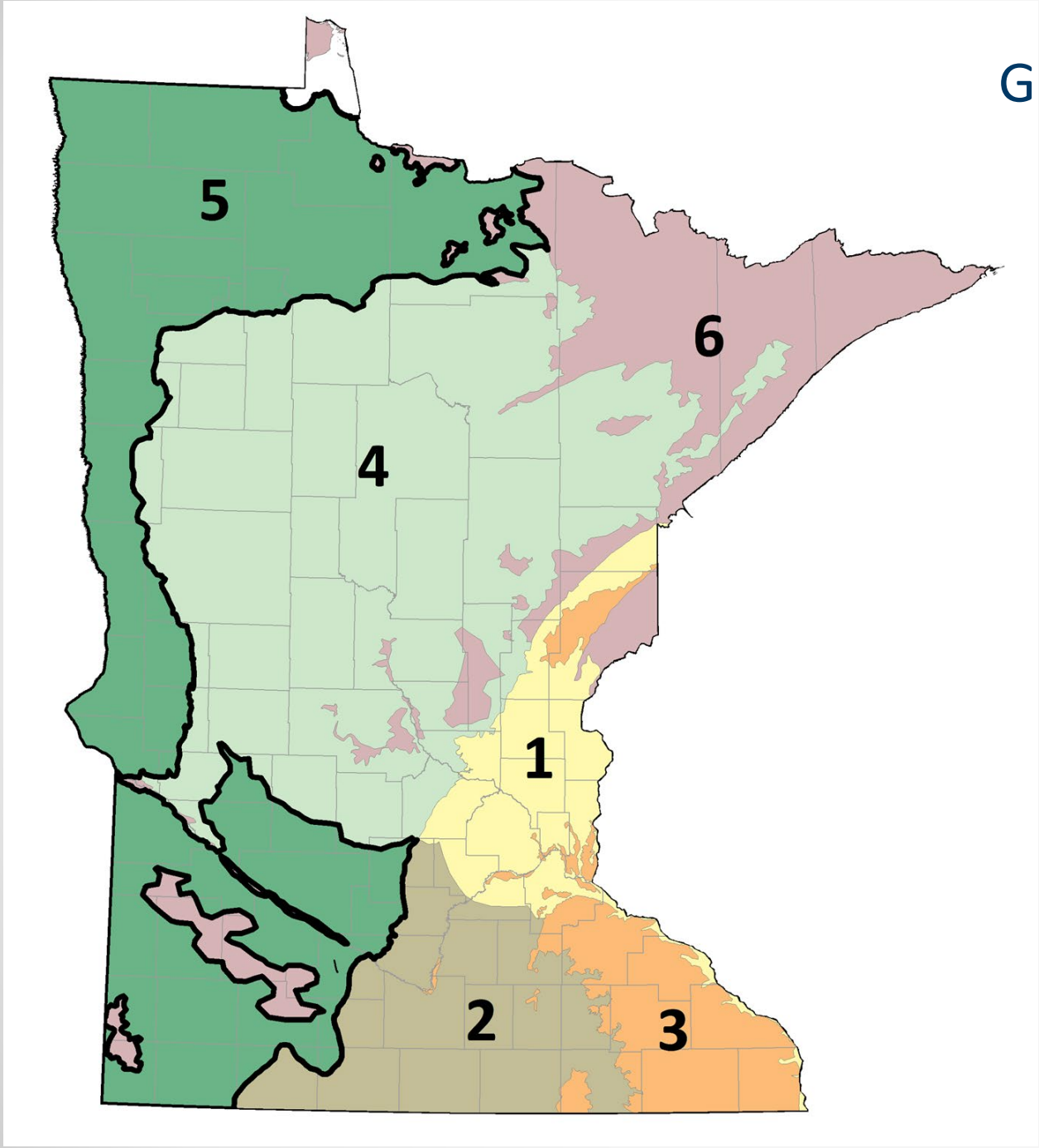
Living without water

25	26	27	28 Rationing water	29	30	31
1	2	3	4	5 Out of water	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27 Applied for a loan	28
29	30	31 New well: water again	1	2	3	4

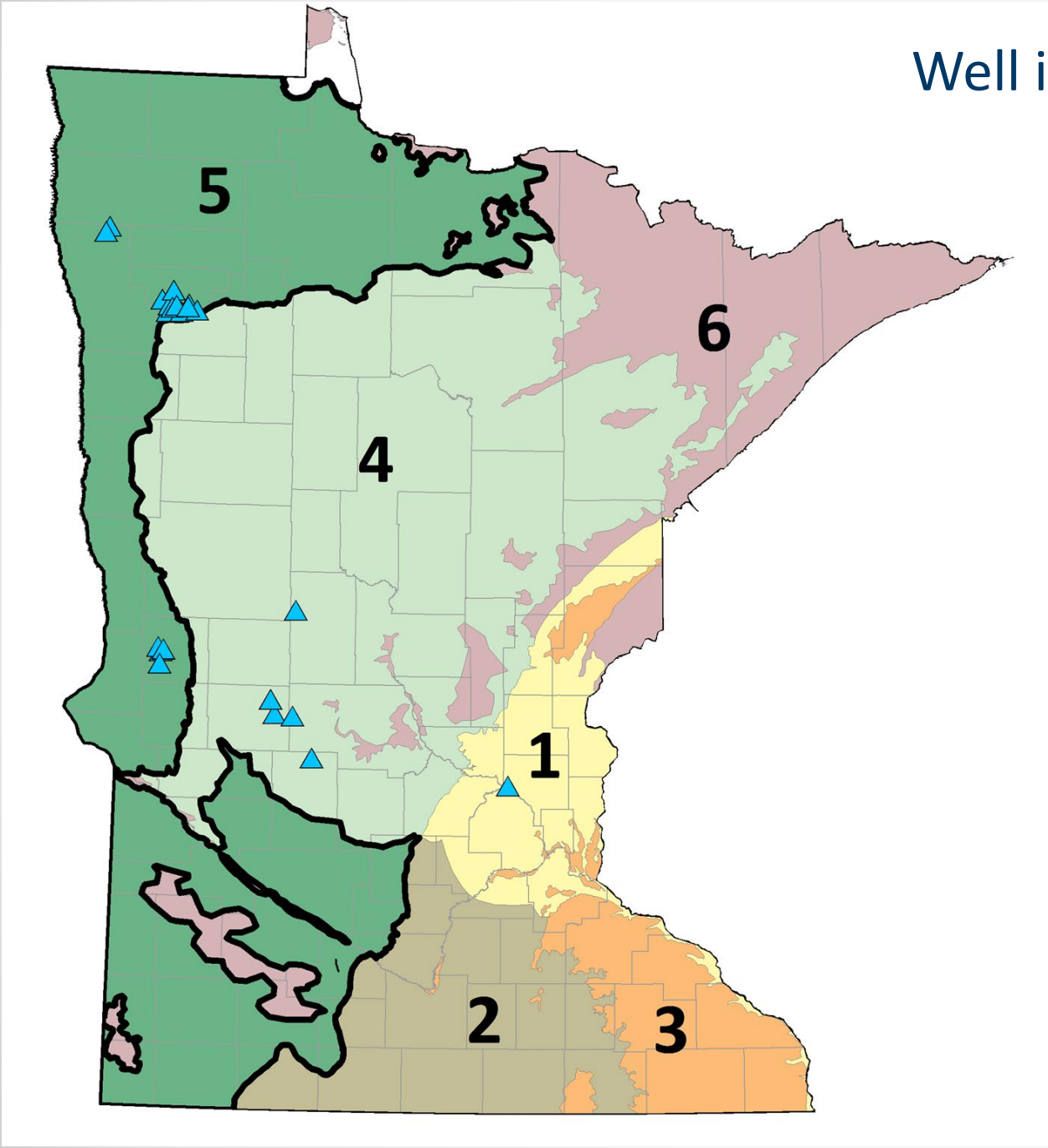
Takeaways

1. High groundwater use → well interference
2. Well interference is hardest on disadvantaged people
   - Elderly, low-income, disabled
3. Well owners don't want to complain to DNR

Groundwater in western Minnesota

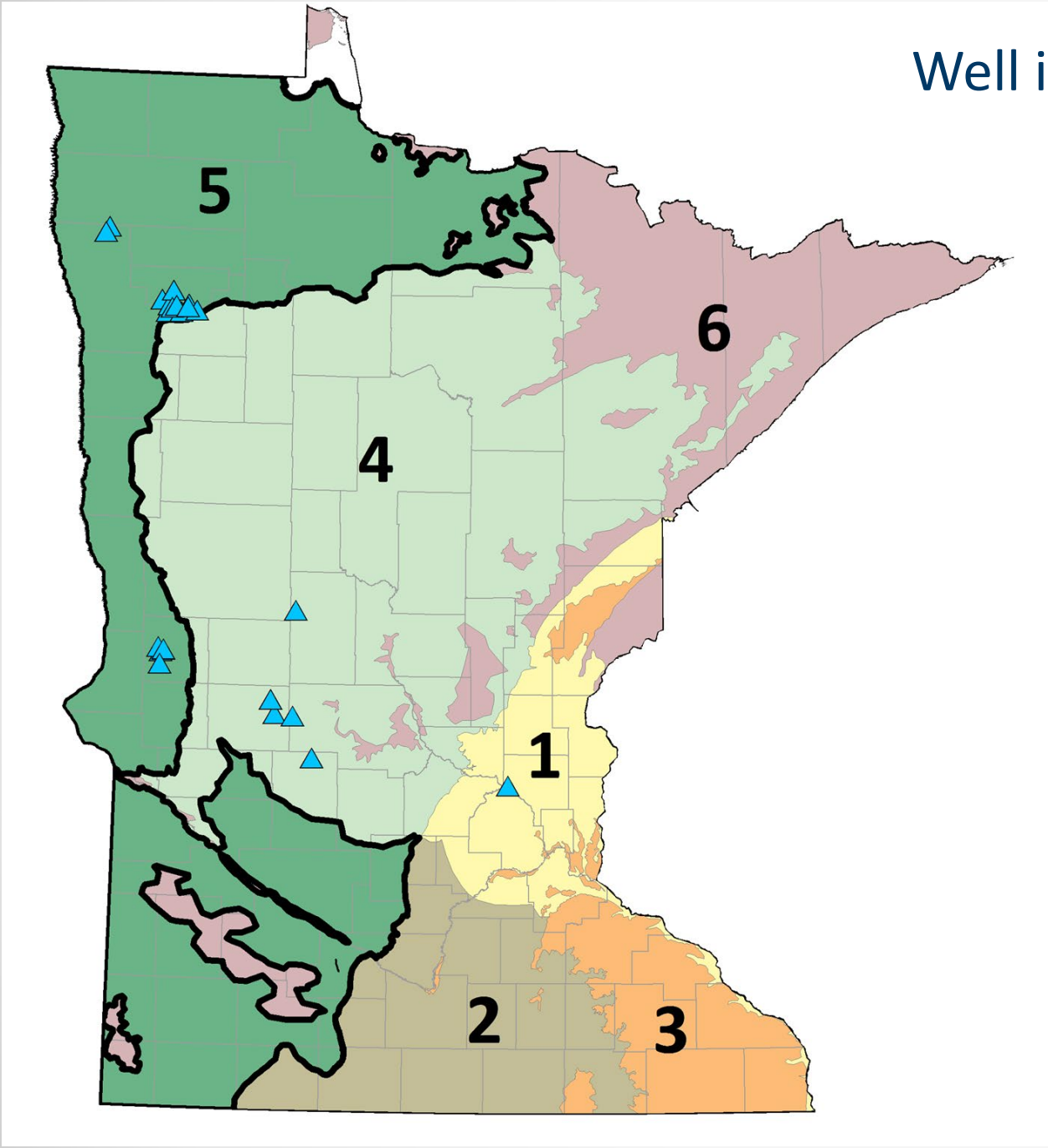


Well interference in western Minnesota



- Unprecedented groundwater use for agriculture

Well interference in western Minnesota



- Unprecedented groundwater use for agriculture
- More rigorous evaluation by DNR to prevent well interference
- More collaboration and conservation among users to leave water for future generations

Takeaways

1. High groundwater use → well interference
2. Well interference is hardest on disadvantaged people
3. Well owners don’t want to complain to DNR
4. Evaluate groundwater use carefully in western Minnesota

