



Intersection of Groundwater Models, Ecology and Management

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- State Policy – Develop and use water sustainably
- DNR's Approach
 - Vigorously pursuing the science (e.g. atlases, water level data, ecology...)
 - Building relationships with stakeholders (i.e. water users and connected interests)
- Approach Illustrated Through Examples
 - NE Metro, Little Rock Creek, Bonanza Valley
 - Future areas

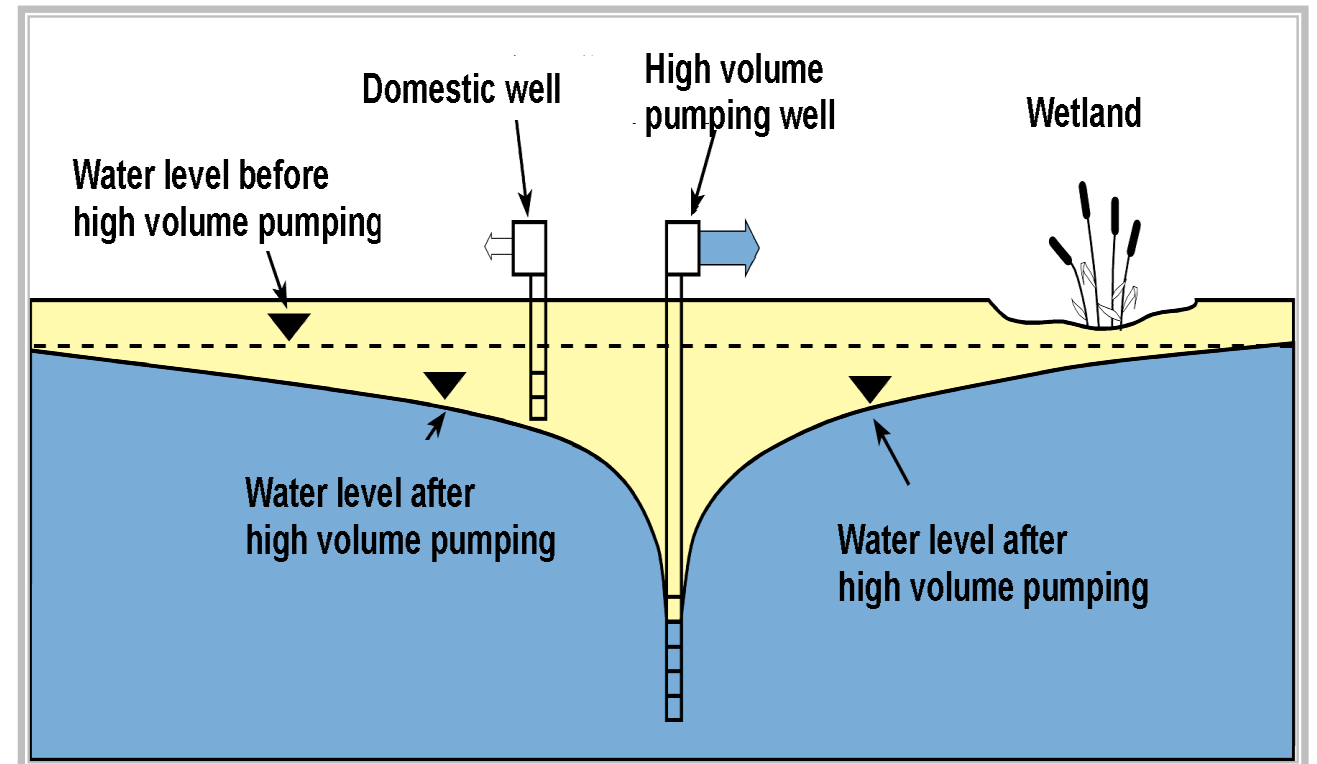
DNR's Responsibility

- **Assurance of supply** - develop and manage water resources to assure an adequate supply to meet long-range seasonal requirements for *domestic, municipal, industrial, agricultural, fish and wildlife, recreational, power, navigation, and quality control purposes* from waters of the state.



Calculating the Invisible

- Measure (trends over time)
- Model
- Check



Engaging Stakeholders in Groundwater





North & East Metro Groundwater Management Area Plan

November 2015

Minnesota Department of Natural Resources
Ecological and Water Resources Division

