



Thresholds For Negative Impact To Surface Waters

Update for the Legislative Water Commission

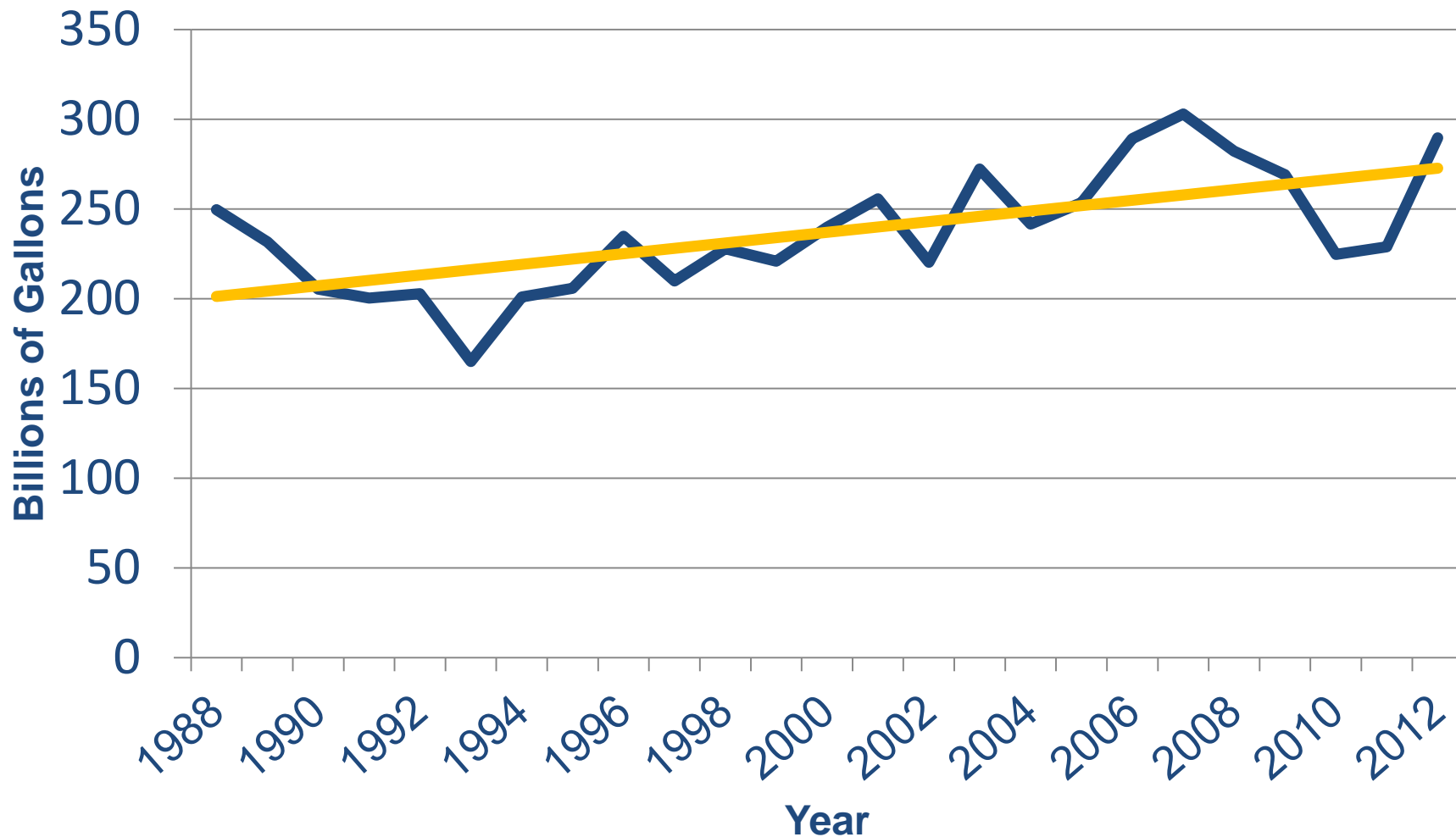
4 November 2015

Jason B. Moeckel

**Section Manager, Division of Ecological and
Water Resources**

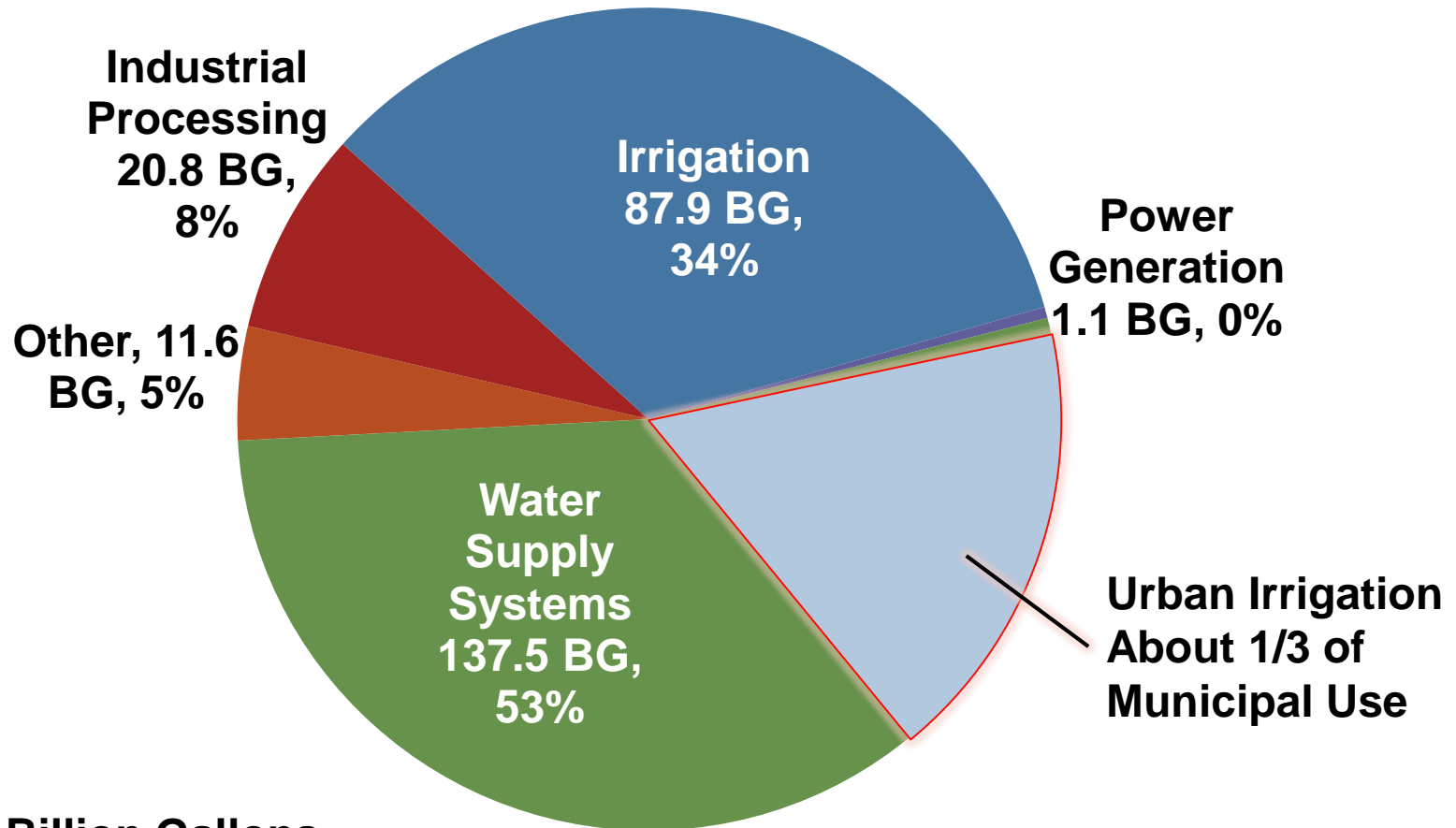


Statewide Annual Reported Groundwater Use



Groundwater Use Percentages By Major Category

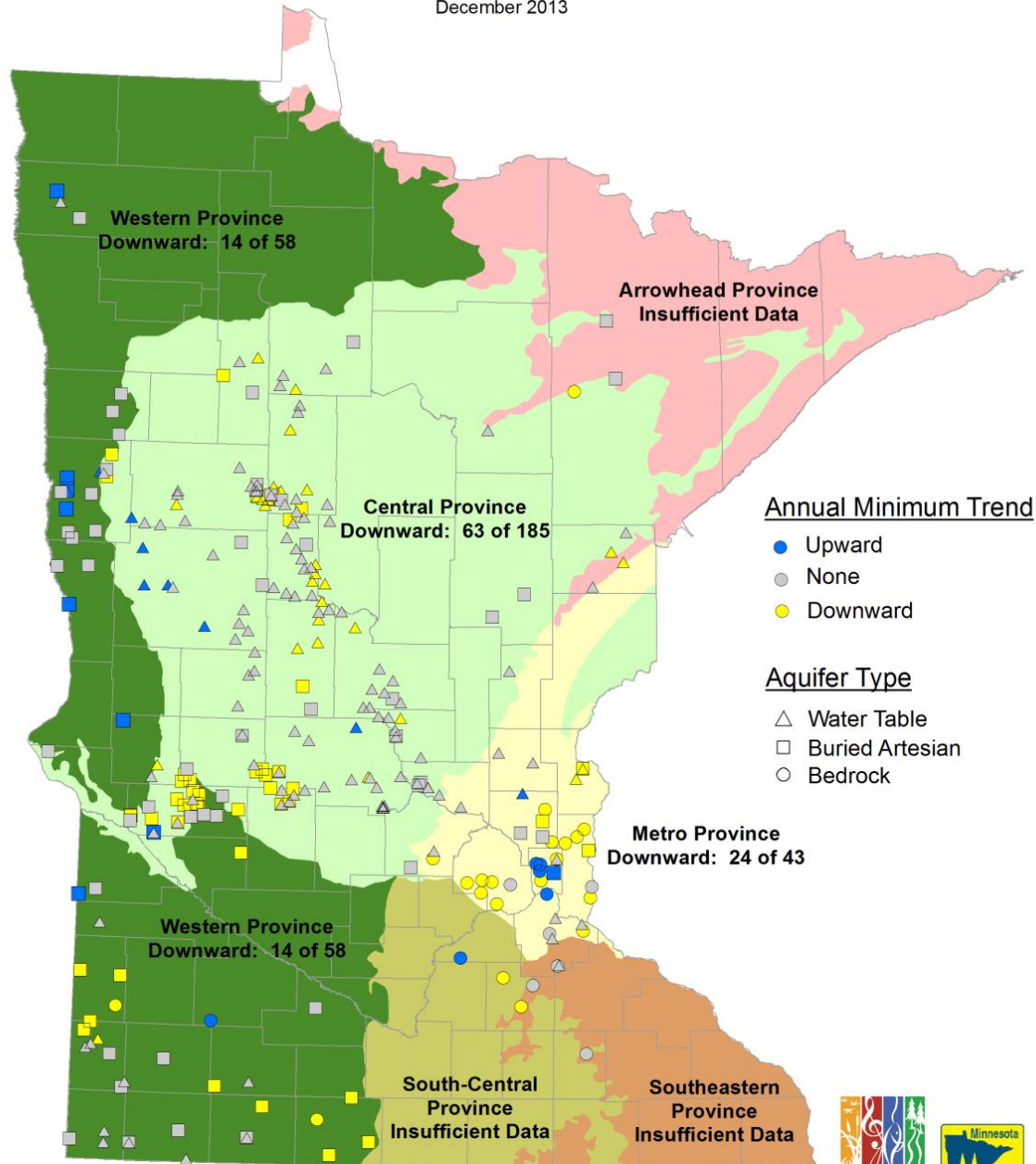
5 Year Average from 2008 - 2012



BG = Billion Gallons

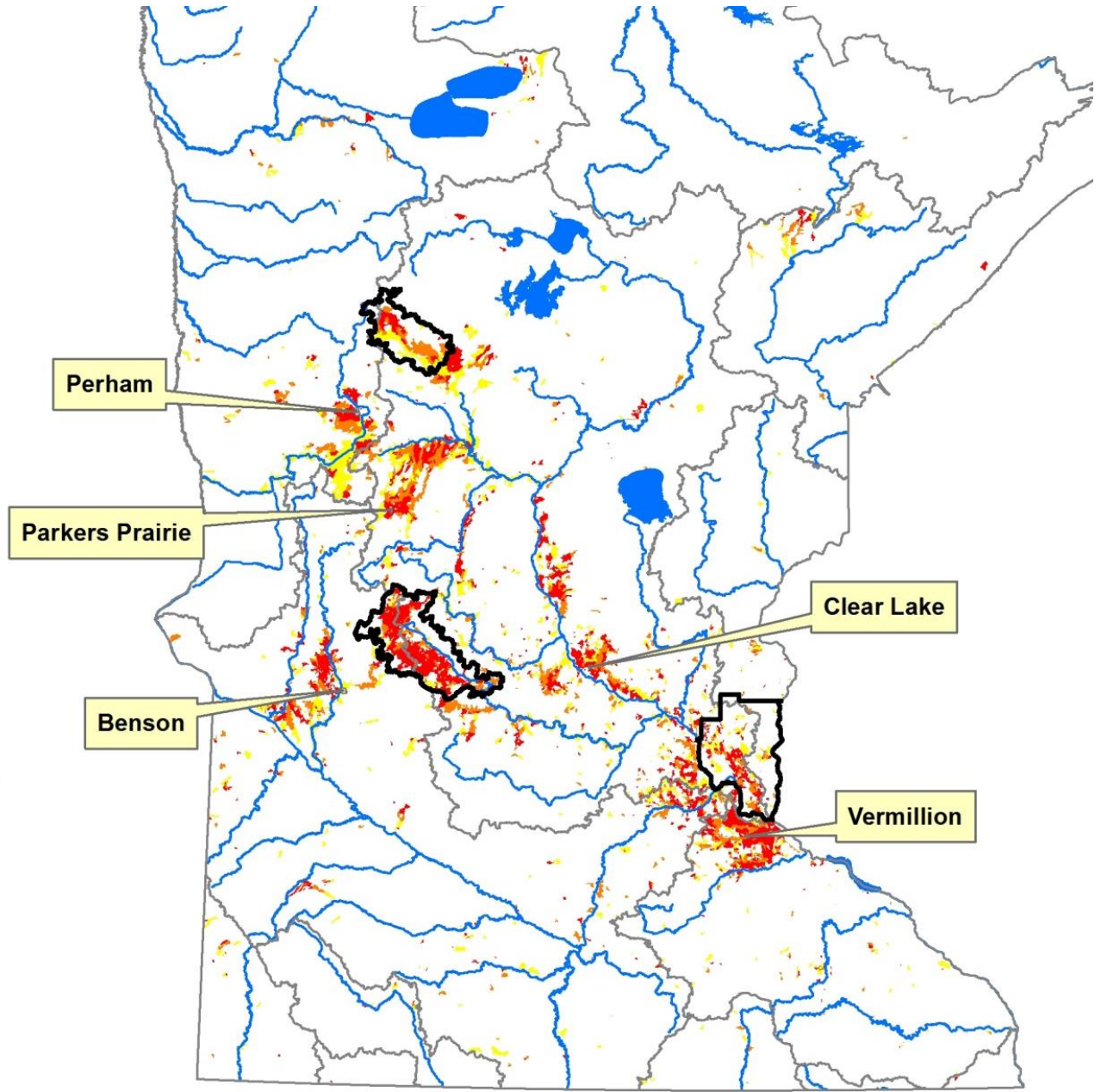
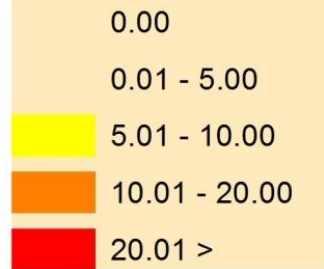
Annual Minimum Water-Level Trends in Observation Wells By Groundwater Province, 1993 - 2012

December 2013



DNR Level 09 Catchments

Water Use Index
(use/available %)





Minnesota Water Rights

- Water is a public resource, no one “owns” it
- Riparian system of water rights – access and reasonable use
 - The state grants the right to water beyond personal use
 - In Minnesota, 10,000 gallons per day or 1,000,000 gallons per year
 - Based on: available, sustainable and priority



Water Use Priorities

1. Domestic uses
2. Consumptive use < 10,000 GPD
3. Ag. Irrigation & Processing
4. Power Production
5. Commercial & Industrial
6. Non-essential uses



DNR Responsibility... (Statute 103G.287)

- When establishing limits DNR must consider the sustainability of the resource, including:
 - Current and projected water levels
 - Water quality
 - Protect ecosystems
 - Future generations to meet their needs



103G.287. Subd. 2.