DEPARTMENT OF NATURAL RESOURCES

Thank you

Ellen J Considine, PG | Hydrologist Supervisor

Drought and Limited Aquifers
A Case Study from Warren, Minnesota

Amanda Yourd | Groundwater Specialist

January 23, 2023

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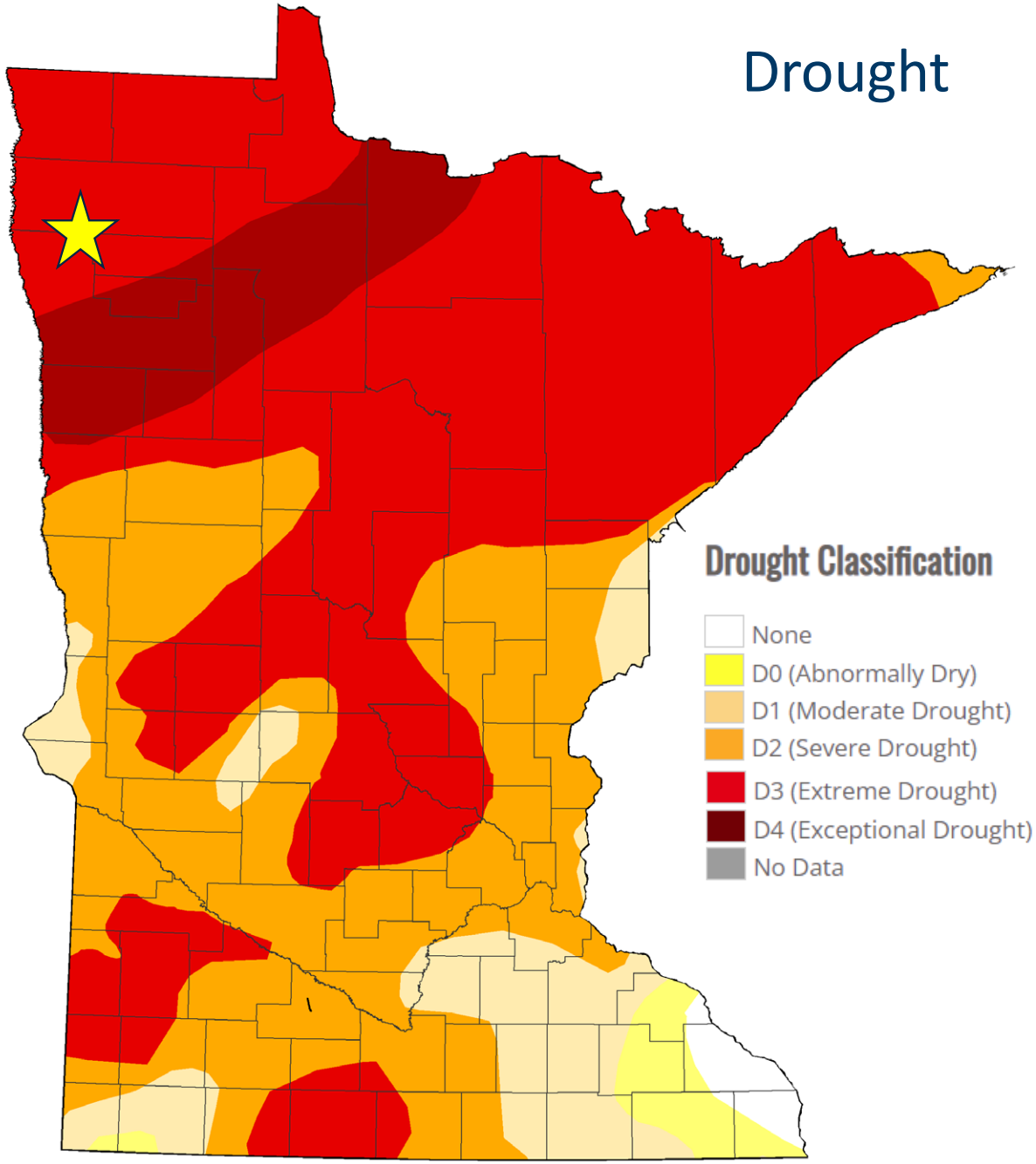
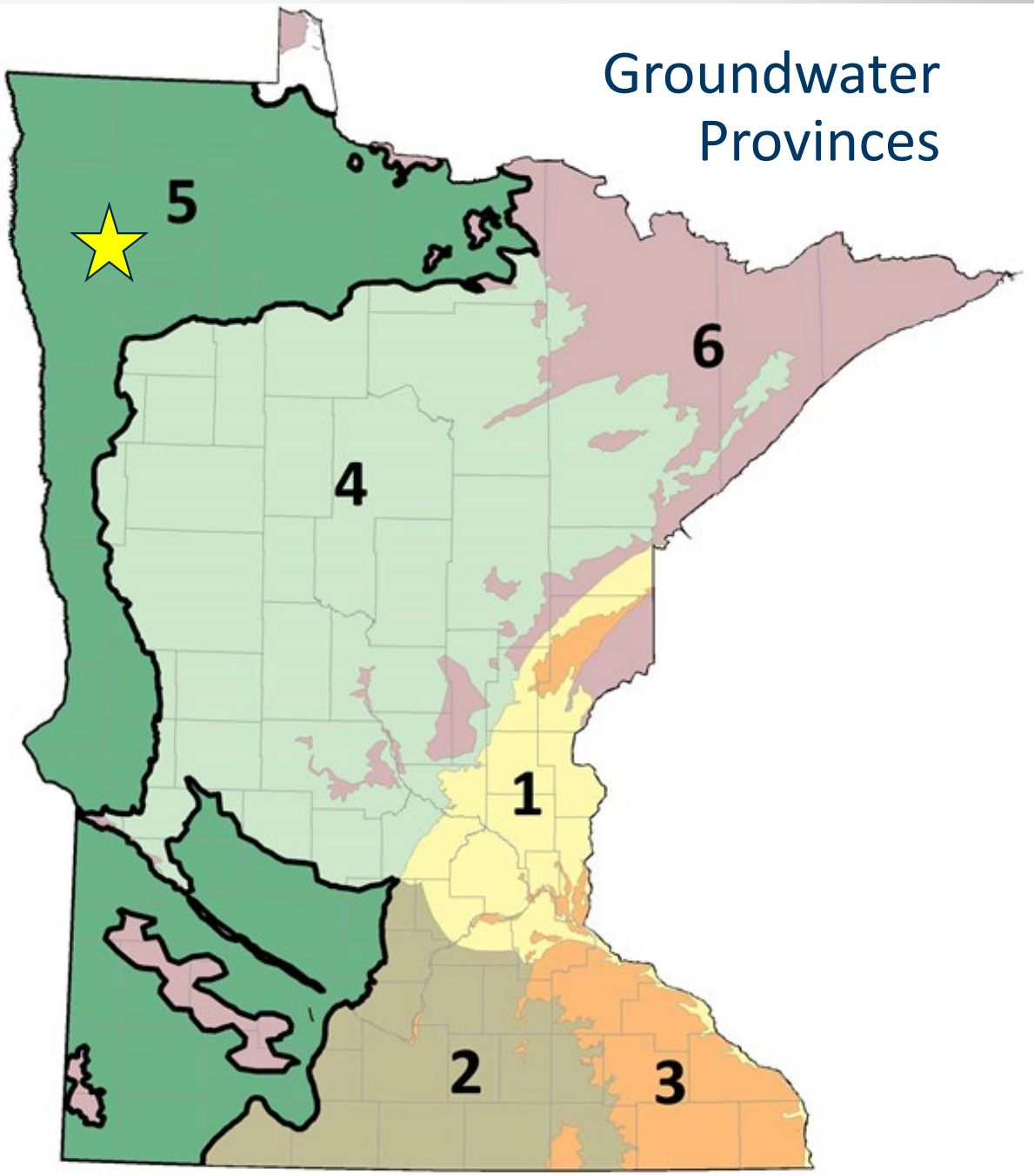
Drought



Groundwater Provinces



Takeaways

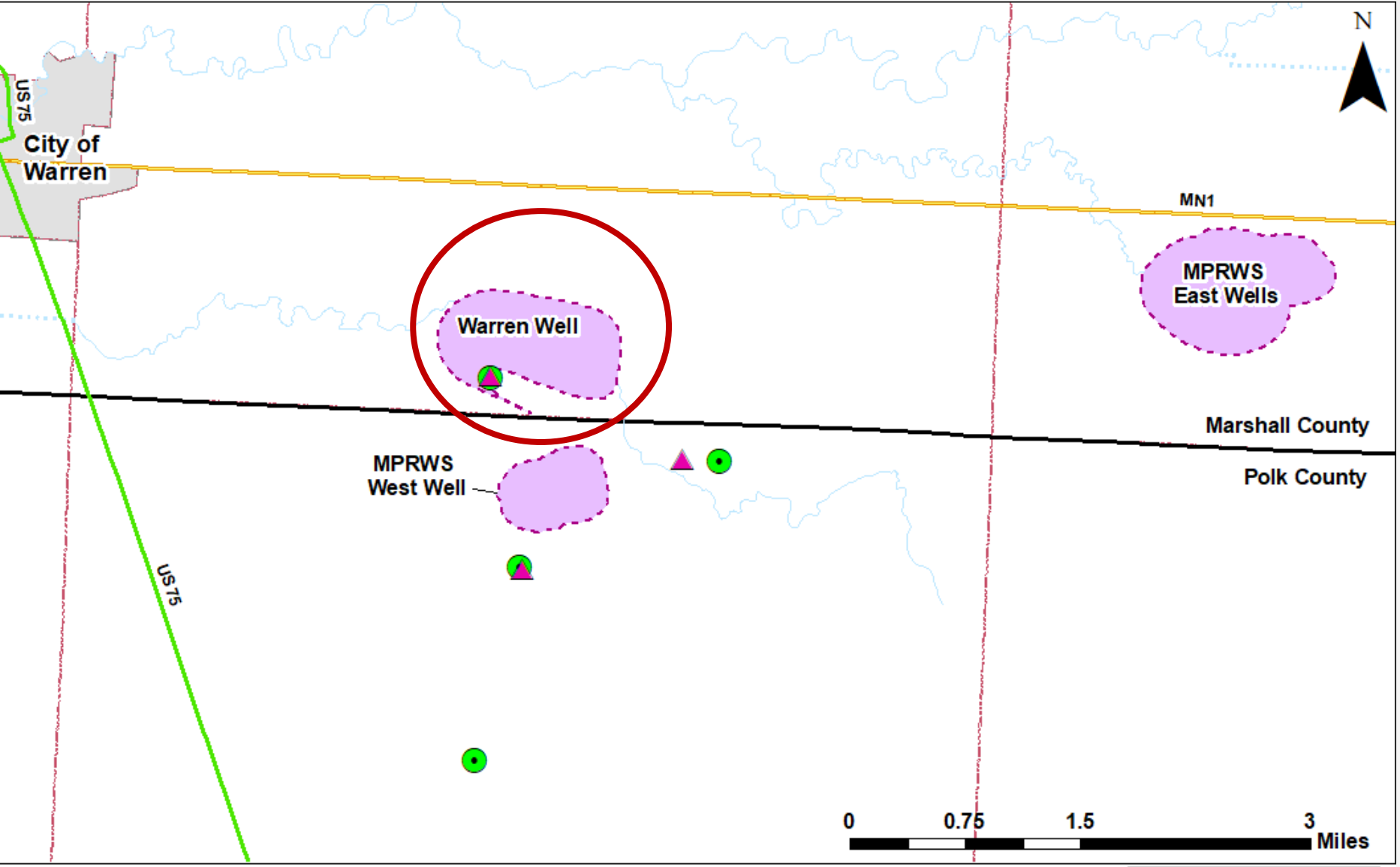
1. Water supply for over 6,000 people was threatened near Warren.