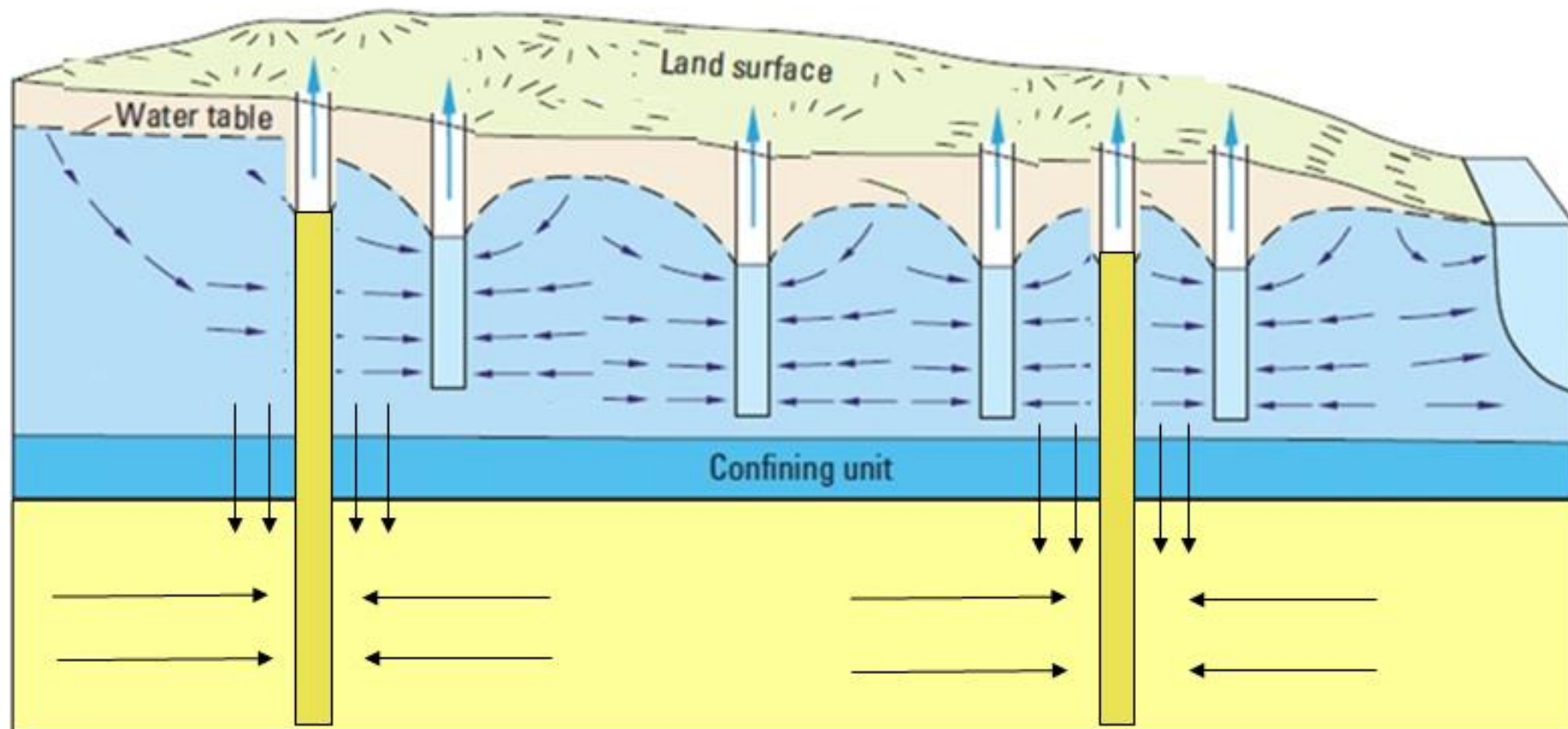


Groundwater Management Strategic Plan

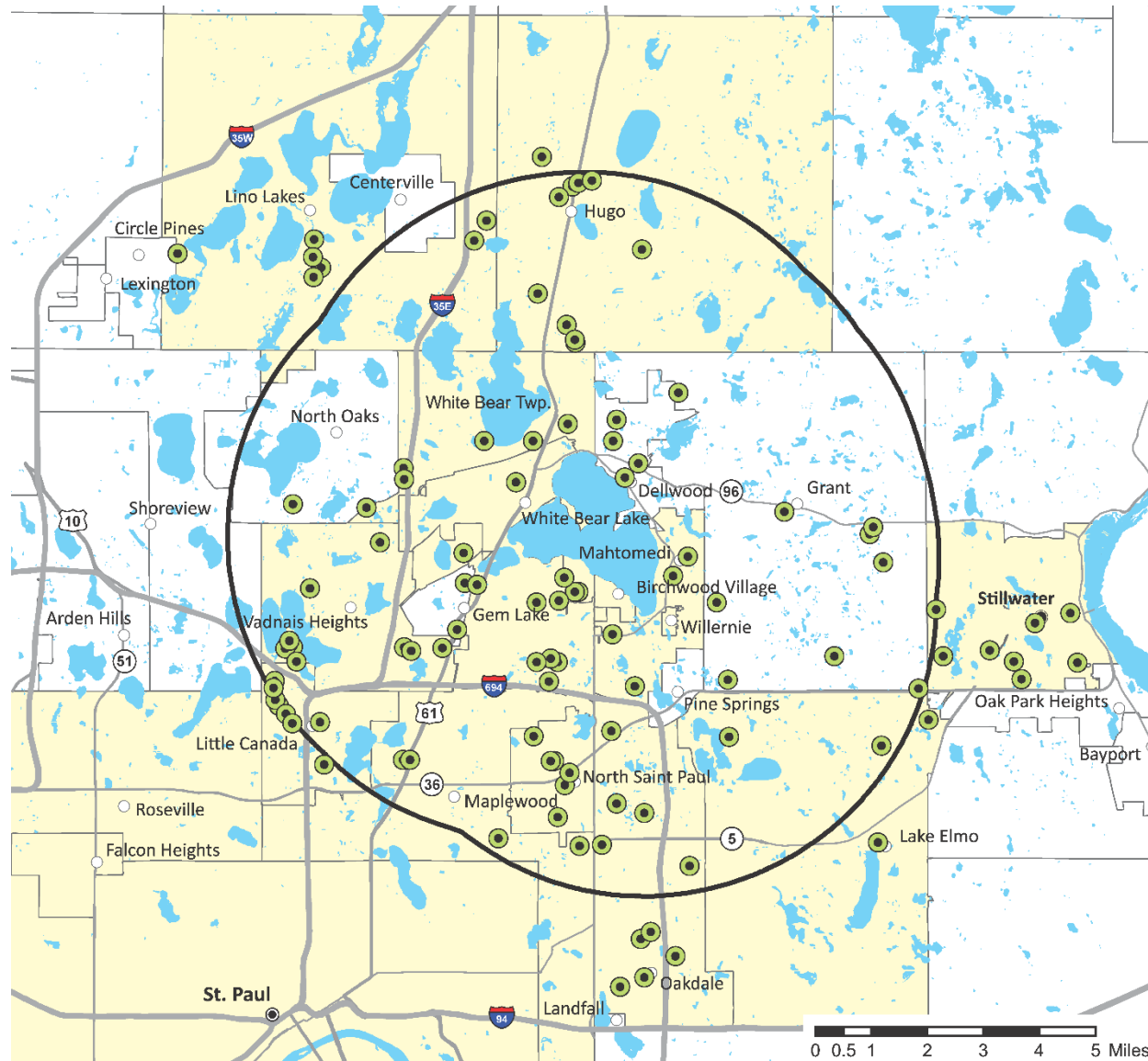
Seven Core Strategies

1. Heighten the priority given to groundwater
2. Enhance the information available for decisions
3. Improve management of appropriation permits
4. Improve compliance with permits and regulations
5. Improve communication and education
6. Effectively address challenges in areas of high use
7. Promote water conservation and wise use practices

