Clean Water: Groundwater Management Areas

Dr. Jeanette Leete

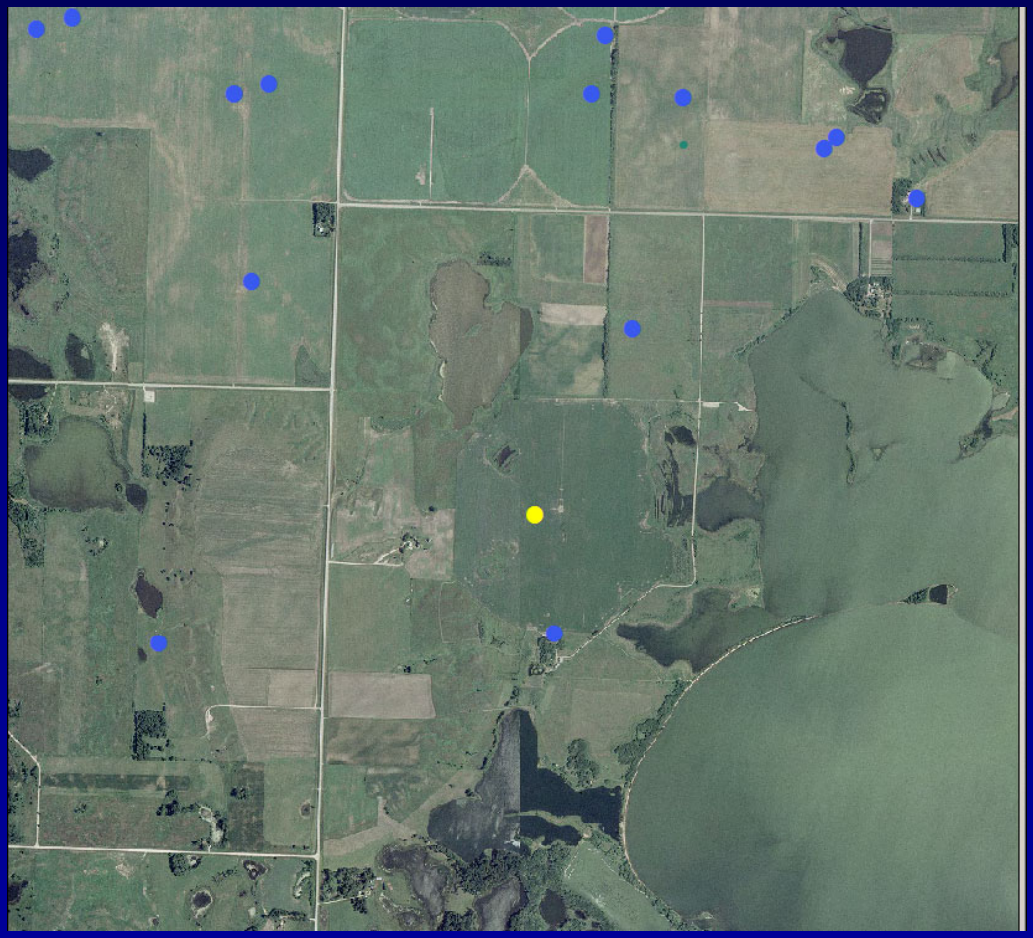
Division of Ecological and Water Resources