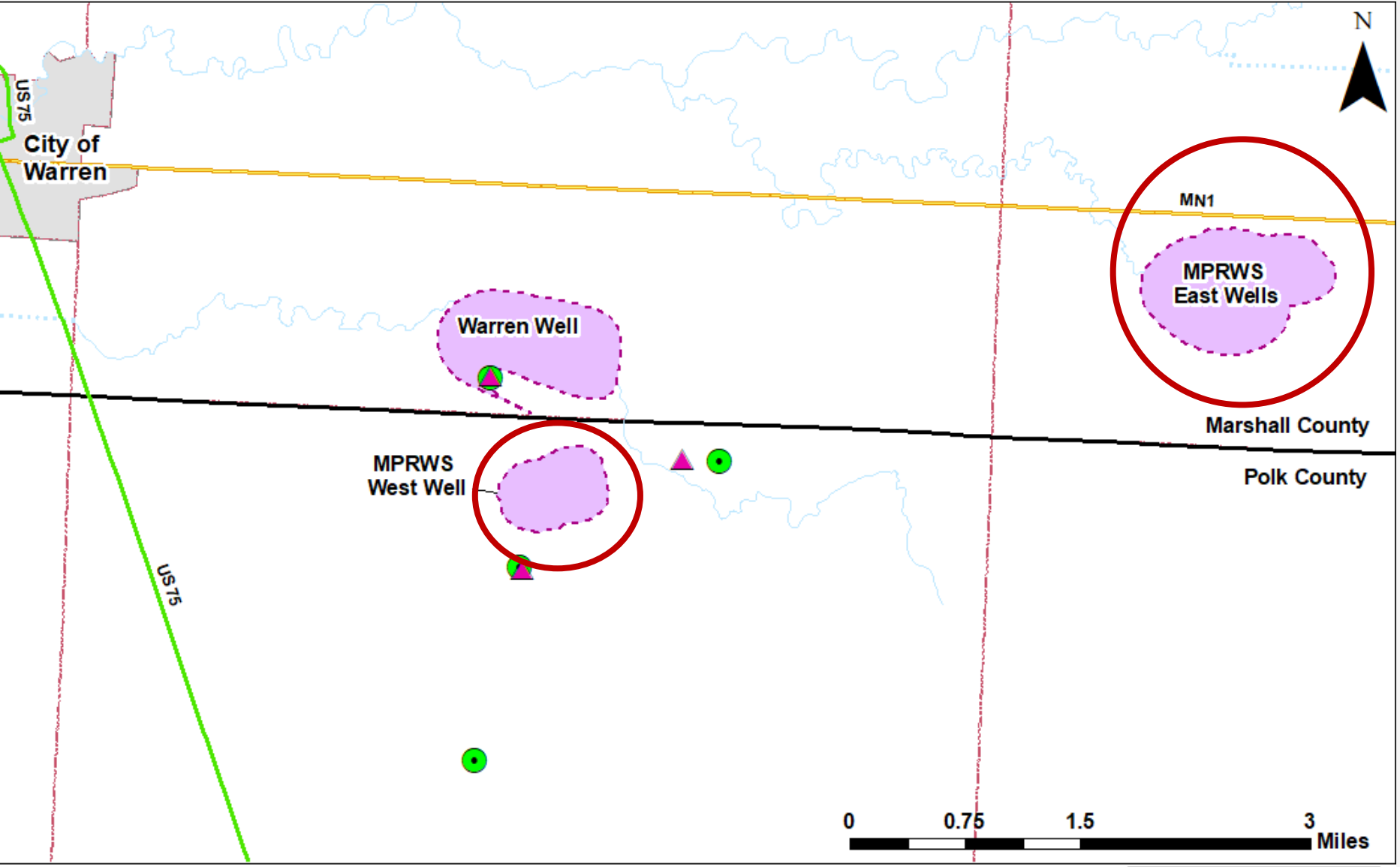
2. The Warren aquifer system is over-allocated. More water is being pumped out of the ground than is going back in.

3. Increasing use of limited aquifer systems calls for creative regulatory solutions by DNR and community of groundwater users.

Permitted Water Users

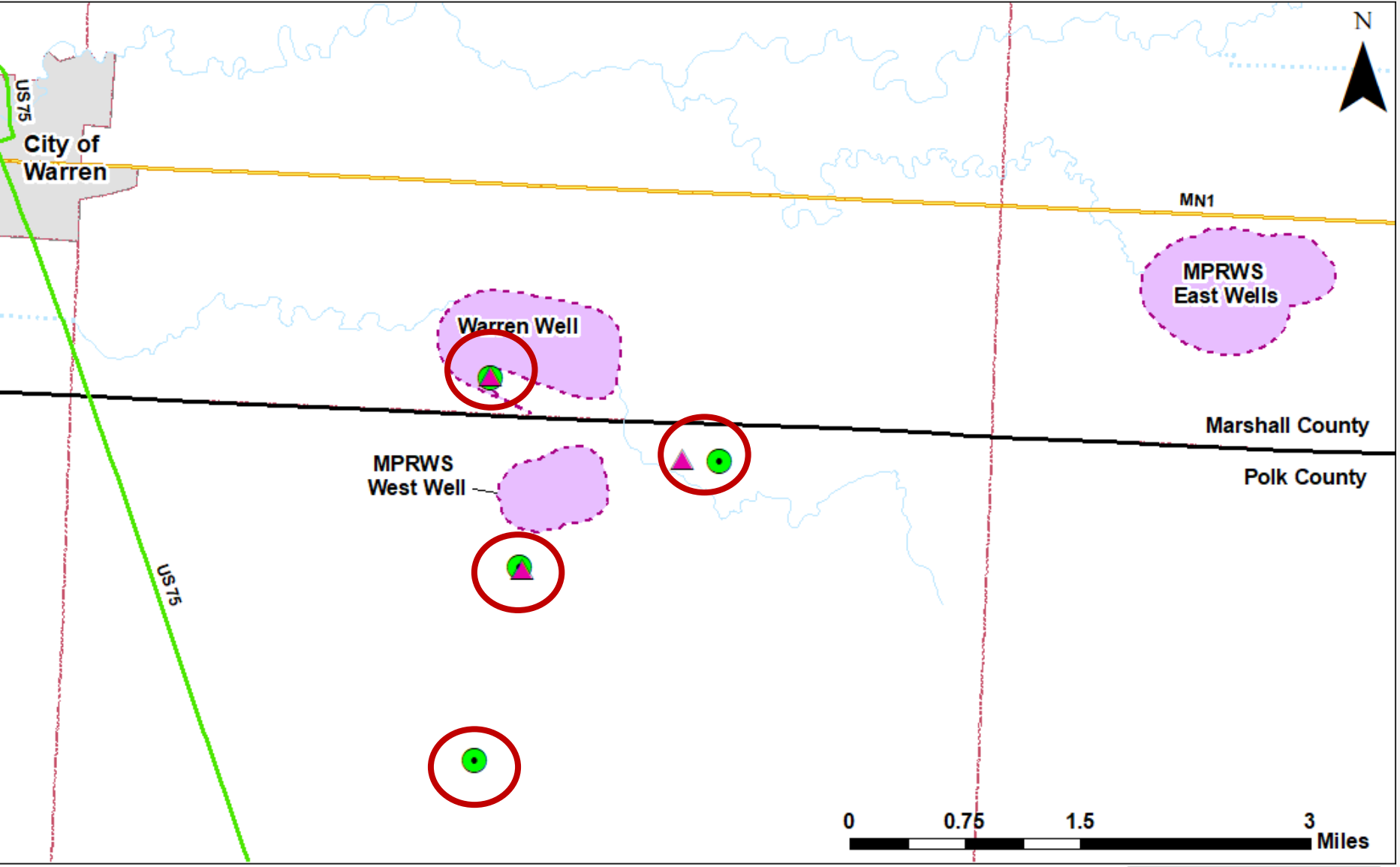
- City of Warren





Permitted Water Users

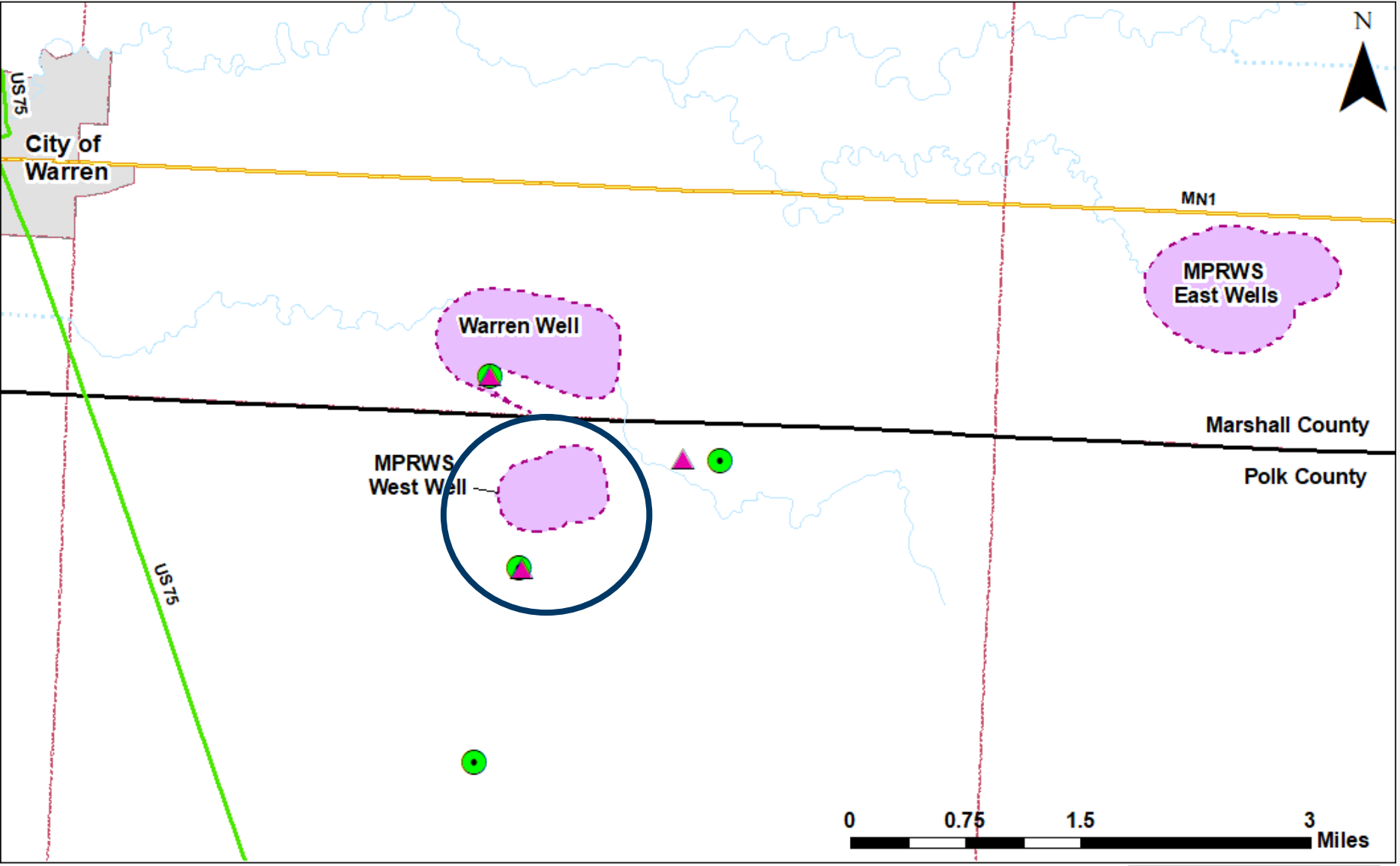
- City of Warren
- Marshall-Polk Rural Water System (MPRWS)



Permitted Water Users

- City of Warren
- Marshall-Polk Rural Water System (MPRWS)
- Four Agricultural Irrigation Permits

Water Levels Tell a Story



Well type

- Permitted Irrigation Well
- Permittee Monitoring Well
- Municipal Well Area
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- CITY
- TOWNSHIP