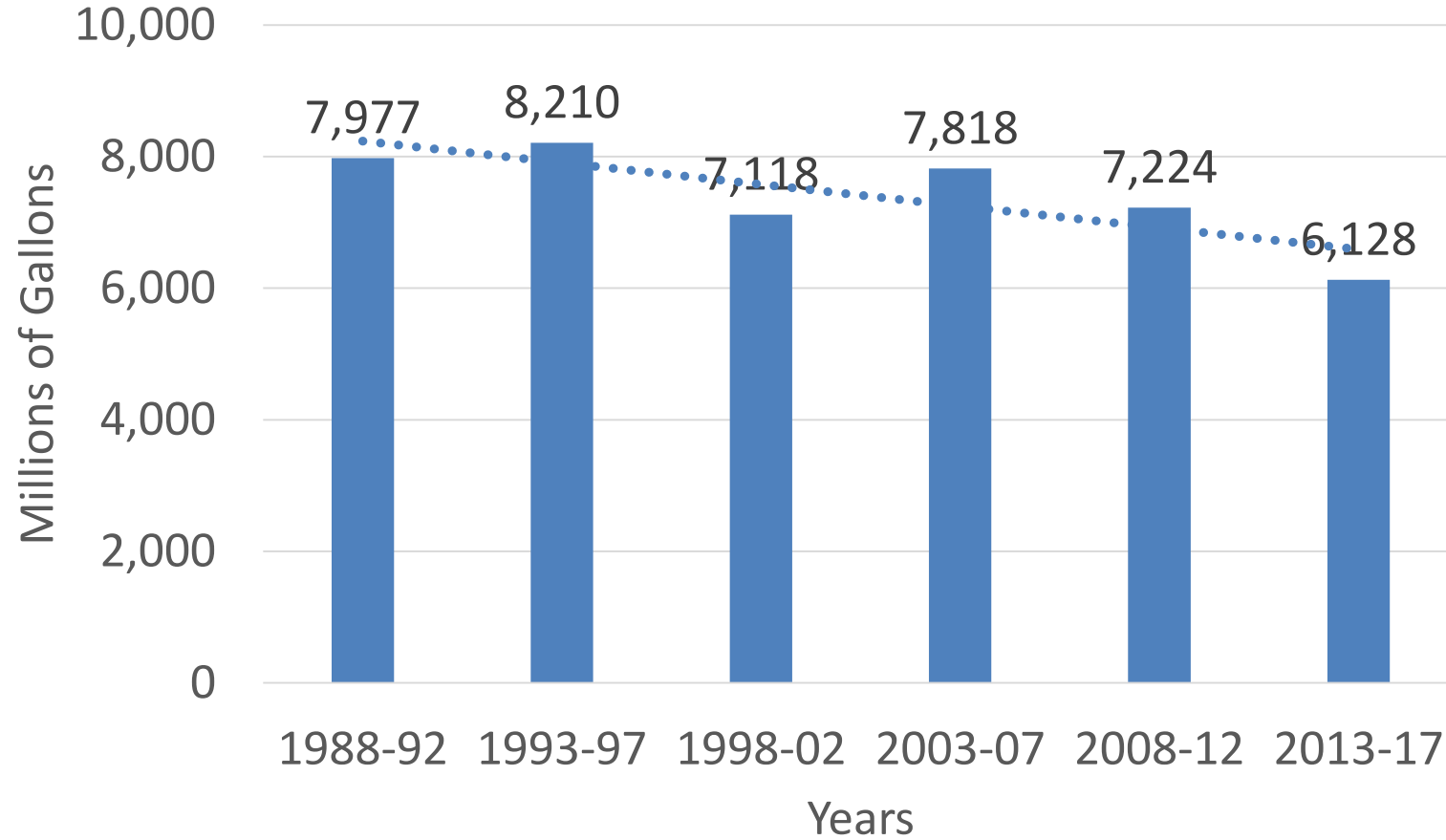
Complex Groundwater Model



Permits and Wells w/in 5 Mile Area

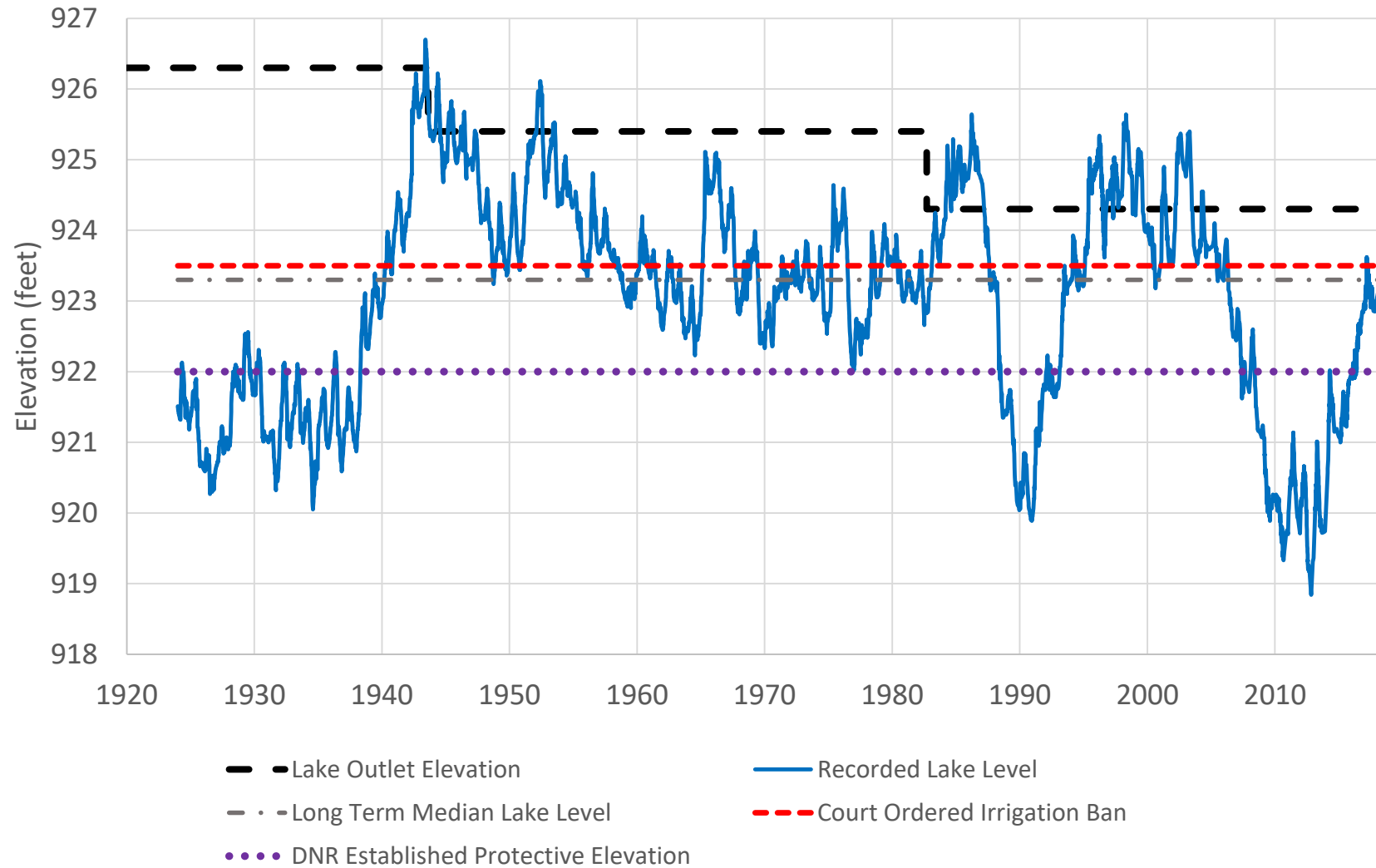


5 Year Annual Average Groundwater Use within 5 Miles of White Bear Lake

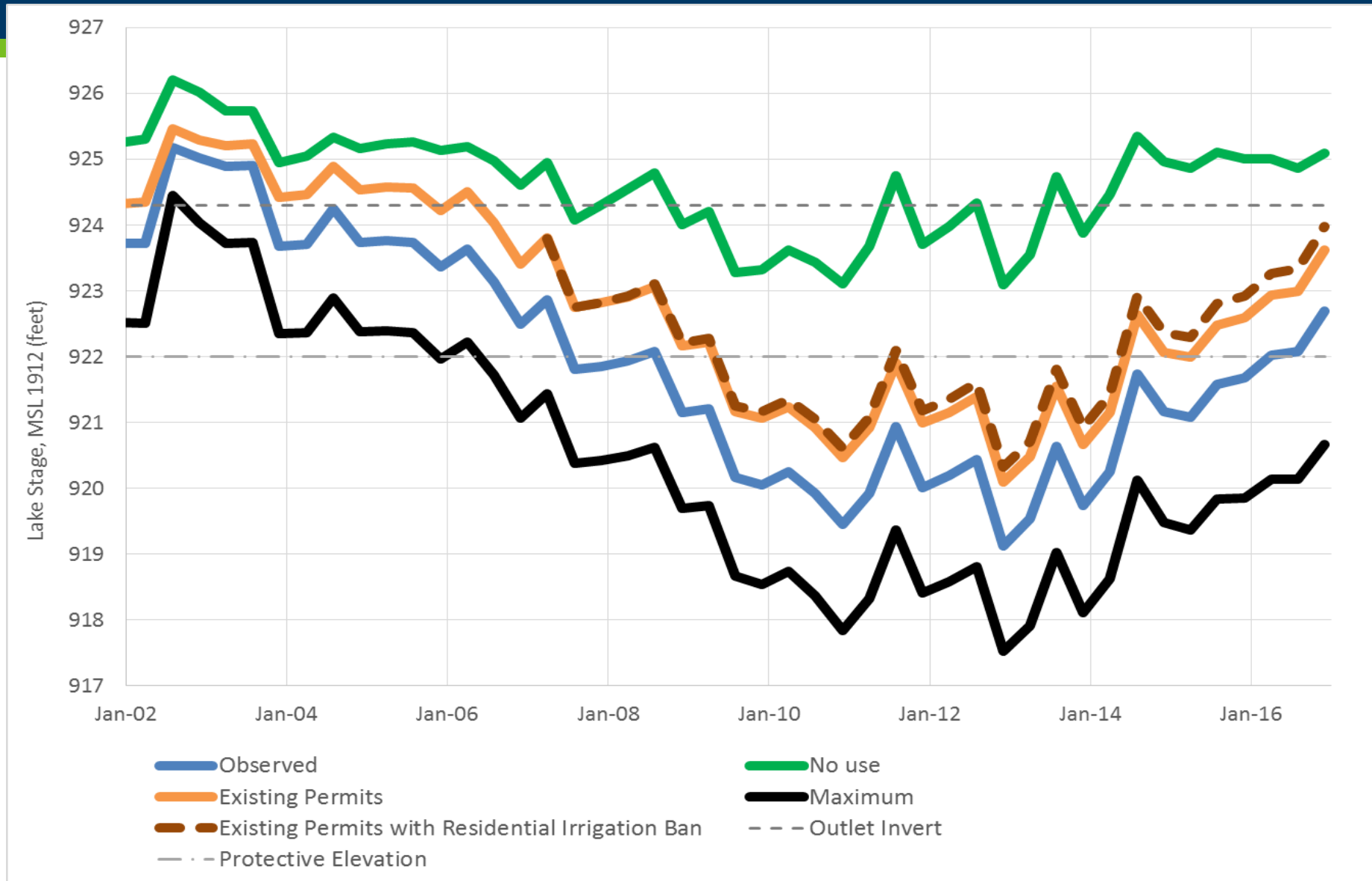


Note: St. Paul Regional Water Services no longer relying on groundwater

Long-term Record



Triannual Model Results – White Bear Lake



Lakes: Take Another Look



Summary of Modeling Analysis

- Existing use does not harm the ecosystem
 - Aquatic vegetation, fish and wildlife habitat, fish abundance
- Existing use does not violate aquifer safe yield
- Existing use does not degrade water quality
- Existing and past use results in water levels that go below the protective elevation (922' MSL)
- The model will be extremely useful for evaluating any changes