2014 Legislative Session:

Groundwater appropriations that will have ~~potential~~ negative impacts to surface waters are subject to applicable provisions in section 103G.285.

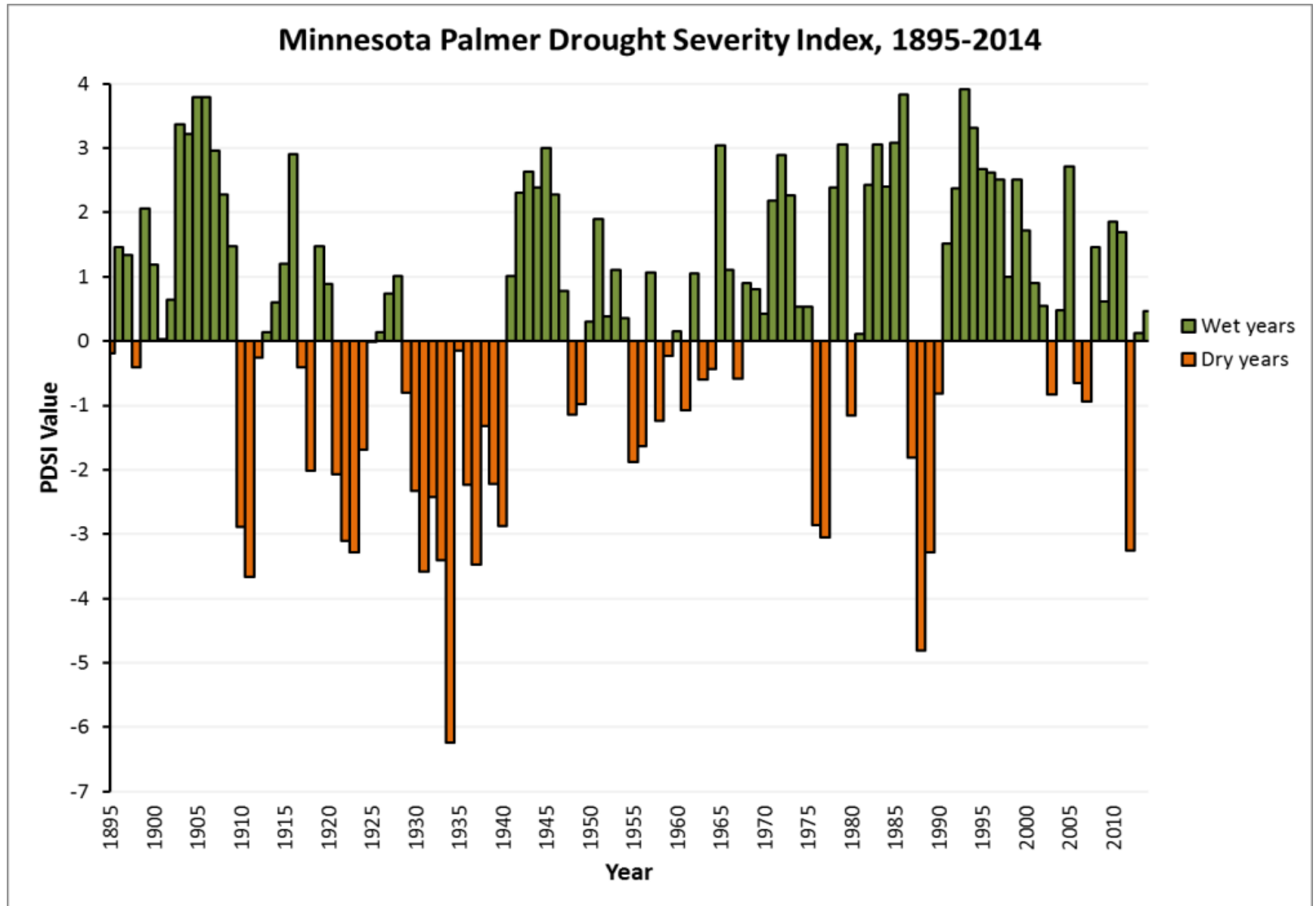
- No appropriations from trout streams
- 6 inches from basins

Report to the Legislature

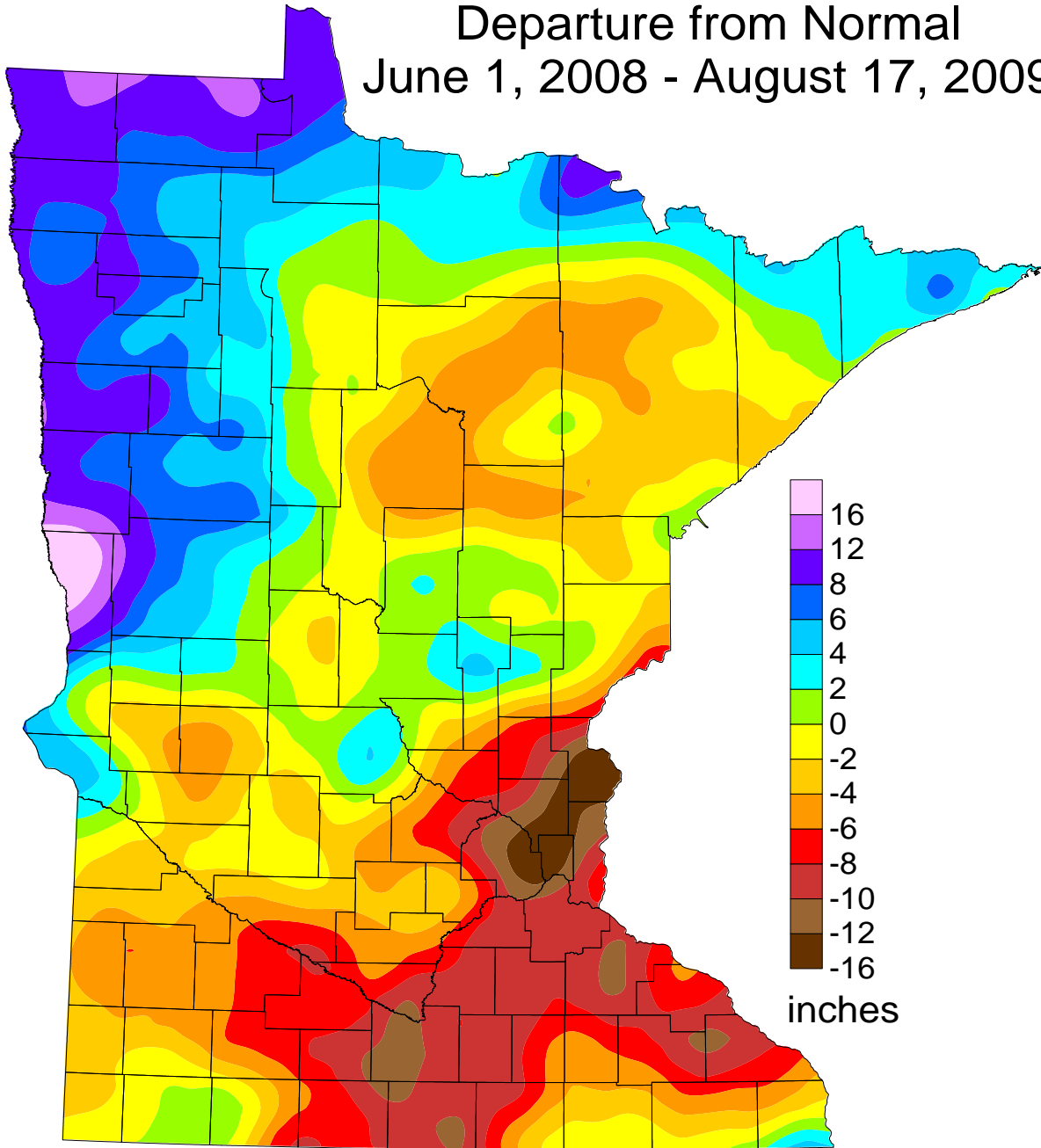
- Required by Legislation
- Consult with Stakeholders
 - 25 Different Organizations
 - Open to public
 - Website and GovDelivery (300+)
- Definition of Negative Impact and Thresholds