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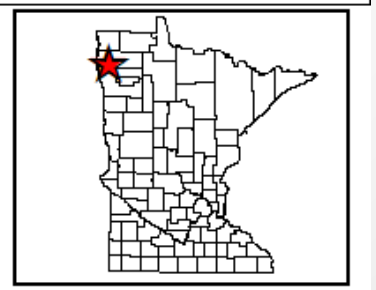
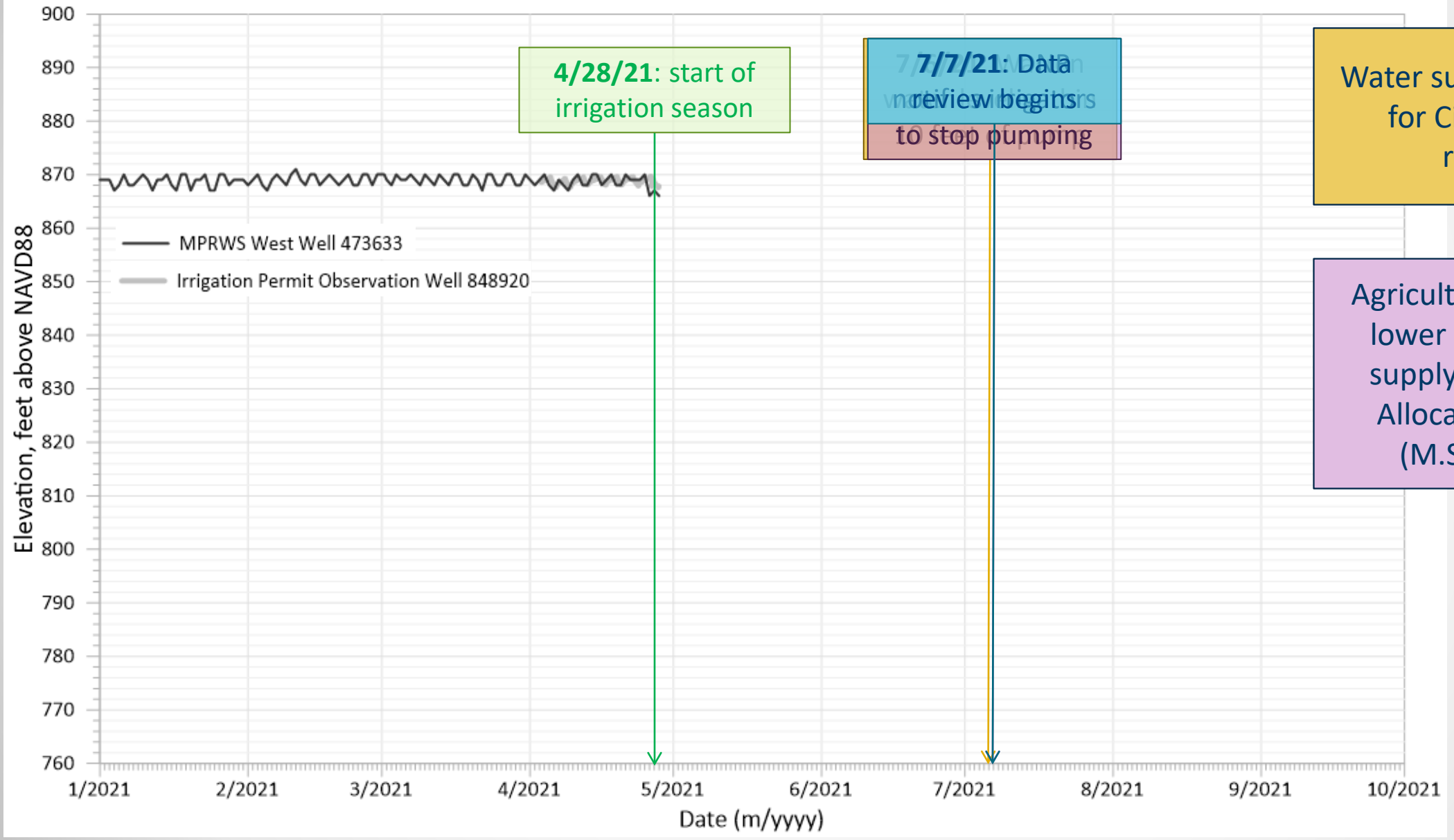


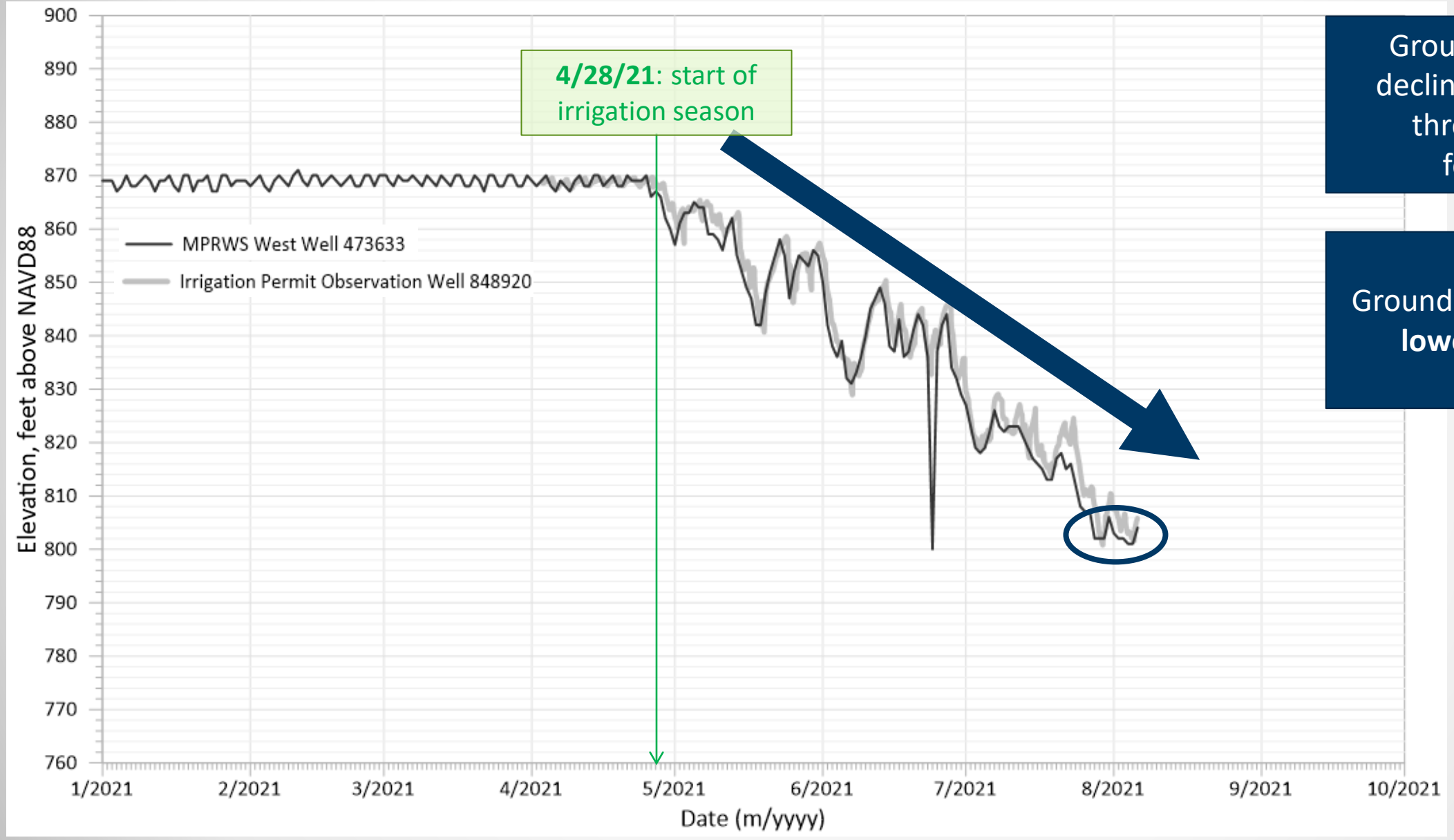
2021 Water Levels



Water supply threatened for City of Warren residents.

Agricultural irrigation is lower than domestic supply on MN Water Allocation Priorities (M.S. 103G.261)

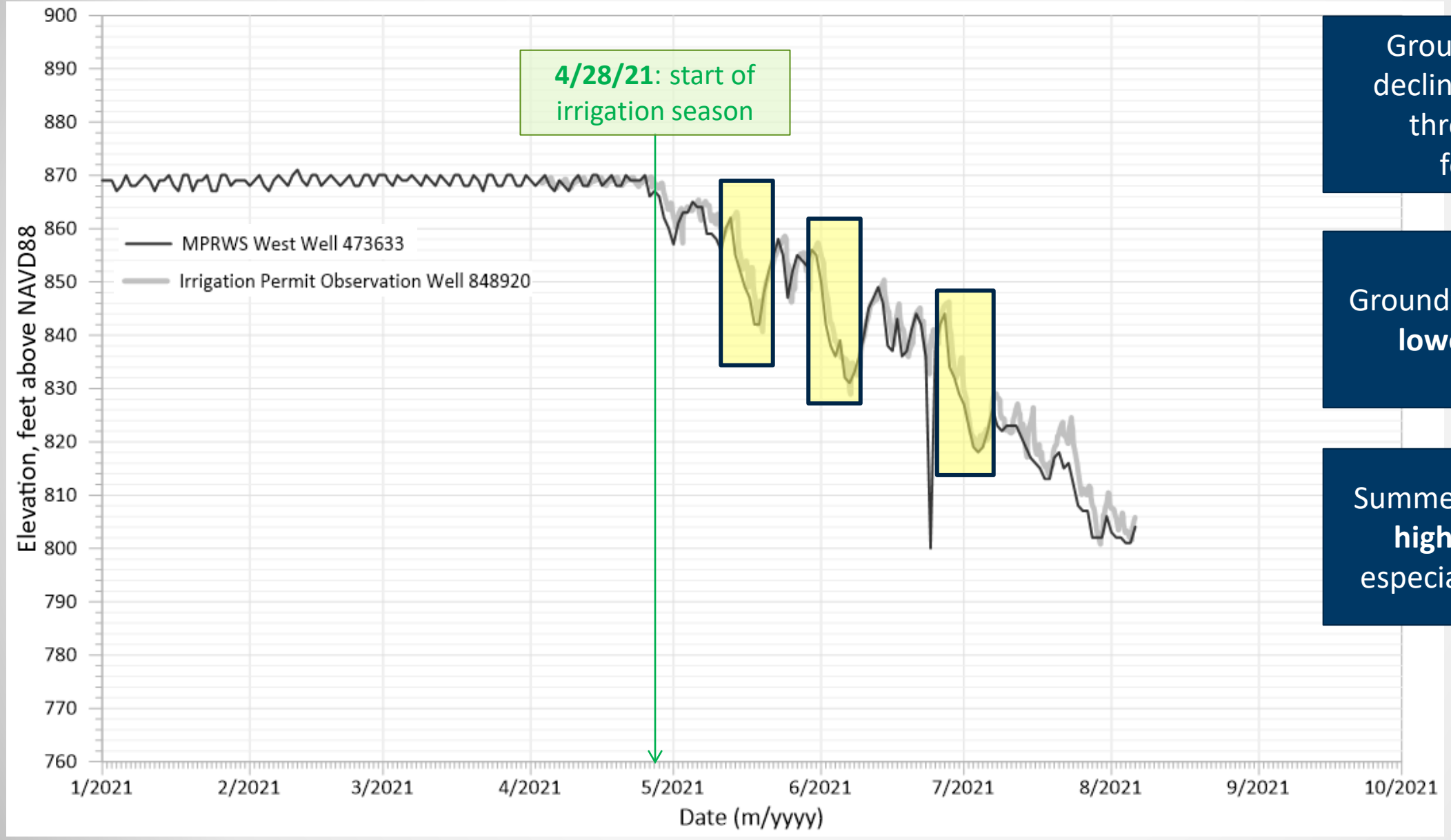
2021 Water Levels



Groundwater levels declined by 70 feet in three months (5 feet/week).

Groundwater levels were **lowest on record.**

2021 Water Levels



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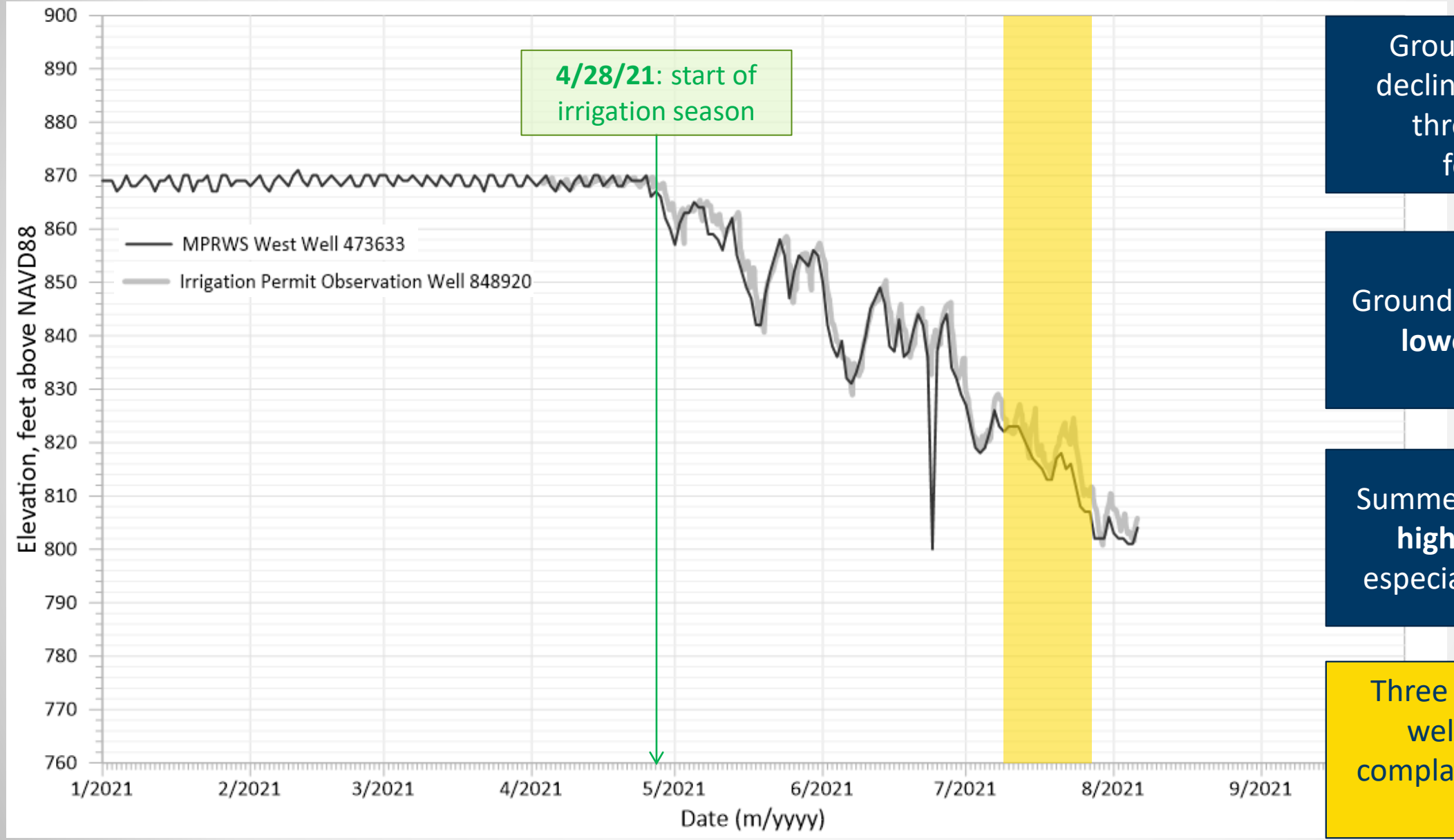
Summer 2021 water use **highest on record**, especially for irrigation.