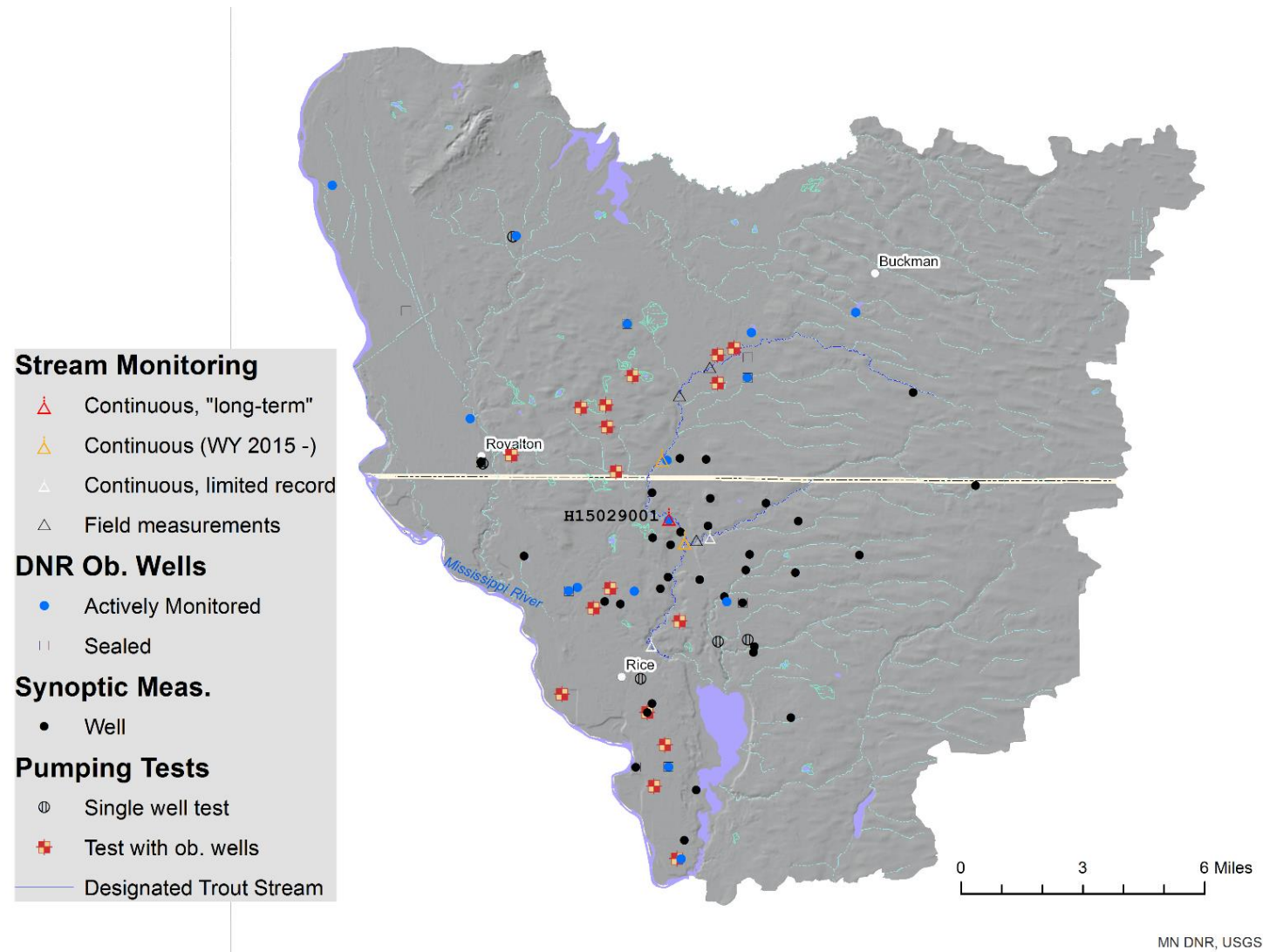


Sustainable Use of Groundwater in the Little Rock Creek Area

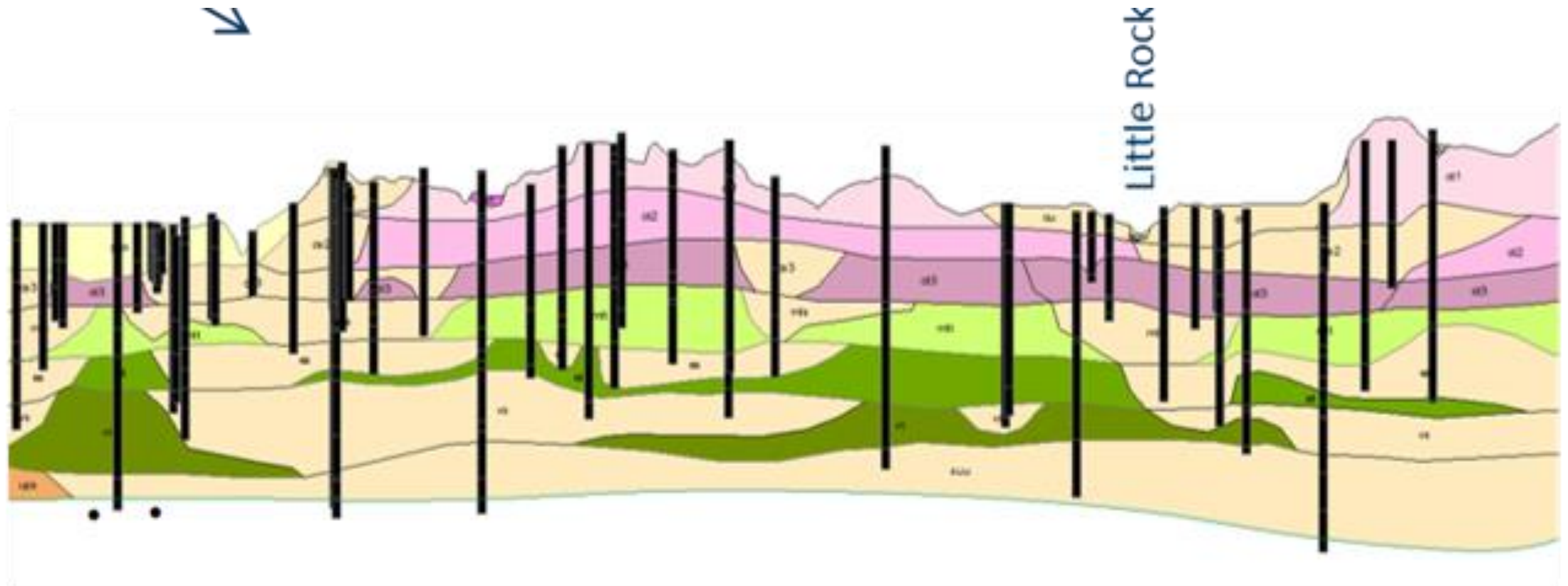
A DNR Action Plan

September 2018

Little Rock Creek Area – Hydrologic Data



Little Rock Creek Area - Geology



Modified from Lusardi (2014), MGS



QBAA 49033 (121 ft) and QWTA 49034(18.3 ft)



H15029003



Little Rock Creek - Ongoing Data Collection & Analysis

- Collect and analyze streamflow information
- Collect site specific fish-habitat association data
- Analyze habitat changes with flow conditions
- Stream temperature analysis
- 2019 Update groundwater flow analysis (model)