Climate variability over time



Total Precipitation
Departure from Normal
June 1, 2008 - August 17, 2009

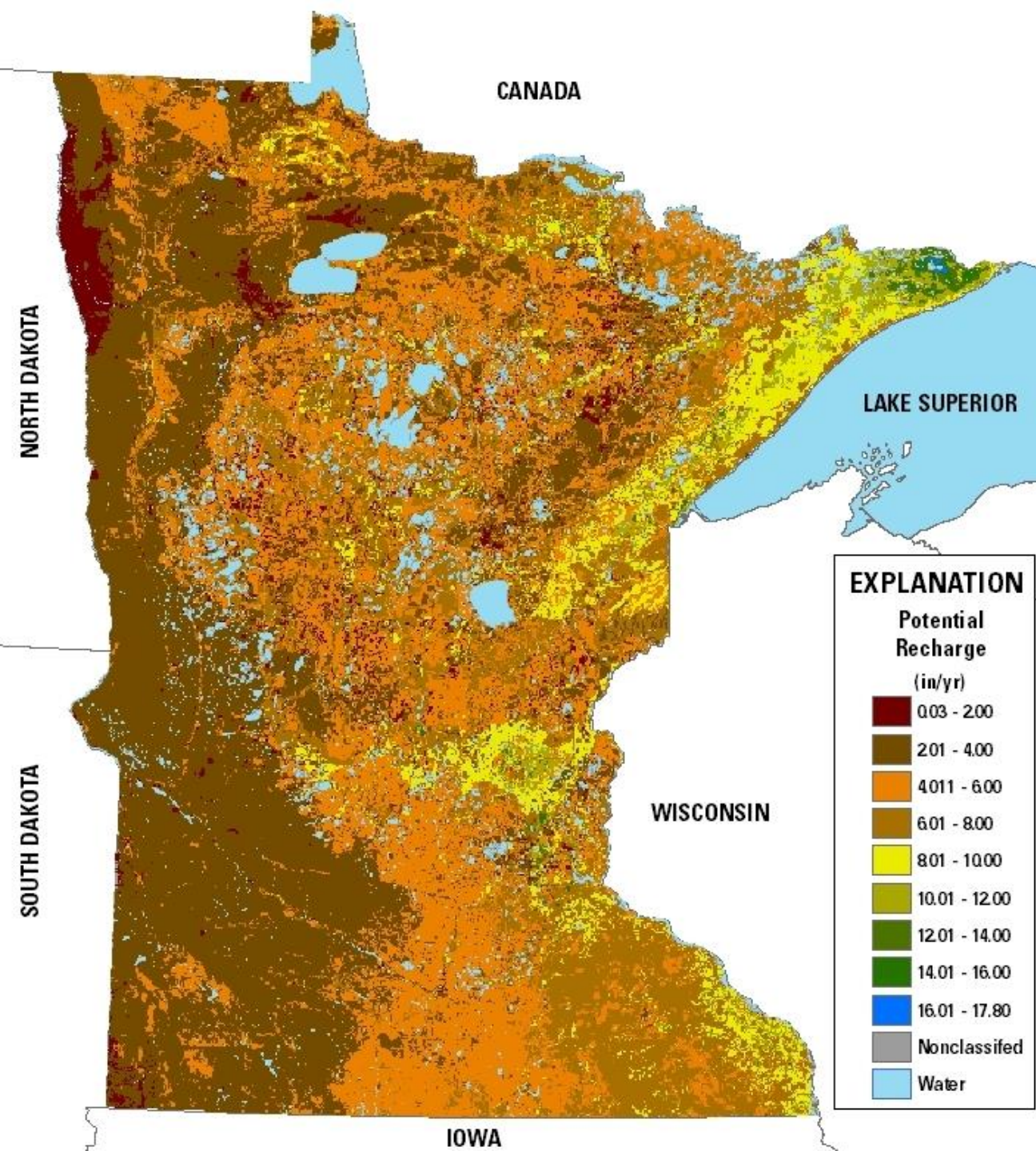


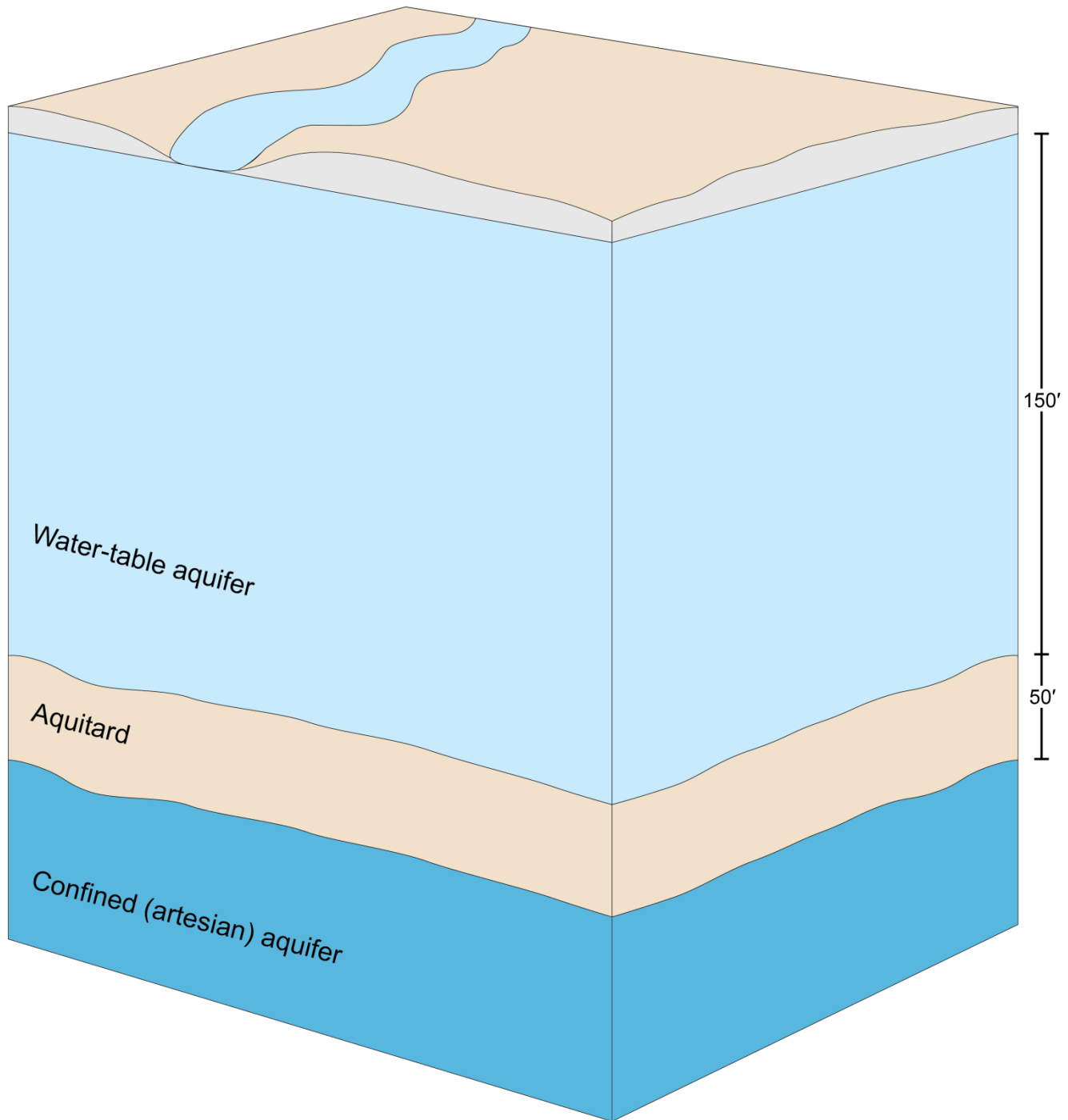
**Climate
variability
across
space and
time**