2021 Water Levels



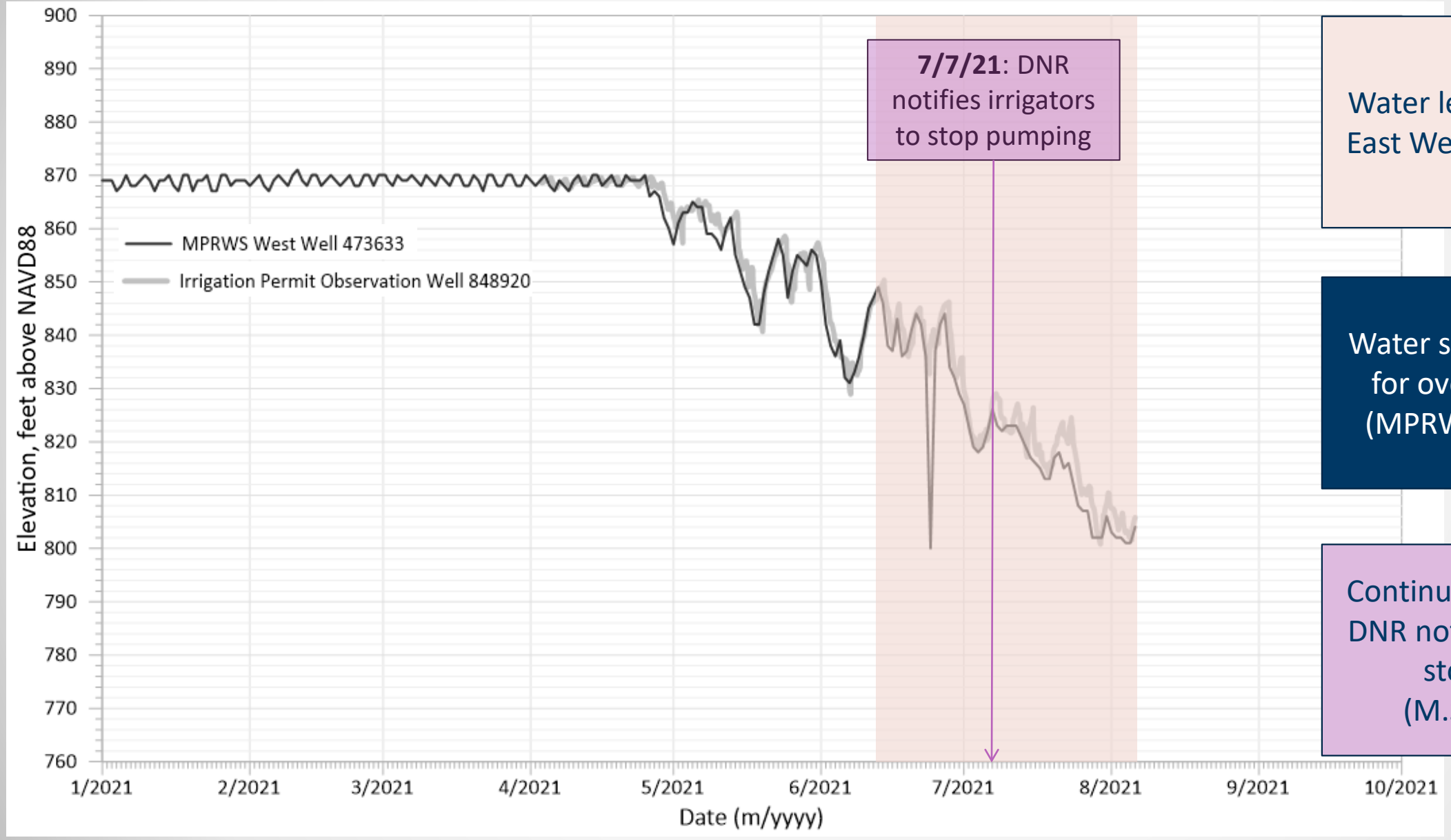
Groundwater levels declined by 70 feet in three months (5 feet/week).

Groundwater levels were **lowest on record.**

Summer 2021 water use **highest on record**, especially for irrigation.

Three verbal domestic well interference complaints submitted to DNR.

2021 Water Levels



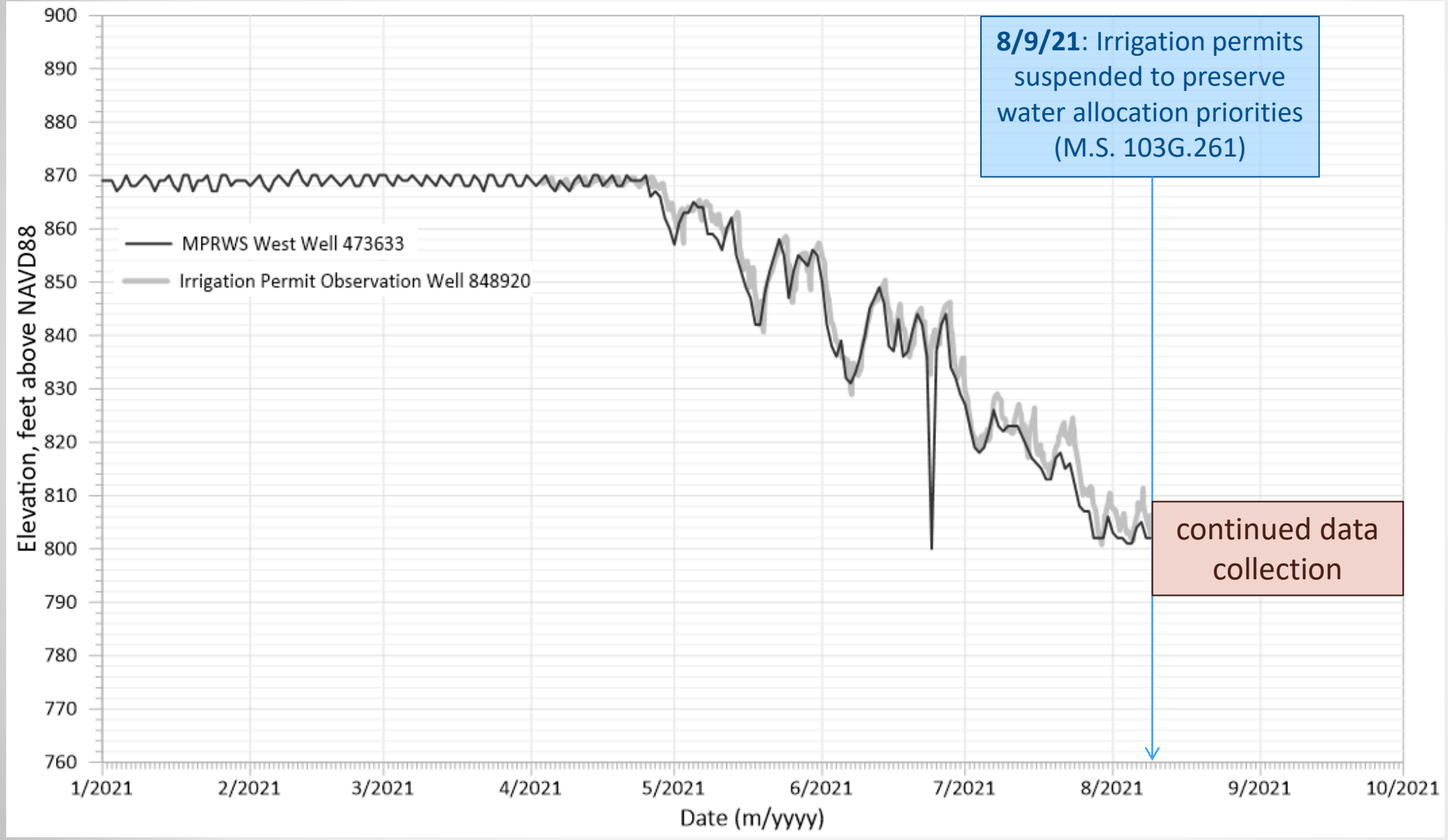
7/7/21: DNR notifies irrigators to stop pumping

Water level near MPRWS East Wellfield well pump.

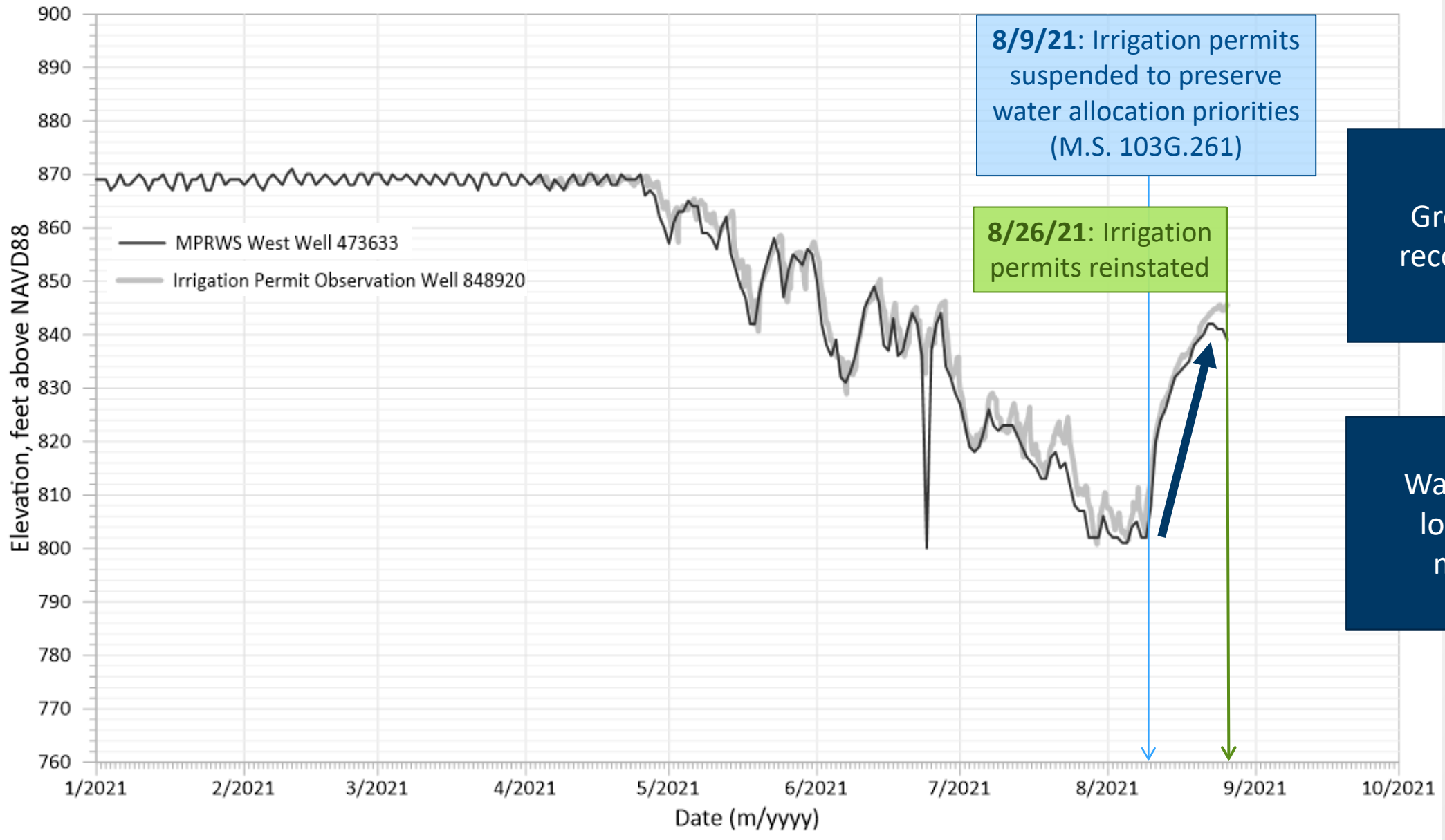
Water supply threatened for over 6,000 people (MPRWS and Warren).