Bonanza Valley Groundwater Management Area Plan

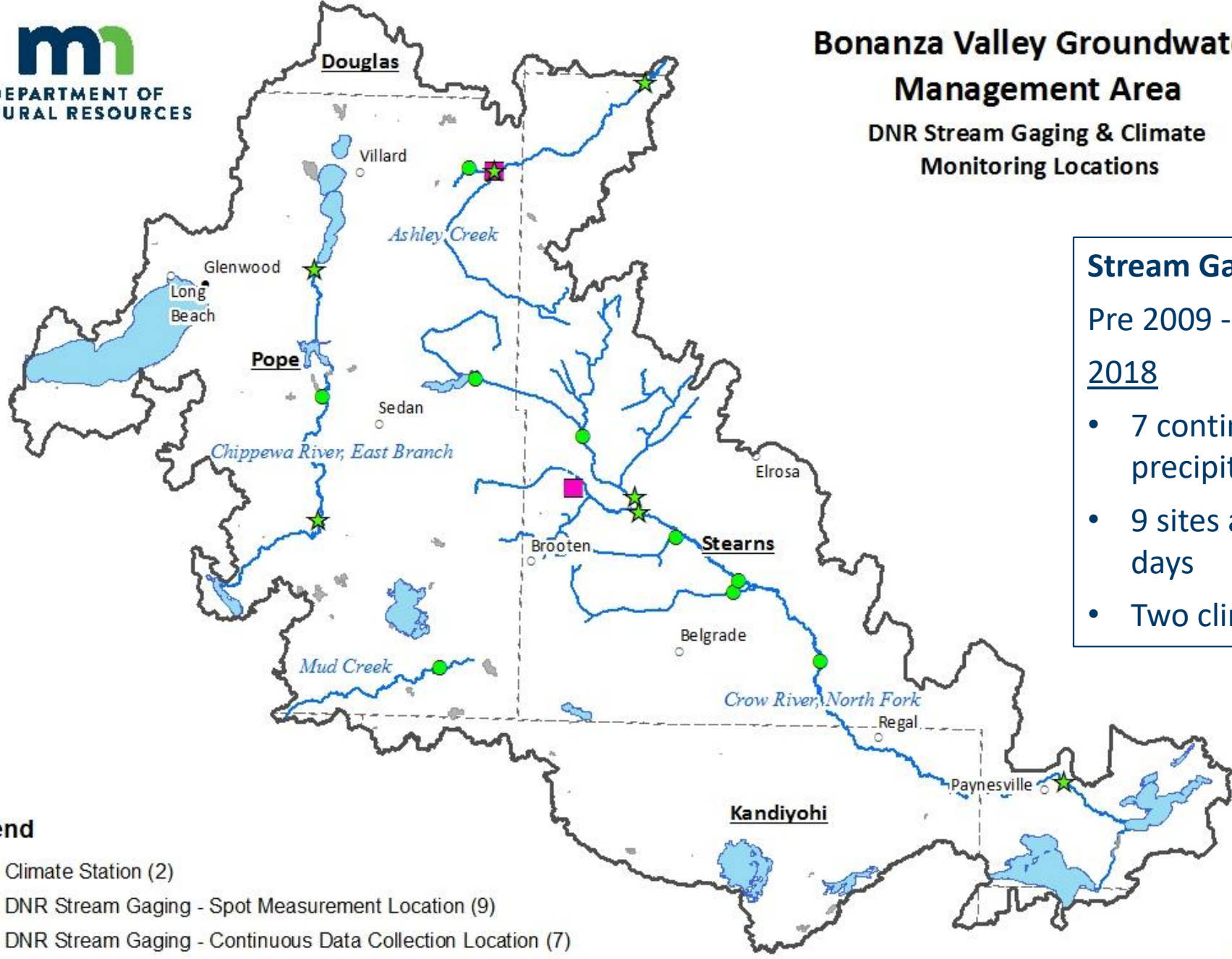
October, 2016

Minnesota Department of Natural Resources
Ecological and Water Resources Division



Bonanza Valley Groundwater Management Area

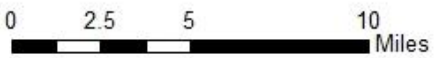
DNR Stream Gaging & Climate