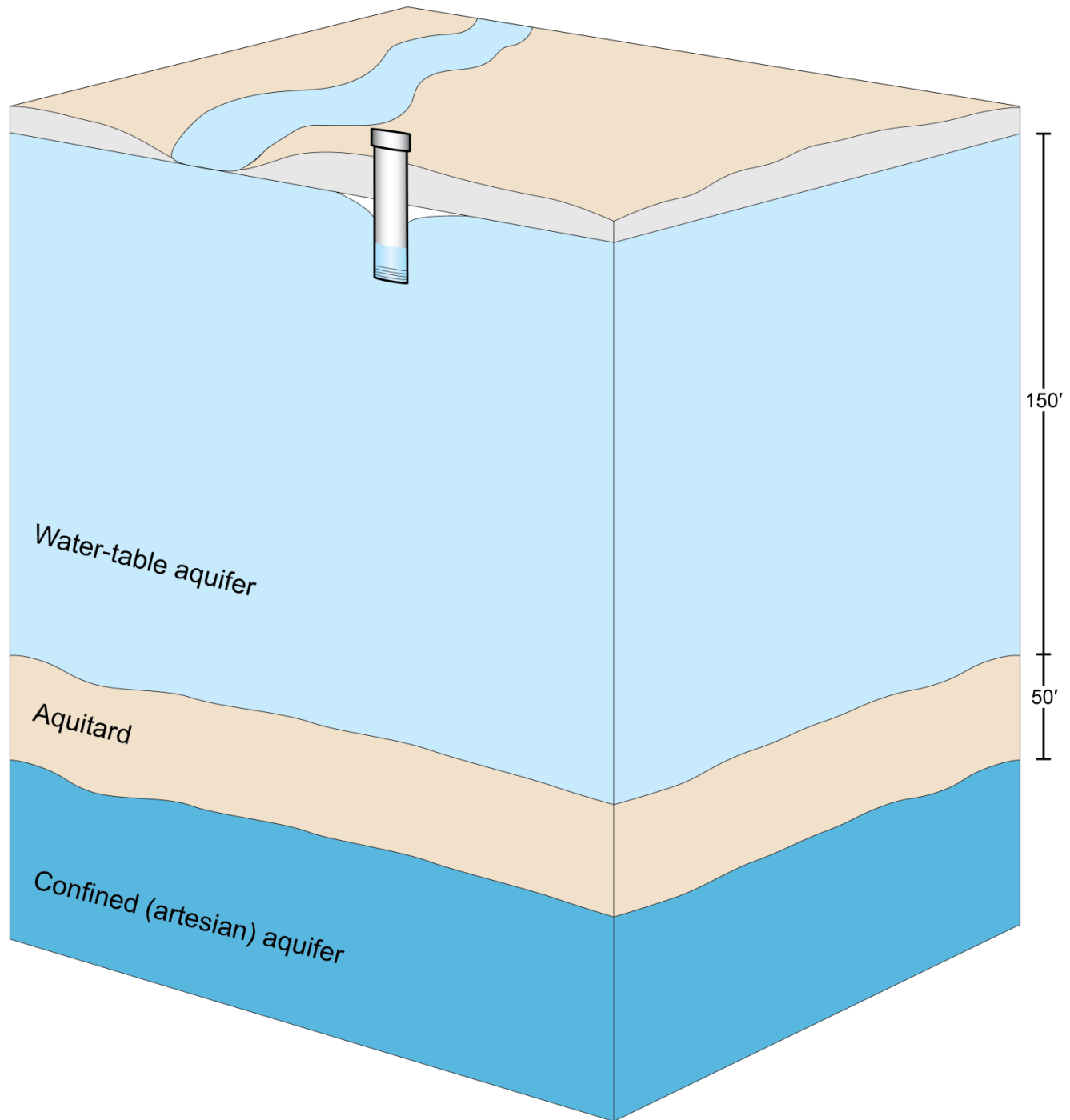
Mean Potential Recharge Estimates, 1996-2010

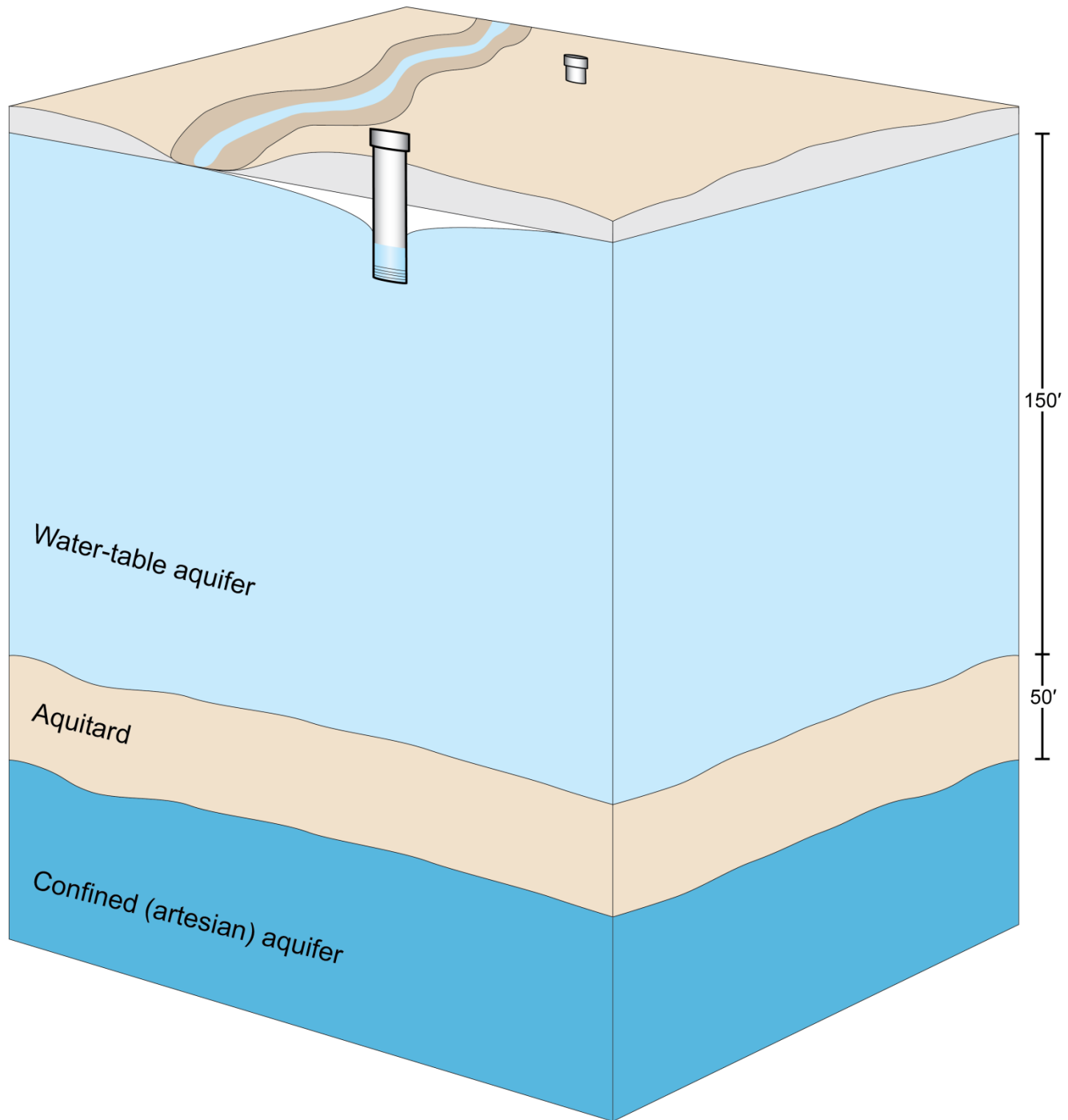
Range:
0.1 – 17.8 in/yr

Statewide
Average:
4.9 in/yr











Definition of Negative Impact

Relative to water withdrawal:

- A change in hydrology sufficient to alter the characteristic, long-term biological community or ecology
 - e.g., vegetation, water quality and temperature, habitat
- A change in hydrology sufficient to alter the long-term recreational use
 - e.g., navigation and access

30051001
Looking D.S. 1
09-15-04
Stage = 1060.33
Q = 936



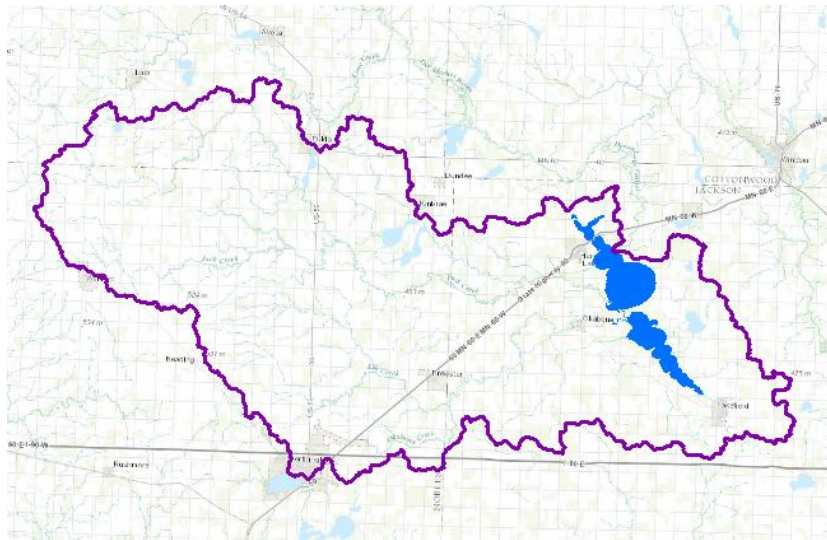
30051001 9/18/2003
Looking d.s.
Stage = 3.86
WSL = 1054.72
Discharge = 0.206 cfs

Lake level patterns in MN

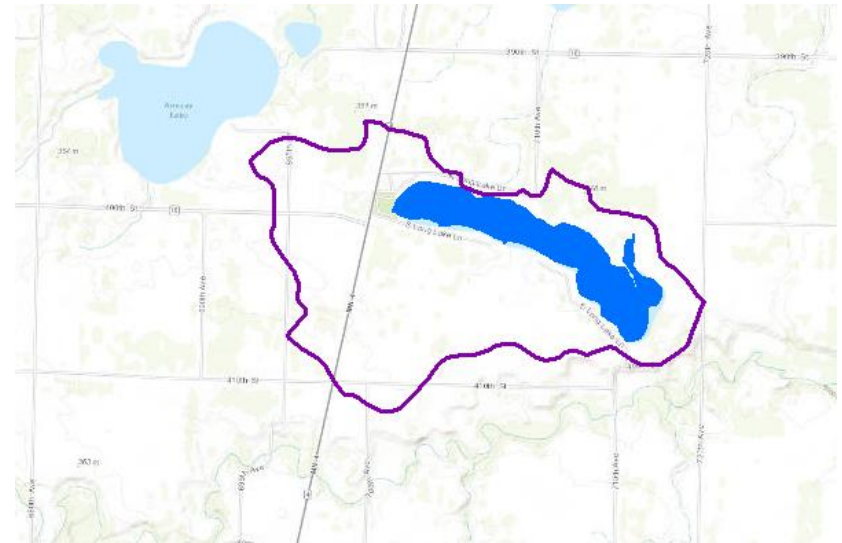
which lake types are most vulnerable?

	Shallow Lakes	Deep Lakes
Frequent Surface Outflow	Moderate	Lowest
Infrequent Surface Outflow	Highest	High

Watershed area to lake area ratio (Two shallow lakes)



Heron Lake (Jackson County)

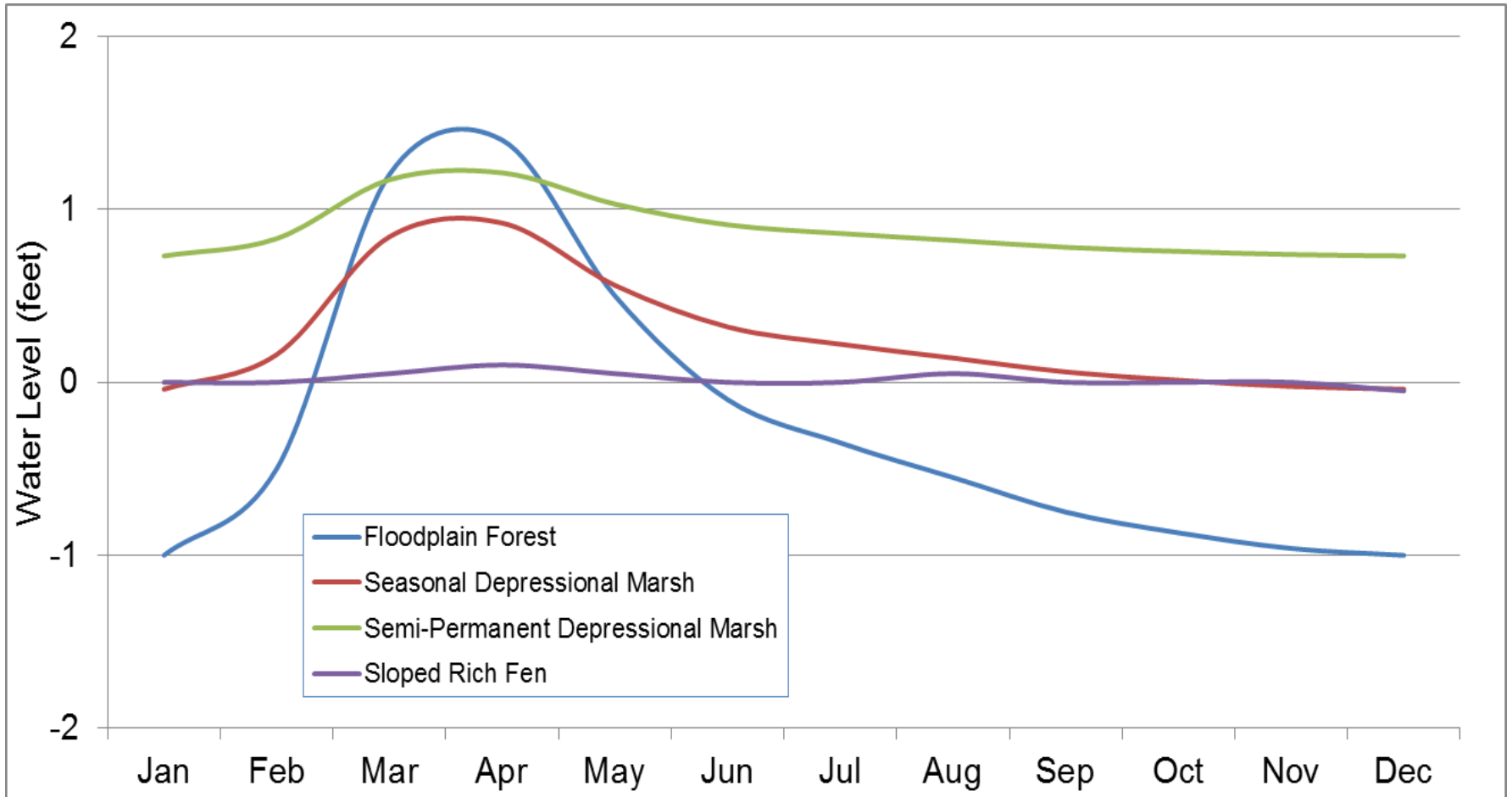


Long Lake (Watonwan County)