Minnesota DNR

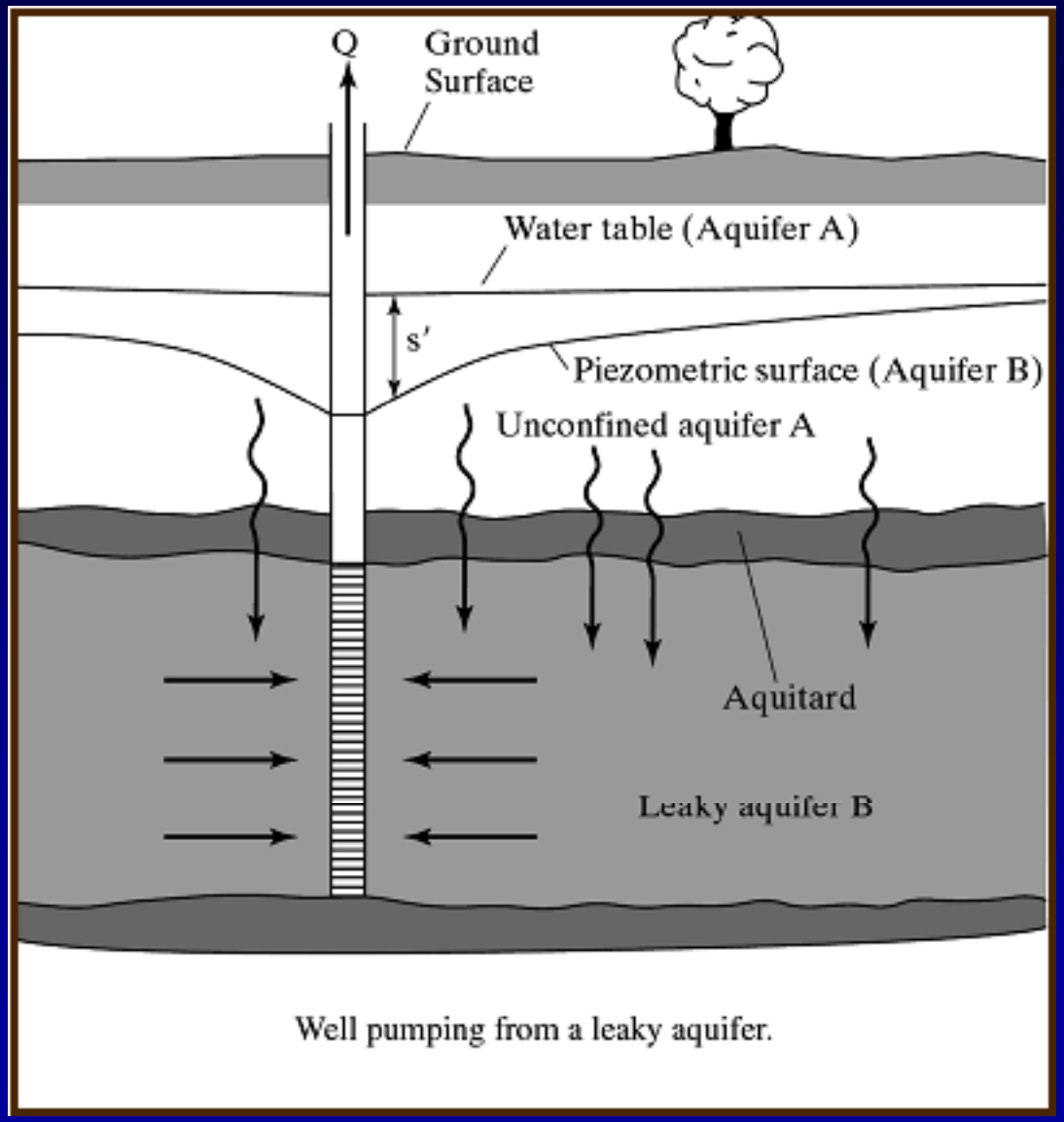
Minnesota DEPARTMENT OF NATURAL RESOURCES