Monitoring Locations



Stream Gaging and Climate Stations:
 Pre 2009 - spot discharge at 15 sites.
2018

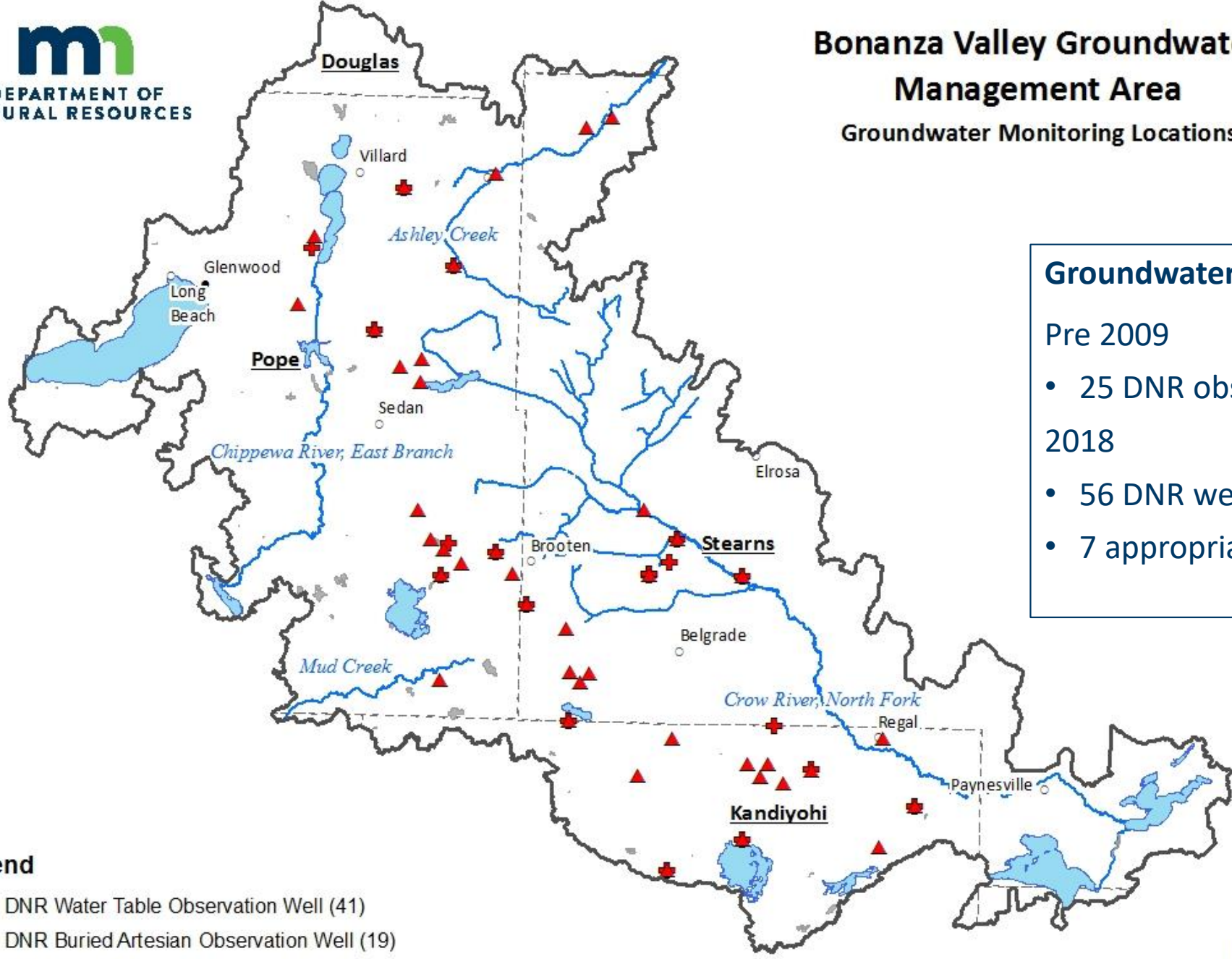
- 7 continuous monitoring sites for stage, precipitation and water temperature
- 9 sites are spot monitored every 30-40 days
- Two climate stations