Watershed Size (acres):	284,000	1,750
Lake Size (acres):	8,000	271
W'shed : lake area ratio:	36 : 1	5 : 1
Maximum lake depth (ft):	5	13
% Littoral:	100	100



“Typical” Wetland Hydrographs



**Generalized regional cross section:
Peat mound formed
over aquifer window on moraine flank
(localized groundwater discharge)**

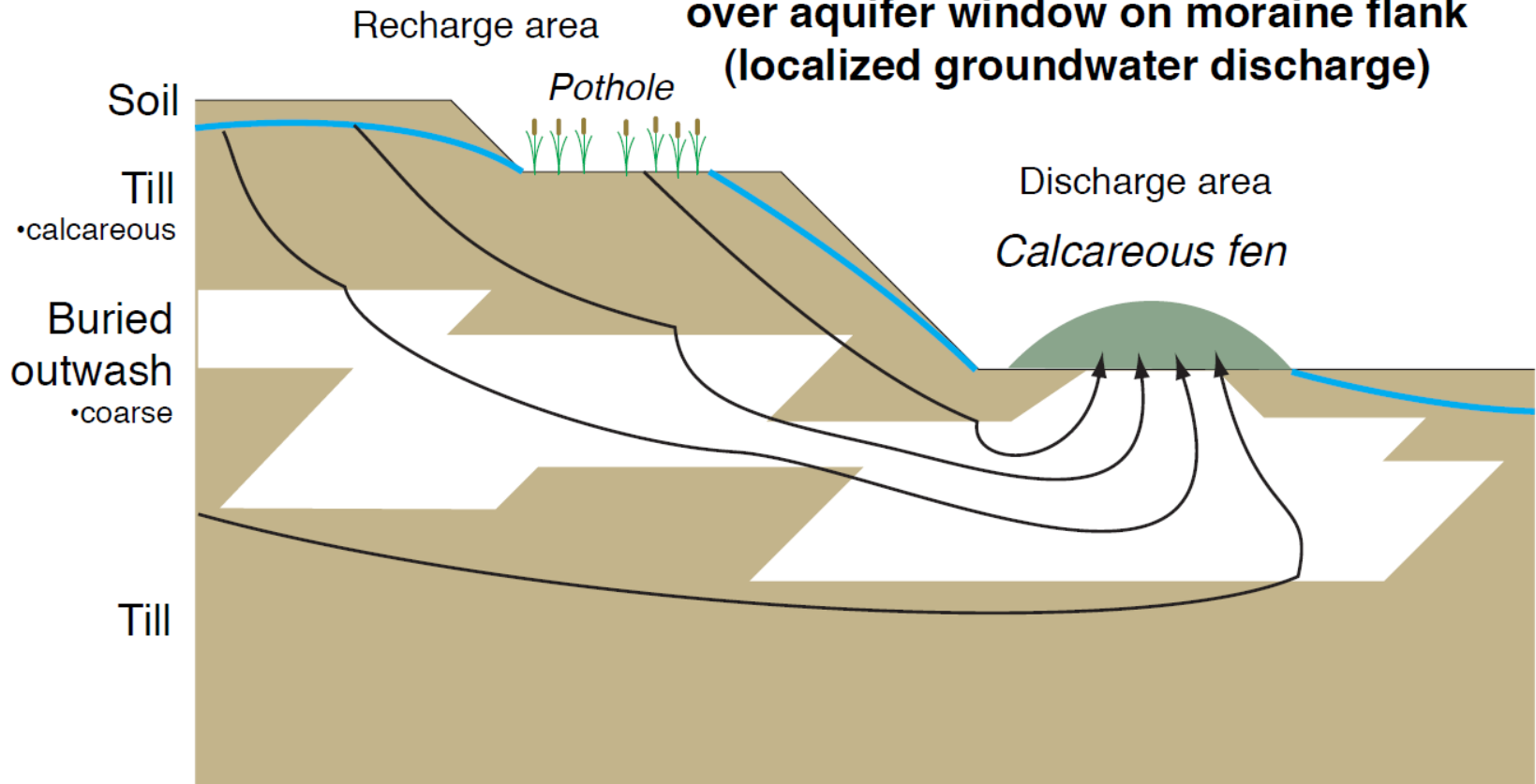
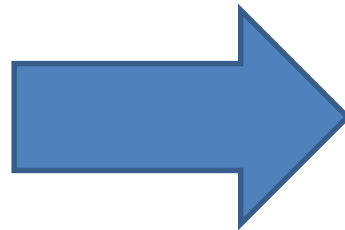


Illustration by James Almendinger

Challenge

Translate
sustainability
thresholds

- Streams
- Lakes
- Wetlands



Volume allowed for
each permit

- Individually
- Cumulatively



Methodology

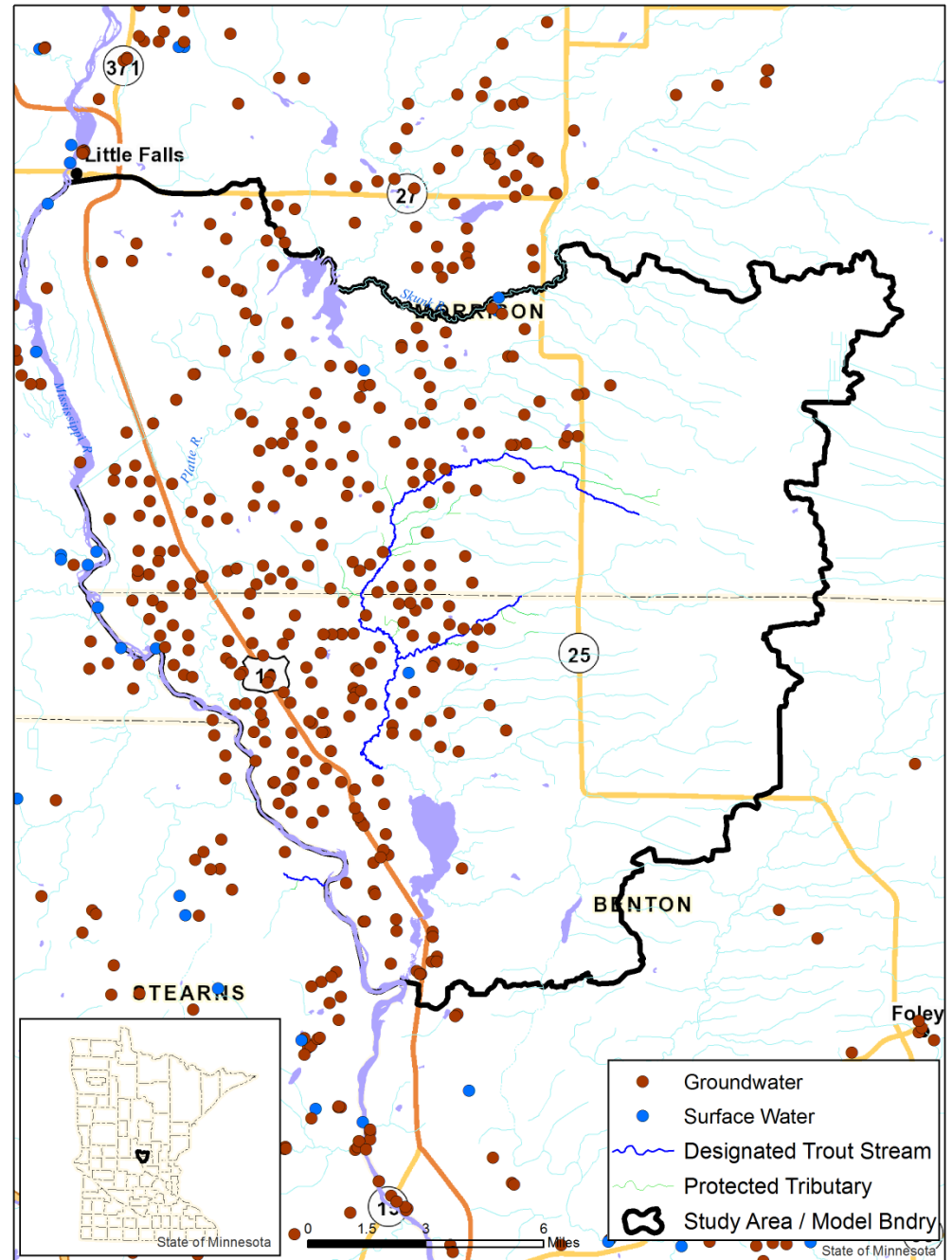
- Quantifiable
- Reasonably quick
- Technically and scientifically sound
- Accounts for cumulative GW use
- Predictive
- Adaptive