CLEAN WATER LAND & LEGACY AMENDMENT

Traditional approach – one permit at a time

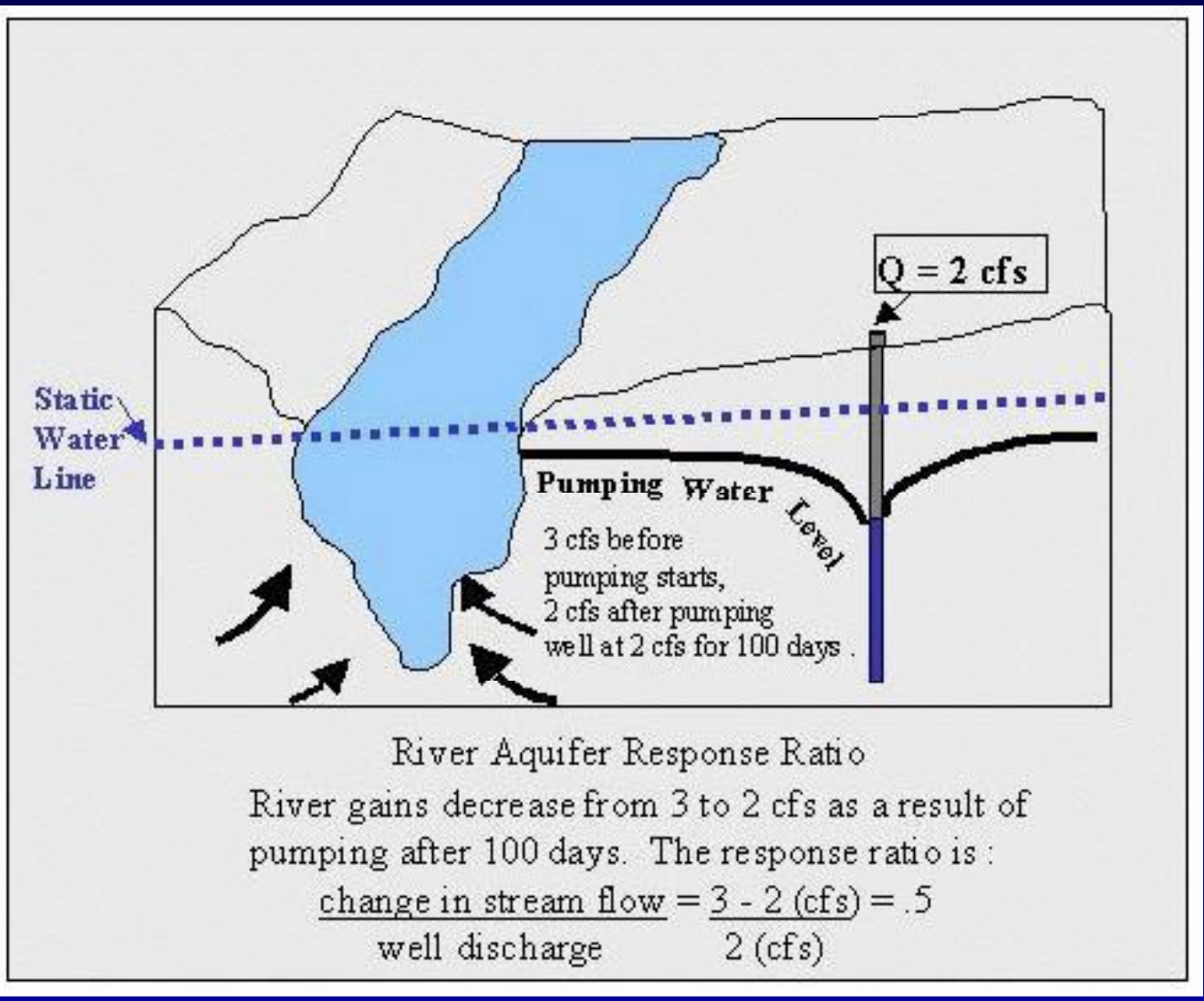


Protection for Aquifers



Well pumping from a leaky aquifer.

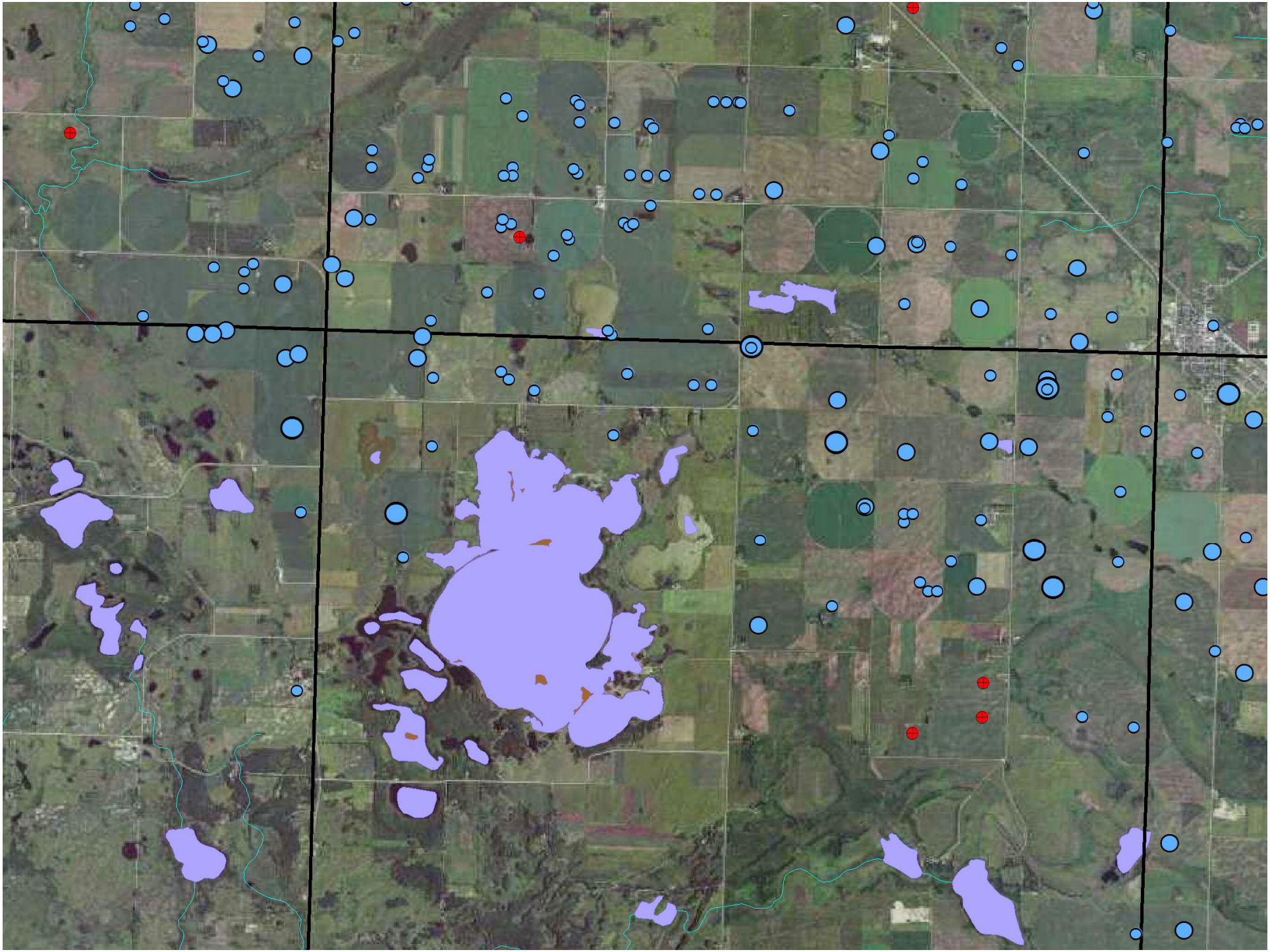
Protection for Other Resources



River Aquifer Response Ratio

River gains decrease from 3 to 2 cfs as a result of pumping after 100 days. The response ratio is :

$$\frac{\text{change in stream flow}}{\text{well discharge}} = \frac{3 - 2\ (\text{cfs})}{2\ (\text{cfs})} = .5$$



Watershed approach is necessary

Virtually everything we do to the land, water, and air is reflected in the health of surface waters and groundwater.