Continued pumping after DNR notified irrigators to stop pumping (M.S. 103G.261).

2021 Water Levels

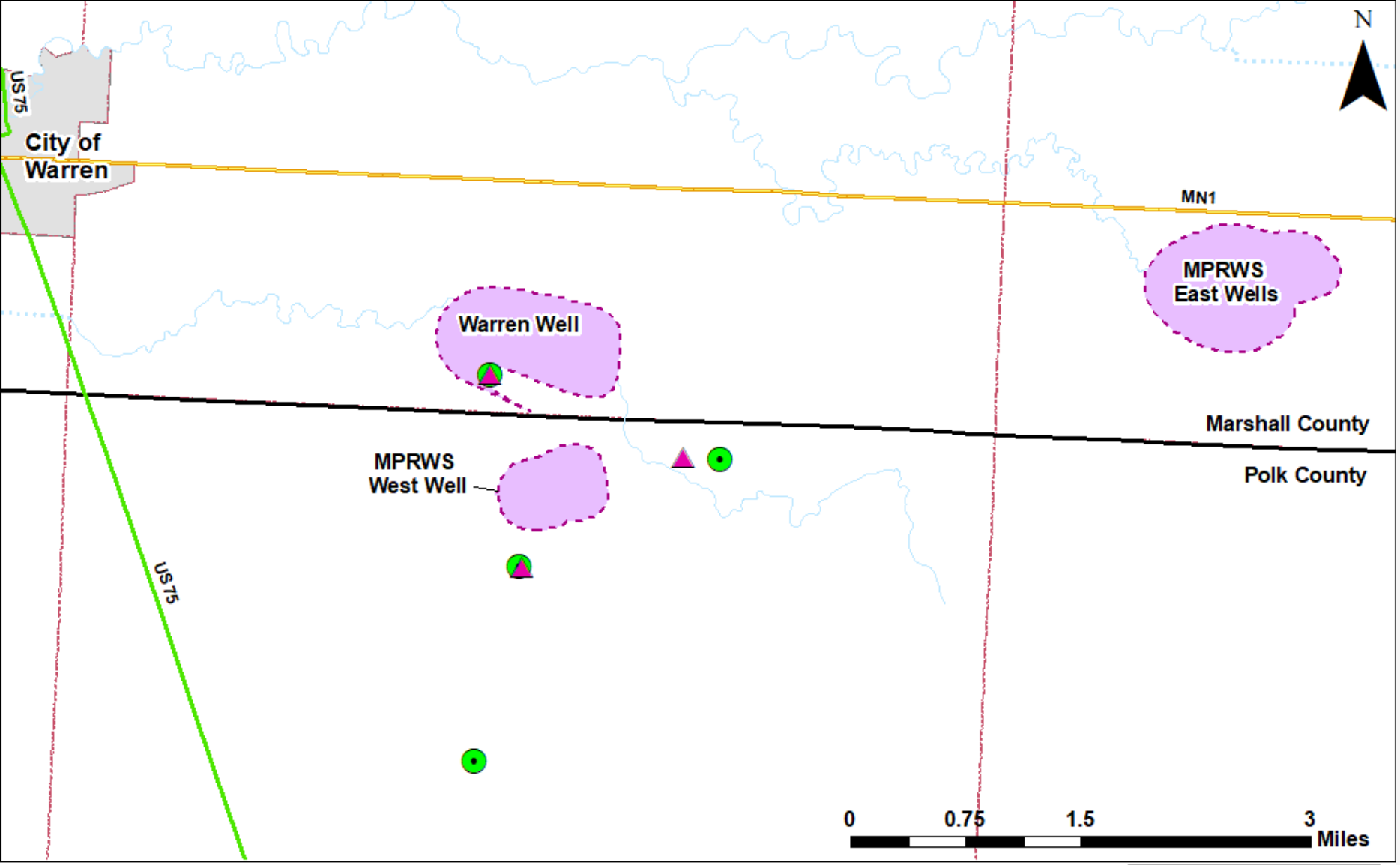


2021 Water Levels



Groundwater levels recovered by 40 feet.

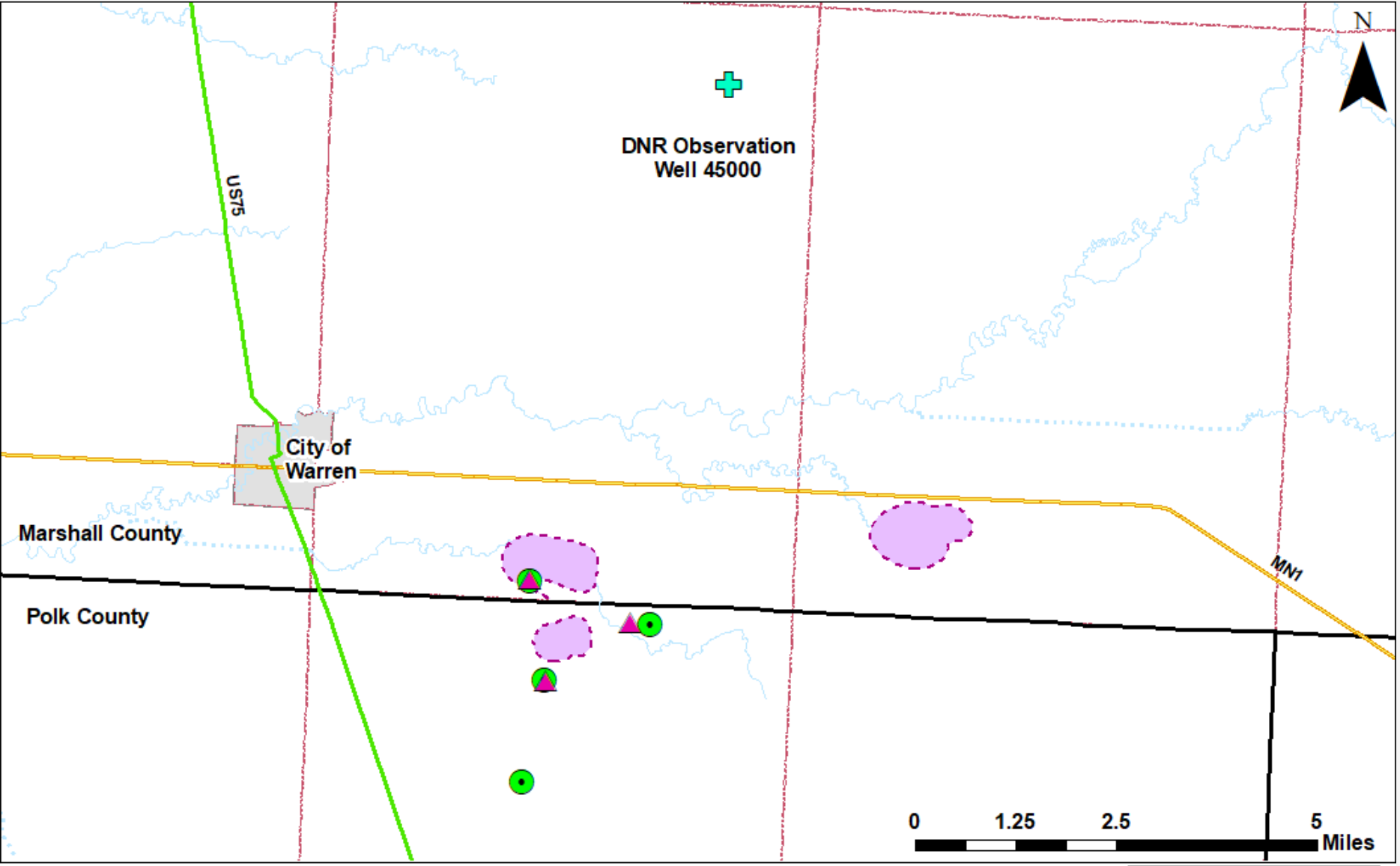
Warren and MPRWS lowered pumps in municipal wells.



What are we learning?

- All wells showed the same trends.
- One aquifer system in area.
- Aquifer system is limited.
  - Small
  - Slow to recharge

Regional view



Well type

- Permitted Irrigation Well
- Permittee Monitoring Well
- DNR Observation Well 45000 (219329)
- Municipal Well Area
- Public Water Watercourse
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- TOWNSHIP

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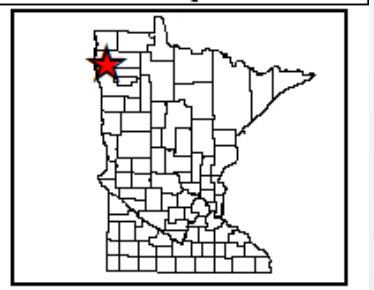
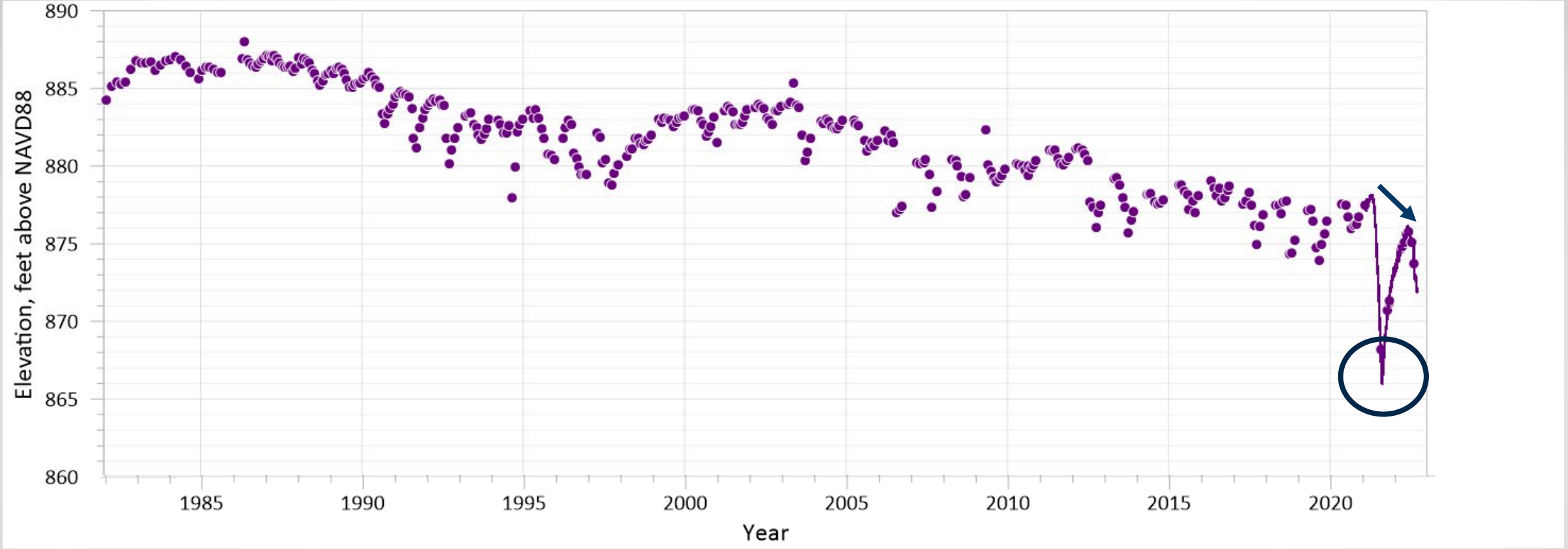