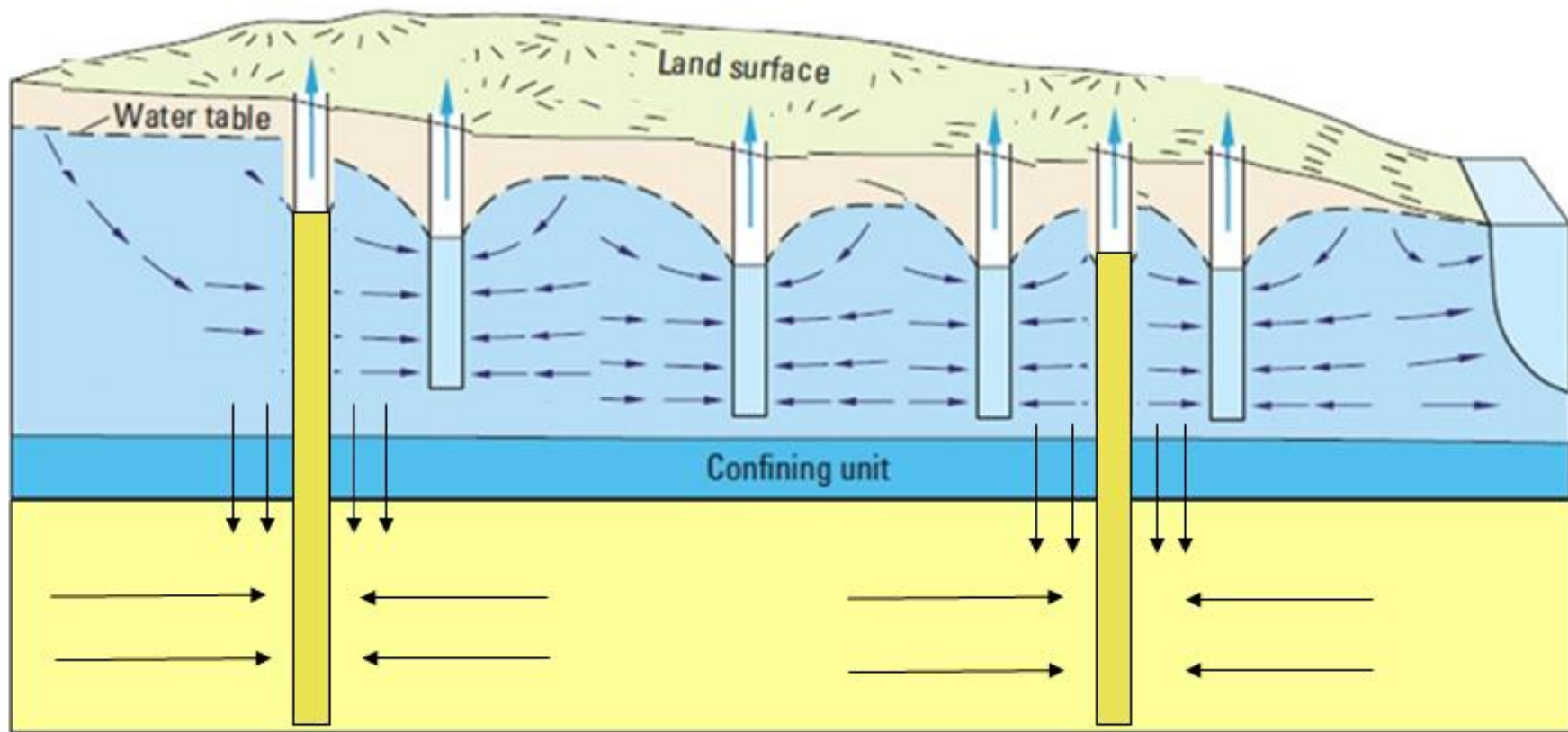


Groundwater Models

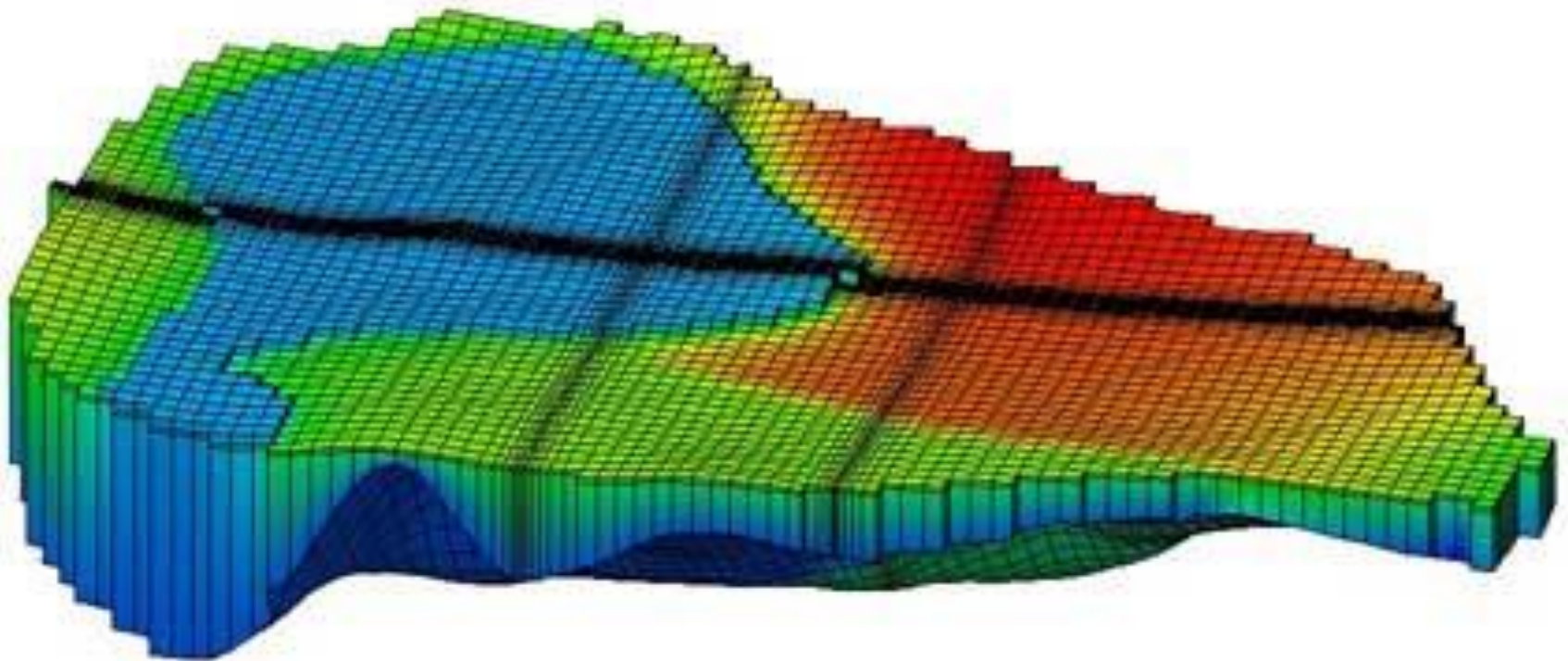
Little Rock Creek

- Proposed model
- Permitted Groundwater wells
- Partnering with USGS





Groundwater Modeling: Modflow Grid





What's Next

- Continue technical work
- Two more meetings with Stakeholder Group
 - Nov. 12 – Initial draft based on possible approaches
 - Dec. 10 – Review and Discuss Final Draft
- Report to the Legislature
 - Dec. 15

Questions...



http://www.dnr.state.mn.us/gwmp/gw_thresholds/index.html