Human health is determined by the combination of our bodily functions, environment, lifestyle, and healthcare. Similarly watershed health is determined by its biological & hydrological systems, external influences, extent of human impact and demands. In difficult cases, patients are cared for by a team of specialists, just as we should collaborate our efforts to address watershed health.

Strategy

- Encourage and influence local engagement
- Deliver up-to-date protection tools and BMPs
- Adopt long-term focus for monitoring and prevention
- Enhance data collection and sharing while simplifying access for all
- Answer key questions and meet key information needs
- Approach water management in a watershed context
- Provide adequate financial and technical resources

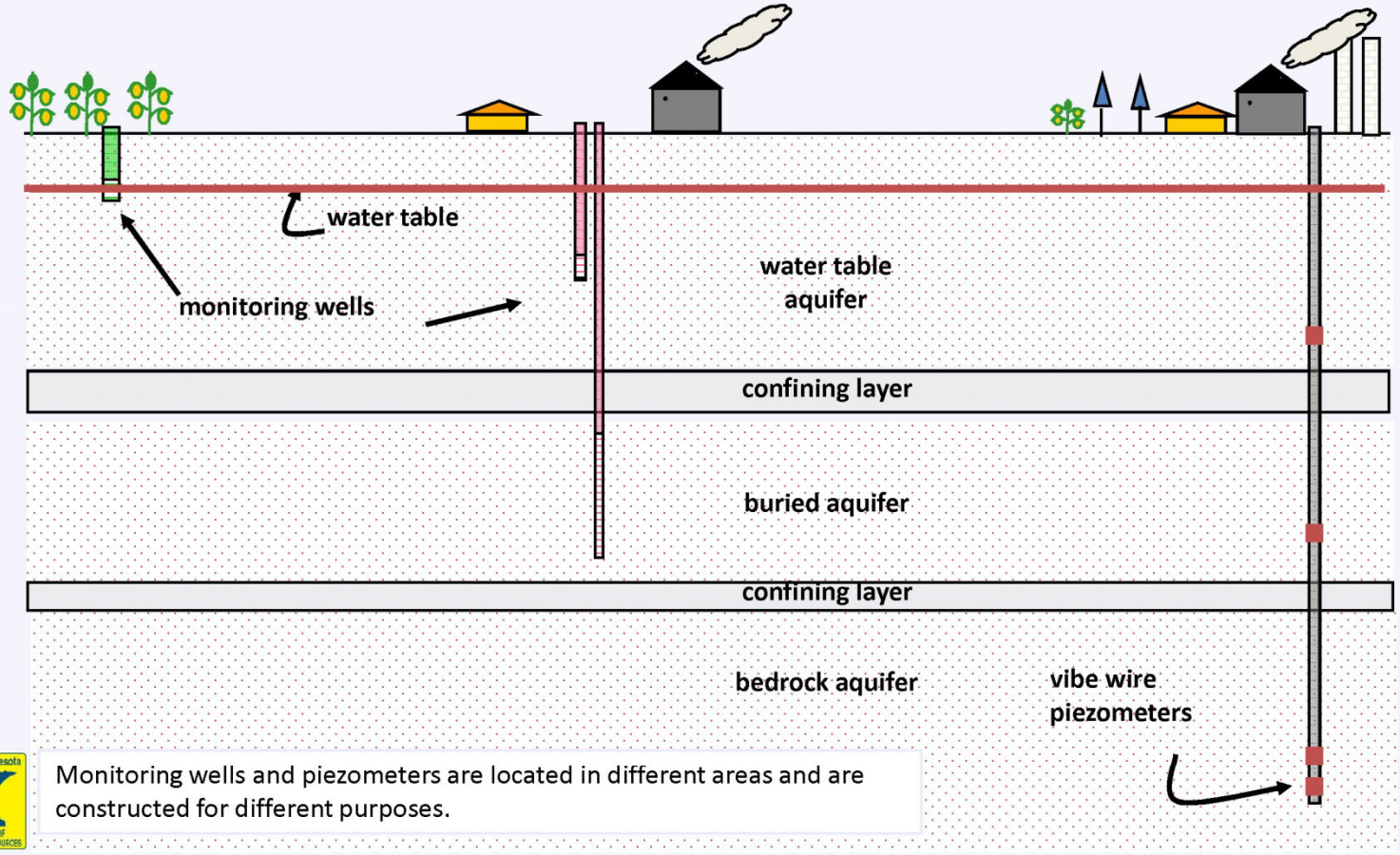
Groundwater Monitoring Roles

MDA:
Pesticides
Fertilizer

MPCA:
Chemicals
Industrial pollutants

MDNR:
Water availability for
domestic supply, irrigation,
public supply, industry

MDH:
Drinking water
protection



Monitoring wells and piezometers are located in different areas and are constructed for different purposes.