Historic Records from DNR Observation Well 45000

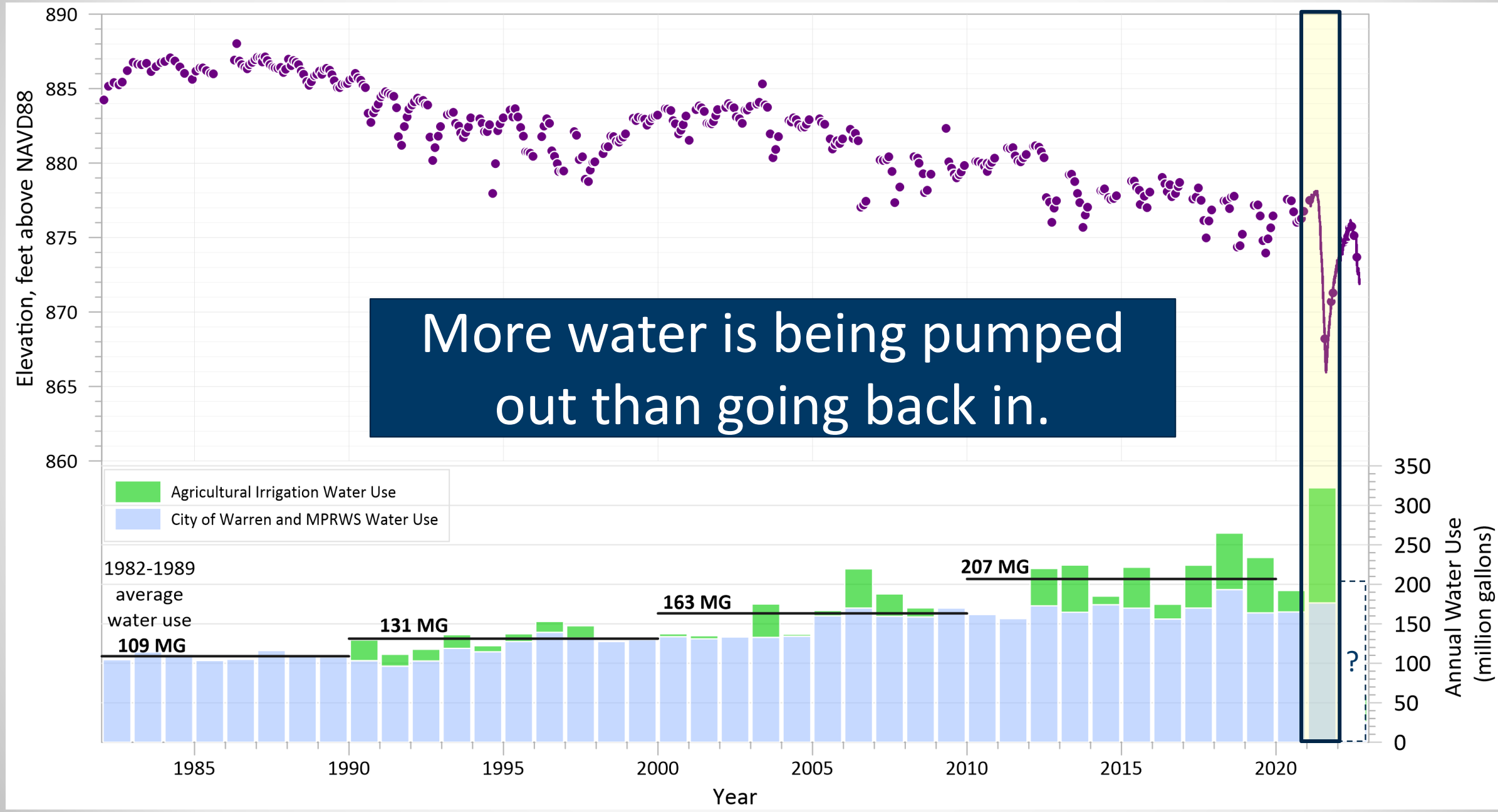


Over 10 feet of decline since 1985.

Lowest recorded levels in summer 2021.

Two to five feet of water level decline between 2021 and 2022.

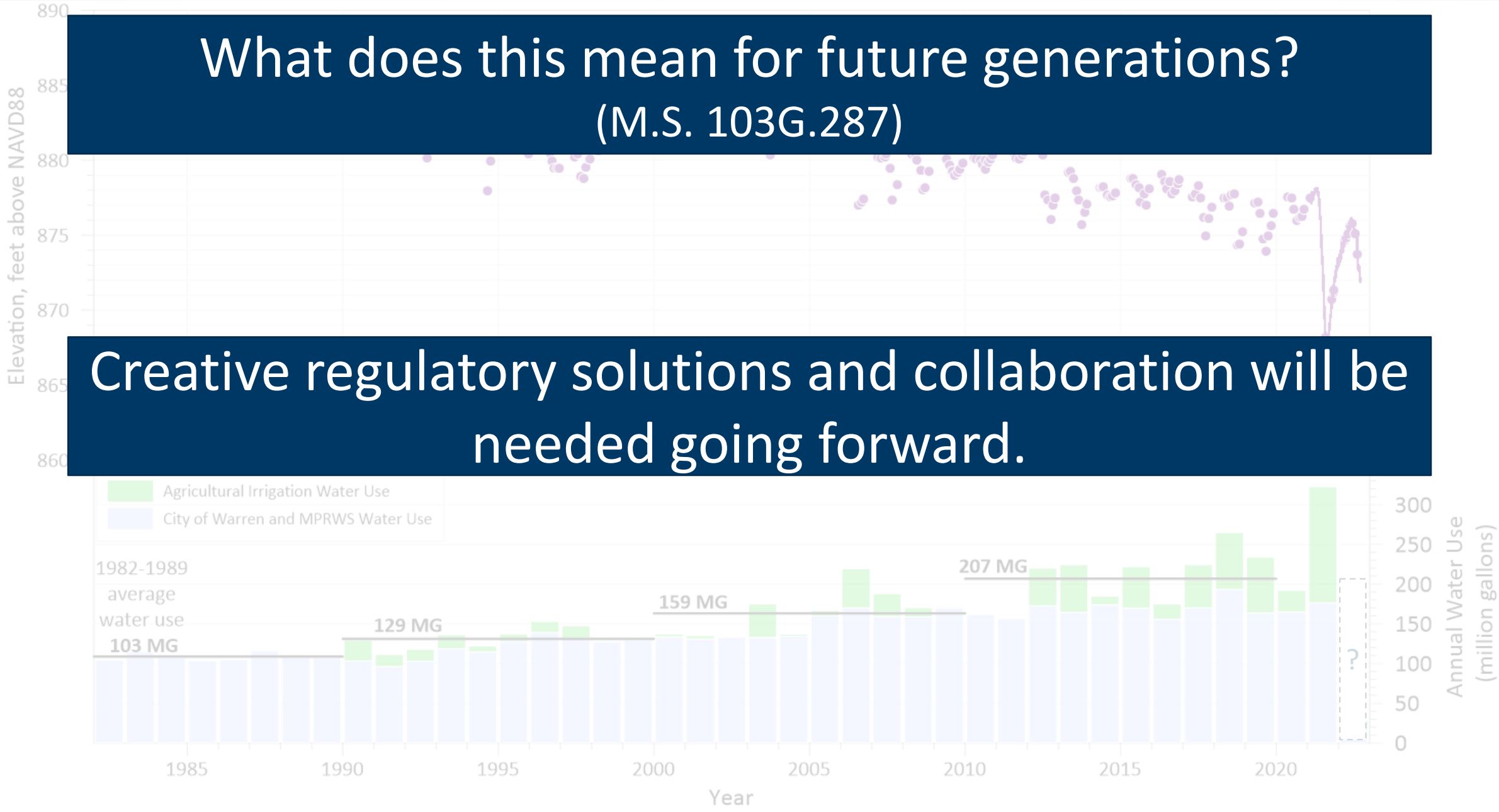
Historic Records from DNR Observation Well 45000



Historic Records from DNR Observation Well 45000

What does this mean for future generations?
(M.S. 103G.287)

Creative regulatory solutions and collaboration will be needed going forward.



Thank You!

Amanda Yourd

Amanda.Yourd@state.mn.us

612-390-1097

Water Appropriations and Permit Suspensions

Dan Miller | Water Use Specialist

Clean Water Council, January 2023

DEPARTMENT OF NATURAL RESOURCES

Water Regulations Unit
Division of Ecological and Water Resources

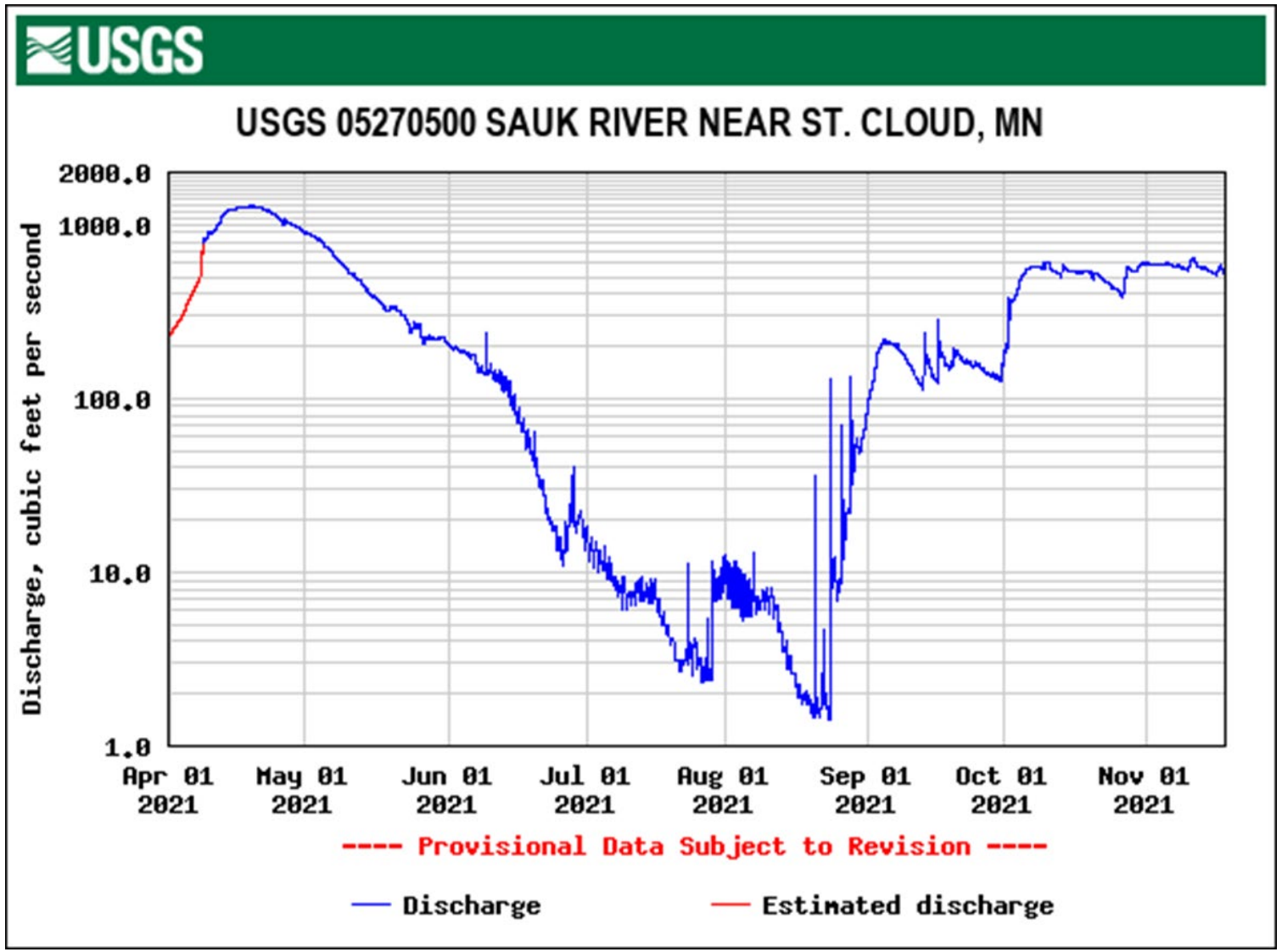
Permit Requirements

- Appropriation of surface water or groundwater
- 10,000 GPD or 1 MGY
- Protect drinking water, natural resources, current and future generations