- Legend**
- Climate Station (2)
 - DNR Stream Gaging - Spot Measurement Location (9)
 - ★ DNR Stream Gaging - Continuous Data Collection Location (7)
 - - - County Boundary
 - Bonanza Valley GWMA



Bonanza Valley Groundwater Management Area

Groundwater Monitoring Locations



Groundwater Monitoring Notes:

Pre 2009

- 25 DNR observation wells (none continuous)

2018

- 56 DNR wells with continuous measurements
- 7 appropriation wells monitored

- Legend**
- ▲ DNR Water Table Observation Well (41)
 - ⊕ DNR Buried Artesian Observation Well (19)
 - - - County Boundary
 - Bonanza Valley GWMA

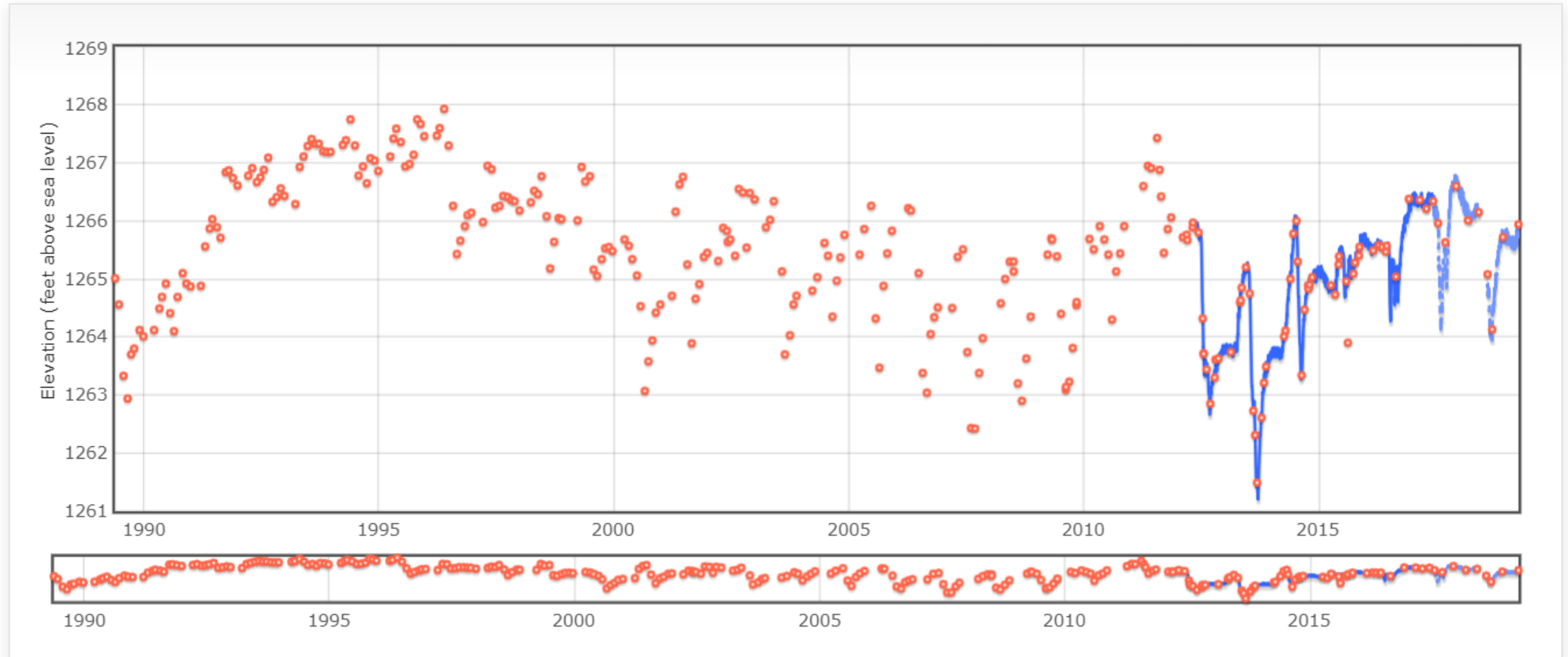


Buried Artesian Well Near Belgrade MN

Quick range:

Displayed Range: to

- Provisional - Water Level
- Approved - Water Level
- Field Measurement - Water Level



Need Better Data

- Wetland hydrology monitoring program



Other Areas of Focus

- Cold Spring – Completed a groundwater model, working with stakeholders to understand the results
- Dakota County – Anticipate developing a groundwater model including updated geologic atlases due in 2020
- Southwestern MN – working closely with several small communities (CAMP)
- Rochester, MN – working with the city on their modeling analysis, planning for substantial growth in demand.

In Closing...



- Using science and data to inform management and planning
- Concepts are fairly simple but execution is complex
- Building relationships with stakeholders
- “Urgency Room”



Thank You!

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