Tool: GWMAs

- Under DNR's authority to guide the use of the waters of the state, the primary tool available to us for watershed-based management is the Groundwater Management Area concept.
- Groundwater/surface water interaction is acknowledged.
- Appropriation limits to protect groundwater resources must consider the sustainability of the resource and whether the use protects ecosystems and the ability of future generations to meet their own needs.

GWMA Guidance

- The area must be large enough that the interrelationship of geohydrologic and climatic factors can be adequately defined and managed.
- The hydrologic and physical characteristics of the water and related land resources must be defined.
- Priority should be given to areas where use is likely to, increase considerably within the next five to ten years; where severe water availability problems exist or are soon likely to exist; and/or where there is local interest in establishing water appropriation management plans.

How to Prioritize Efforts?

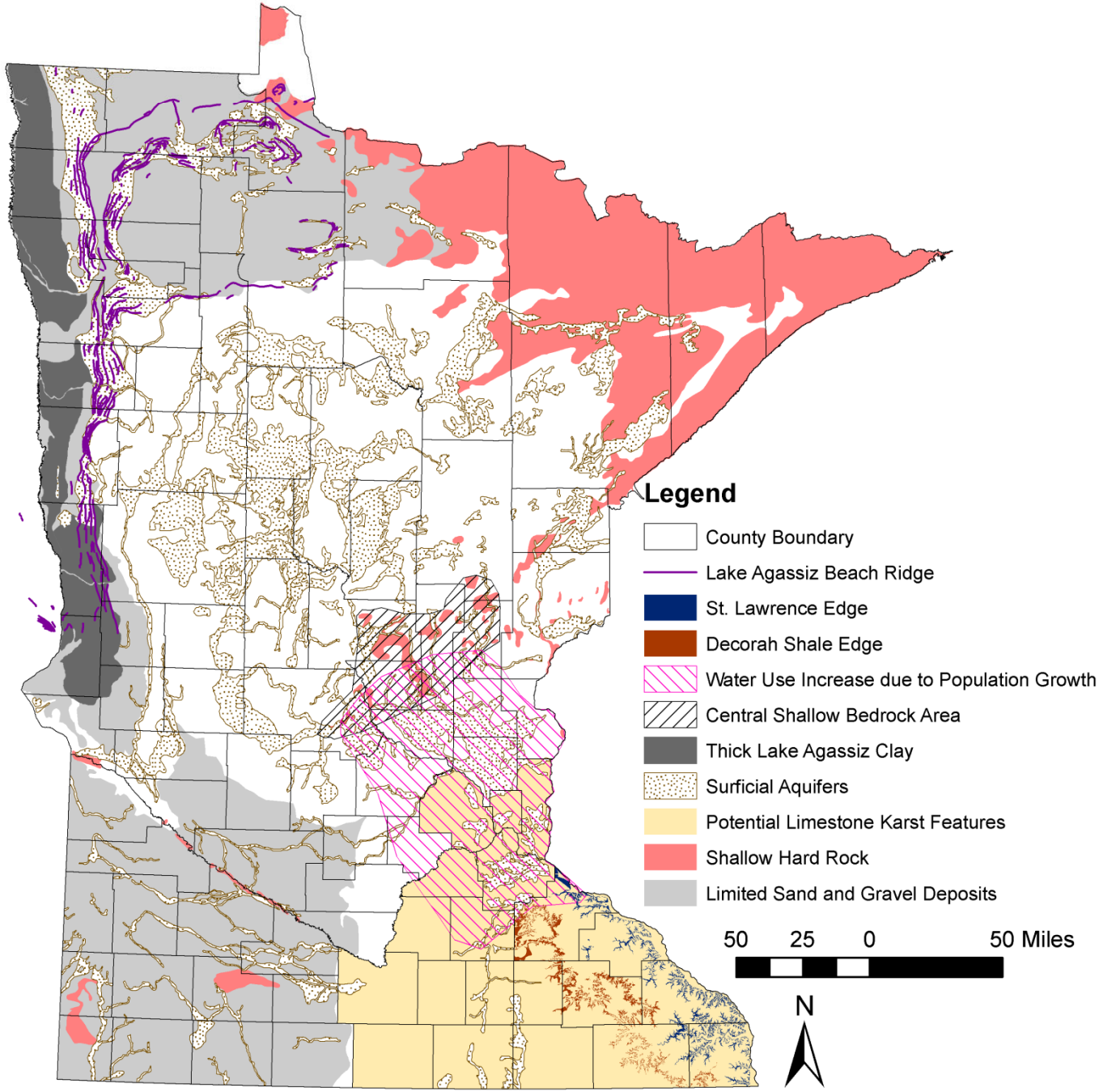
Interagency Working Group

- License to imagine ‘doing it right’ and defining what that means

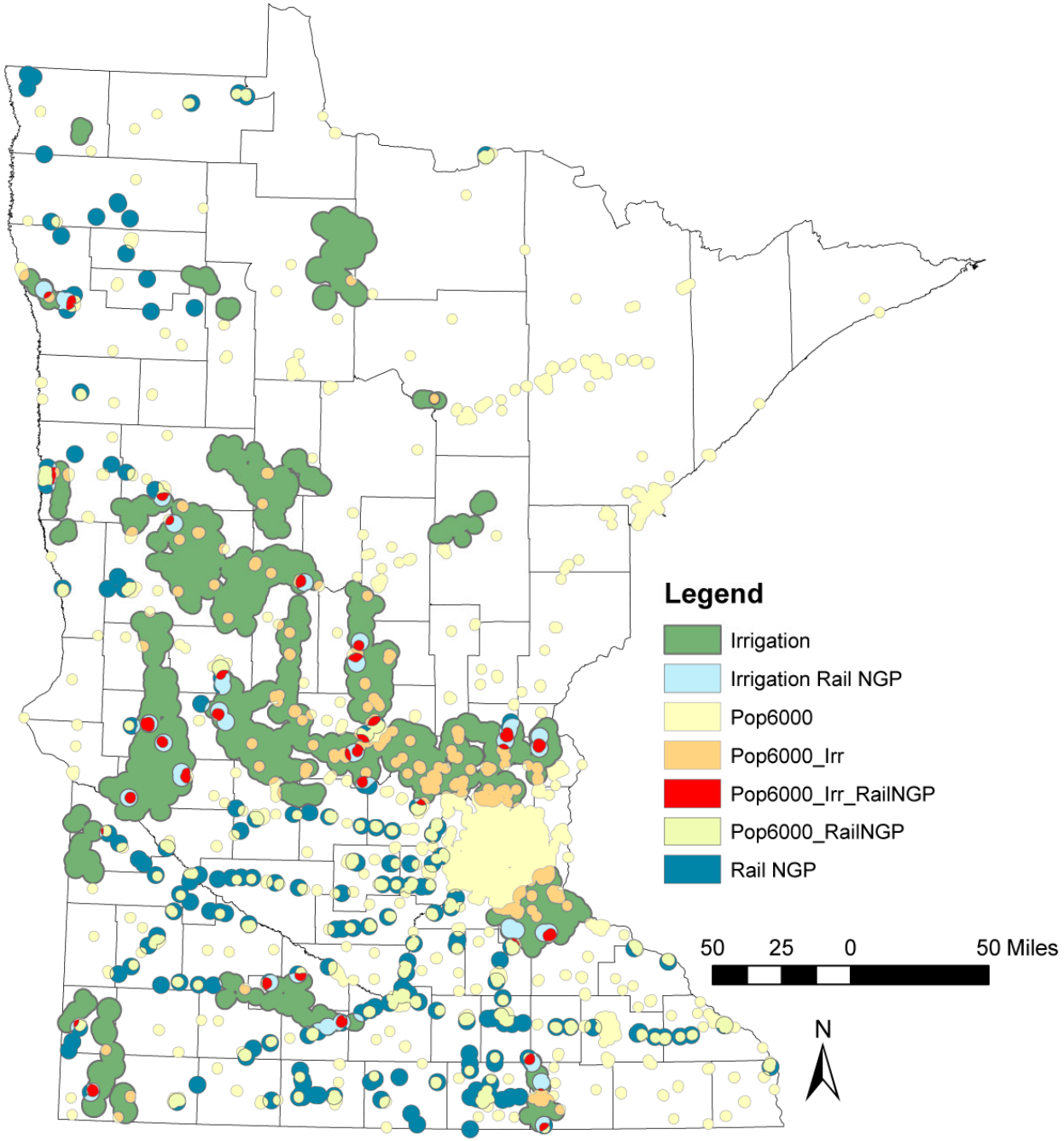
Proposed Criteria

- Community interest
- Water use conflicts
- Increasing water use
- Population trends
- Known water supply issues due to hydrogeologic setting
- Sensitive resources
- Geologic vulnerability