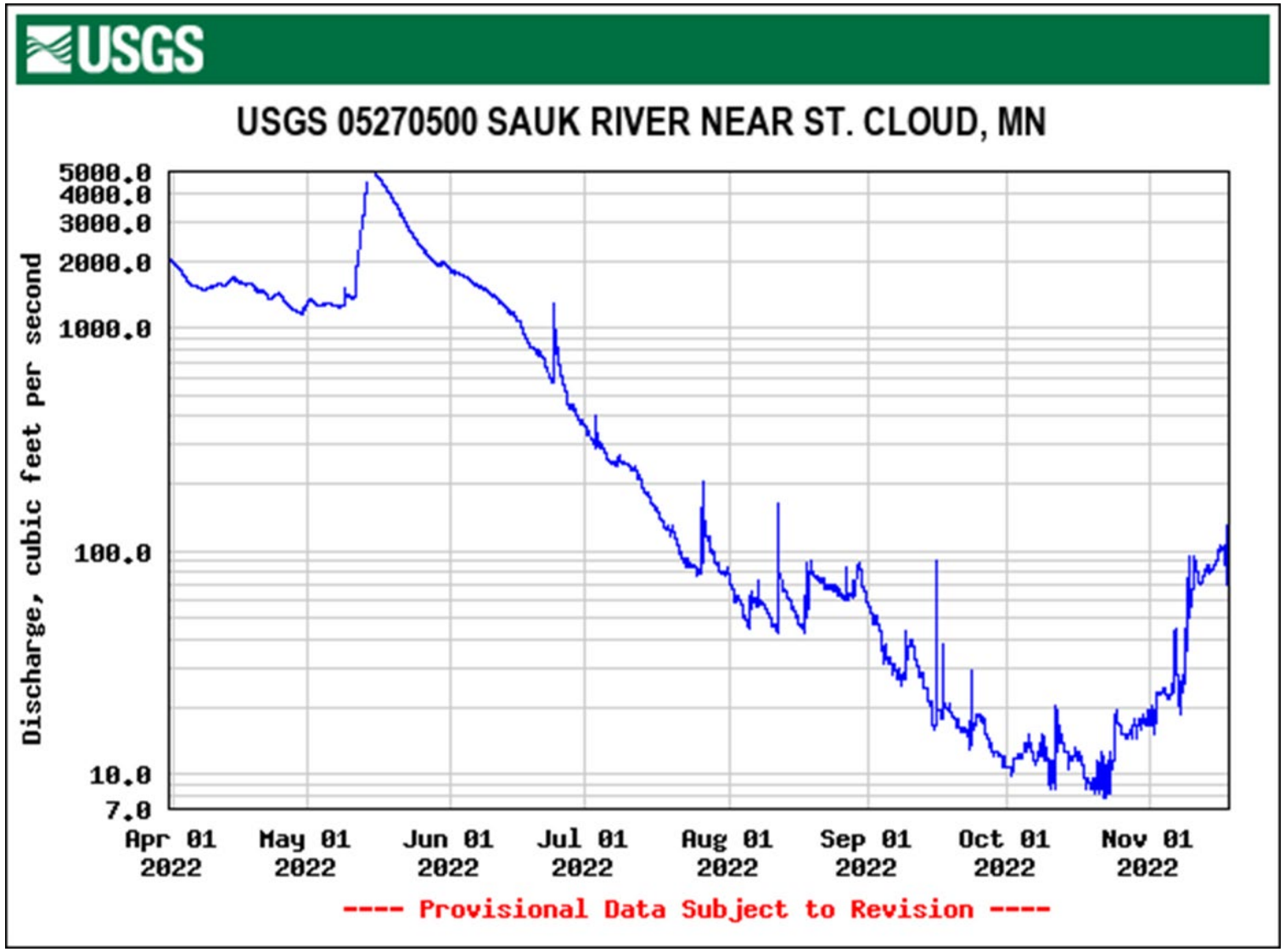
Permit Suspensions

- Watershed flows
- 248 suspended
- Rain in fall
- Flows improved

2021 Stream Hydrograph: Sauk River Watershed



2022 Stream Hydrograph: Sauk River Watershed



- Over 4,000 cfs in late May
- Between 10 - 20 cfs in fall
- Median 140 cfs
- Compounding dry periods

Responding & Adapting

- Suspension for Ag. Irrigation
- Stressful Situation
- Collaborative Solution

Thank you!

dan.w.miller@state.mn.us
651-259-5731

DEPARTMENT OF NATURAL RESOURCES

When in Drought Save Water

Carmelita Nelson

DNR - Water Conservation Consultant

Drought Phase Conservation Requirements

Non-drought → Watch → Warning → Restrictive → Emergency

Implementation of Water Conservation Measures

- Limited customer lawn watering
- City parks watered every 4 days, golf course every 2 days
- Reduced splash pad hours
- Shut down all city irrigation systems except for a few ballfields
- School district turned off irrigation until mid-August
- Contacted 10 largest users, all HOAs
- Banned bulk water sales; theft

- Rebate programs for water saving appliances and devices
- Implemented rate increases for high water users
- Reduced system water loss
- Water saving door hangers/mailings
- More cities are moving to AMI/smart meters – can notify excessive water users

Challenges Meeting Demand

- Many cities saw their highest peak demand days ever in June/July 2021. Some near maximum pumping capacity.
- Drought caused increased water main breaks
- Some cities had to use interconnections with other cities to meet demand
- Complaints about high water bills—showed them the data
- Well drillers struggled to keep up with demand for water; shortage of pumps

Utility Staffing

- Drought response activities may take priority over other routine tasks and maintenance and can increase staff workloads.
- Overtime expenses may increase, which can impact the budget.
- During a drought, utility staff may need to:
  - Respond to increased customer calls.
  - Enforce water restrictions and respond to variance requests.
  - Communicate regularly with local media and the public.

Rural Water Systems felt the Strain

- Lincoln Pipestone Rural Water asked all 36 member cities to conserve water in June 2021. Many of these cities set restrictions on non-essential water use.
- The water system's service area includes Lac qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Redwood, Rock, Yellow Medicine and Jackson counties.

Lincoln Pipestone RURAL WATER

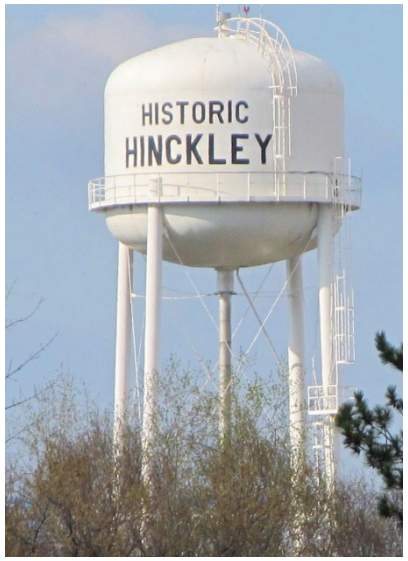
- The city of Lynd announced a water ban on watering lawns or gardens, washing cars or filling pools.
- Many feedlots and ag producers rely on rural water systems too.
- Vulnerabilities are not always obvious until tested by a drought.

Zimmerman

- 5 Days straight – Low Level Tower Alarms continually running
- Door hangers for violators
- If a citizen complained about the cost of a watering fine, the city would reduce it by 50% if the homeowner toured the water treatment plant to learn about the issues

Experiences and Lessons Learned

- Need to align water supply plans with drought plan
- Continue to drive demand down, even in times of abundance
- Compliance and enforcement can be challenging - may need to pivot messaging as drought gets worse
- Expect the unexpected and plan for worst-case scenarios



- May need incentives for redevelopment of landscapes to be more waterwise
- Look to energy sector example of comparing usage with neighbors
- Important to set reasonable target – cities need to balance budgets

Thoughts for the Future

- Reduction of lawn irrigation and an increase in drought tolerant species.
- Partnership is key to expanding programs and changing landscapes
- Need more demand reduction in residential and business sectors
- Irrigation meters for commercial and multifamily properties
- Investing in water saving rebate programs helps manage demand
- Consider EPA WaterSense fixture requirement for new construction
- More recycled water
- More *water is life* and *every drop matters* ethic - Long-term success requires buy-in

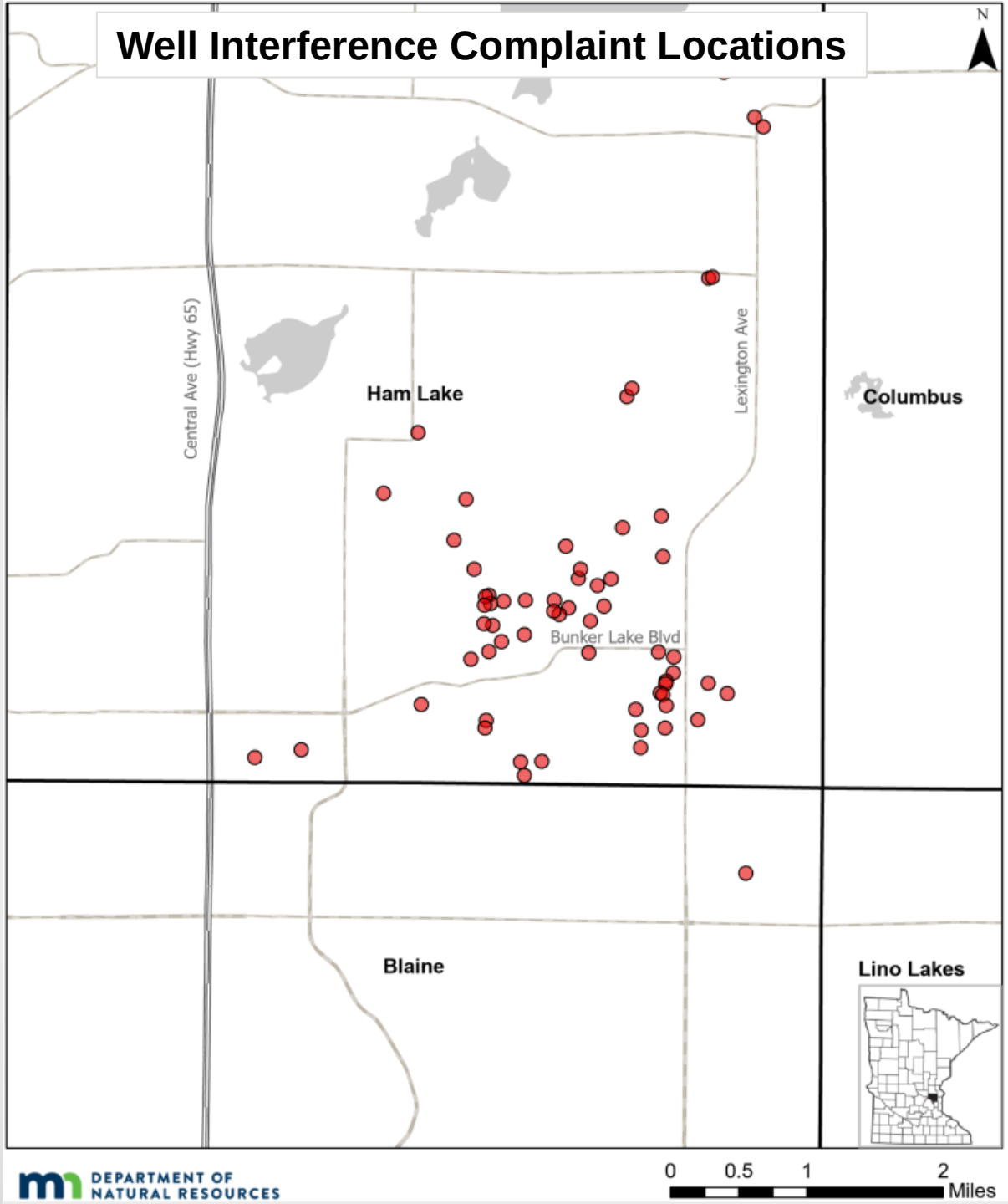
DEPARTMENT OF NATURAL RESOURCES

Thank you

Carmelita Nelson

Carmelita.nelson@state.mn.us

Since the drought….



Ongoing Well Interferences in Anoka County

- 65 Complaints in 2022.
- Unpermitted pumping by the City of Blaine.
- DNR is currently investigating.

Drought Relief Funds

- Budget to Move Minnesota Forward $13.35 million to adverse effects of the 2021 drought
  - Water
  - Trees
- $300,000 funding for well interferences

After Action Report

- Lessons Learned: Successes, Improvements and Actions
  - Communications
  - Drought Plan
  - Well Interferences
  - Permit Suspensions
  - Water Conservation

Drought Plan Revision

- Move forward with drought plan revision in future
- Lessons learned, and actions from After Action Report
- Add new components: mitigation strategies, vulnerability assessment, hazard profile
- Subjective language in plan
- Watershed basin scale
- Stakeholder engagement

Thank You!

Pooja Kanwar – Water Policy Consultant	poojakanwar@state.mn.us
Luigi Romolo – State Climatologist	luigi.romolo@state.mn.us
Ellen Considine –Hydrologist Supervisor	ellen.considine@state.mn.us
Amanda Yourd – Hydrogeologist	amanda.yourd@state.mn.us
Dan Miller – Water Appropriations Consultant	dan.w.miller@state.mn.us
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