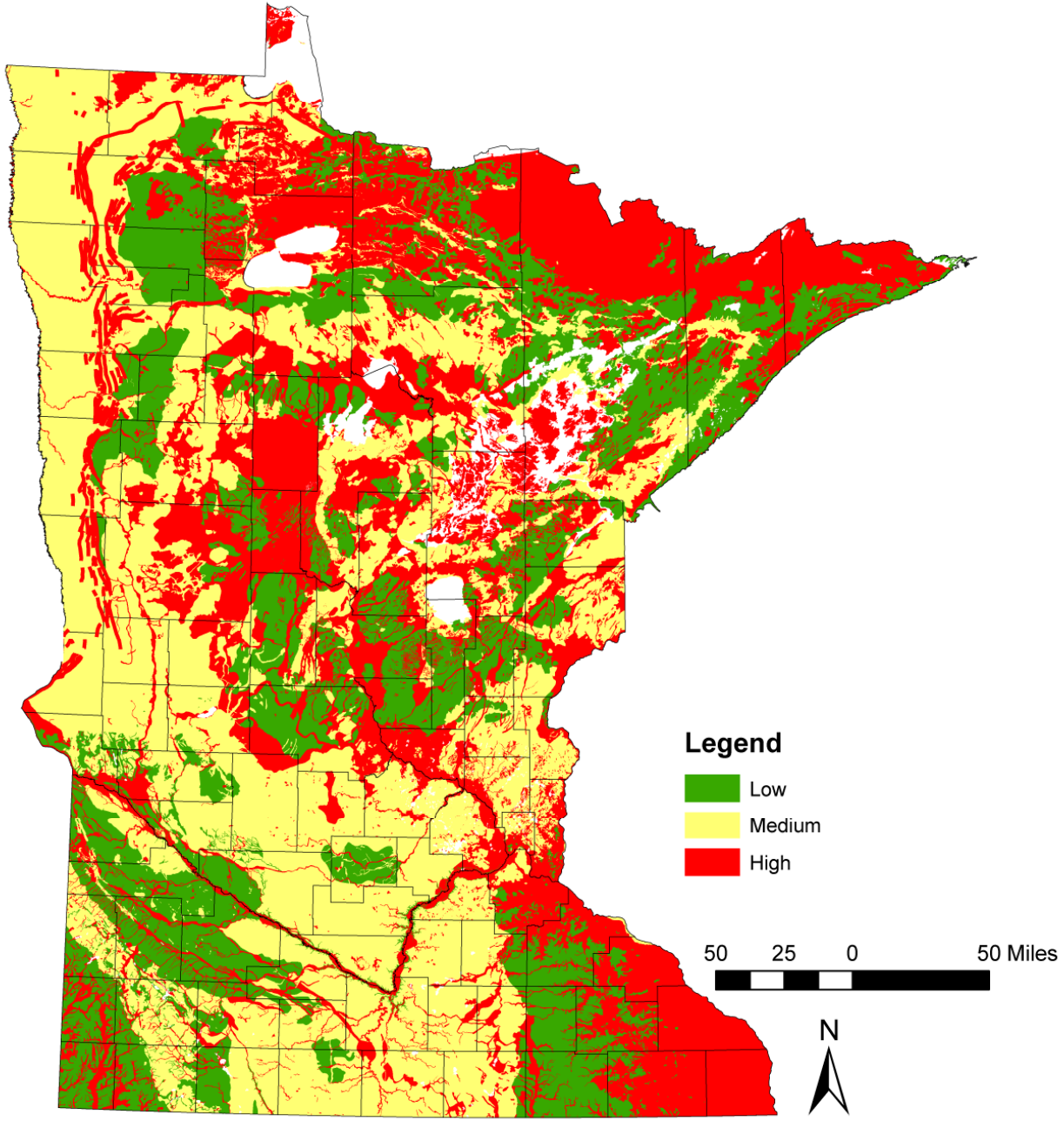
Groundwater Supply Areas of Concern



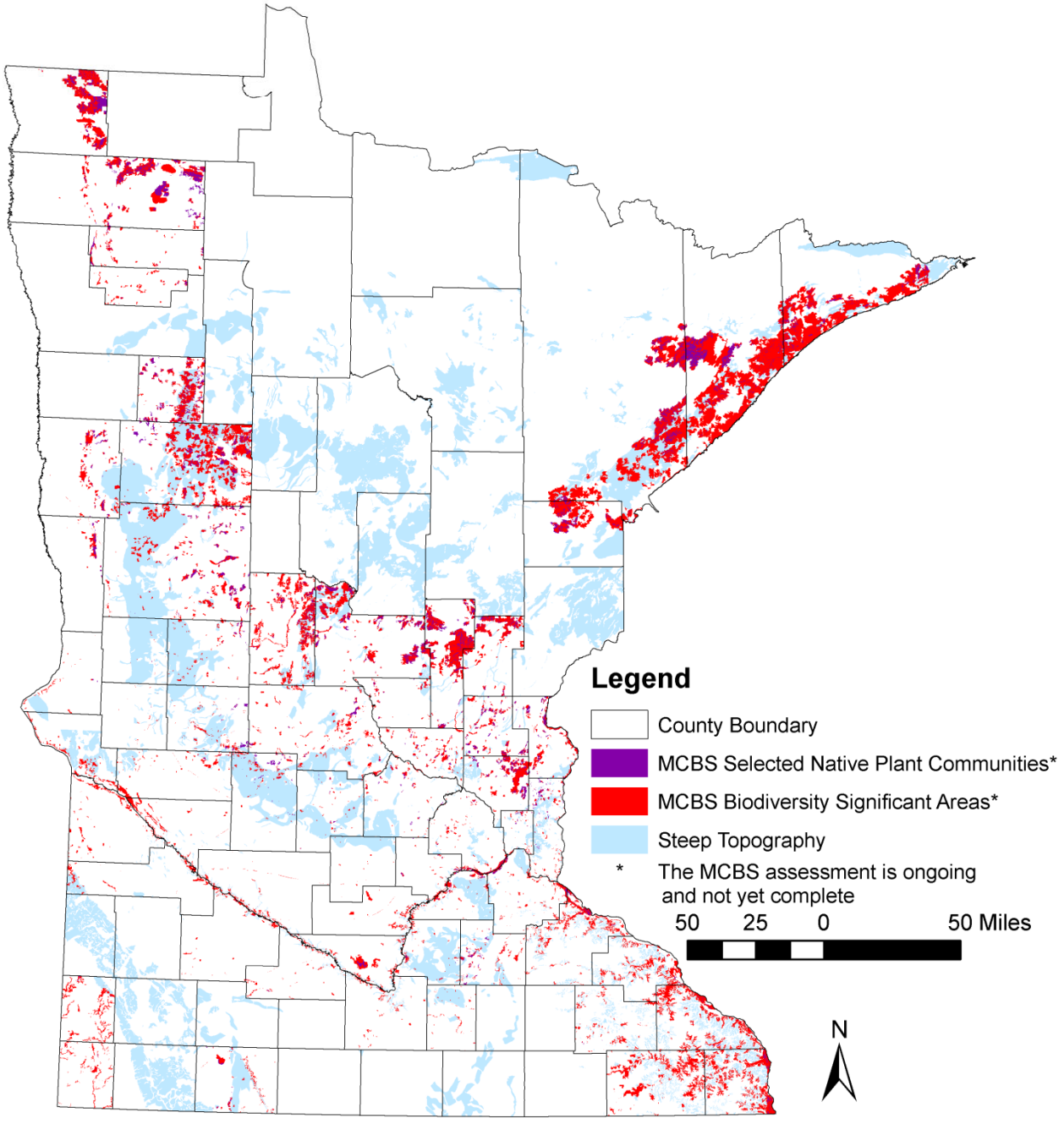
Potential Industrial Growth Areas



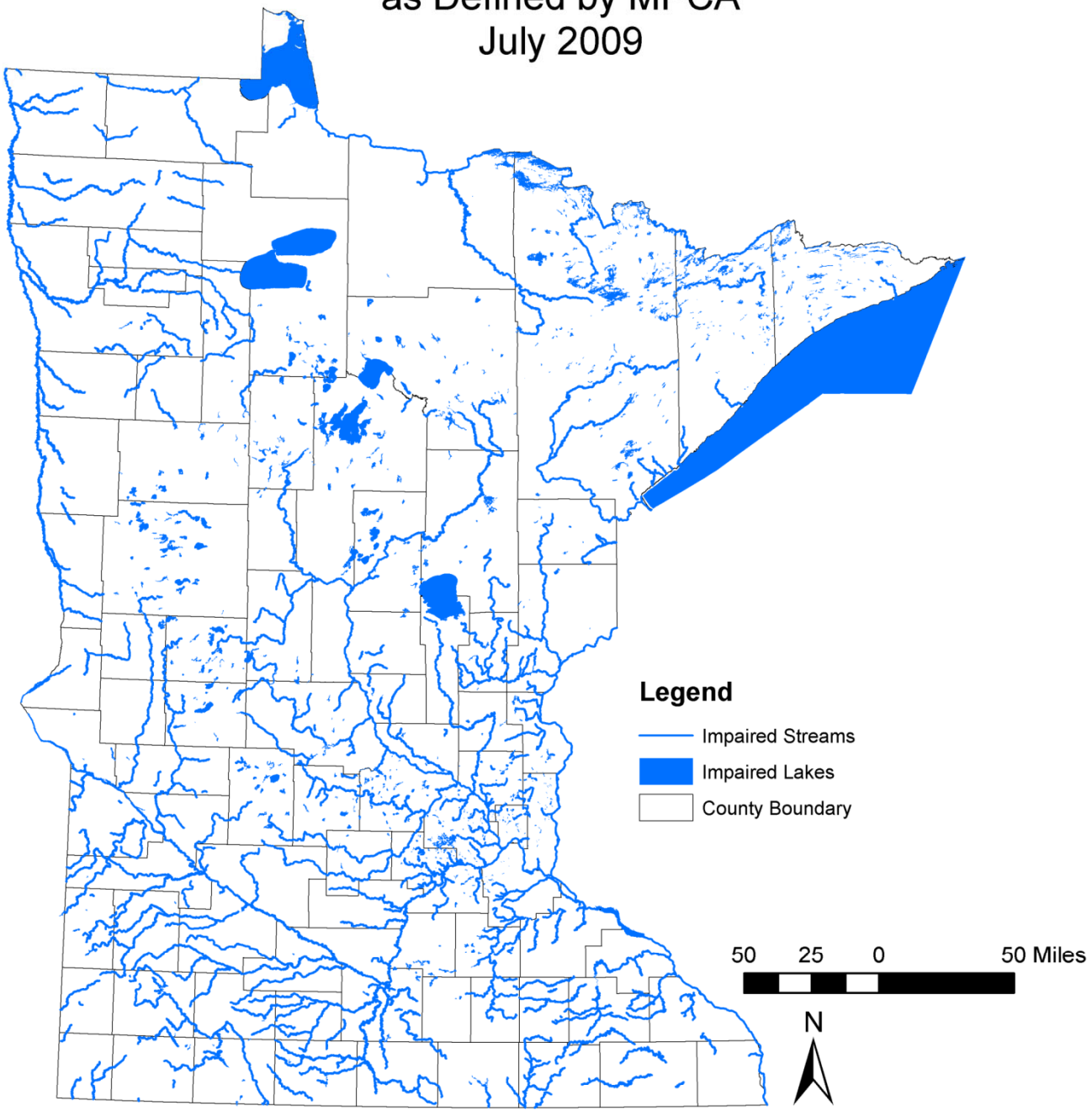
Surficial/Shallow Aquifer Vulnerability



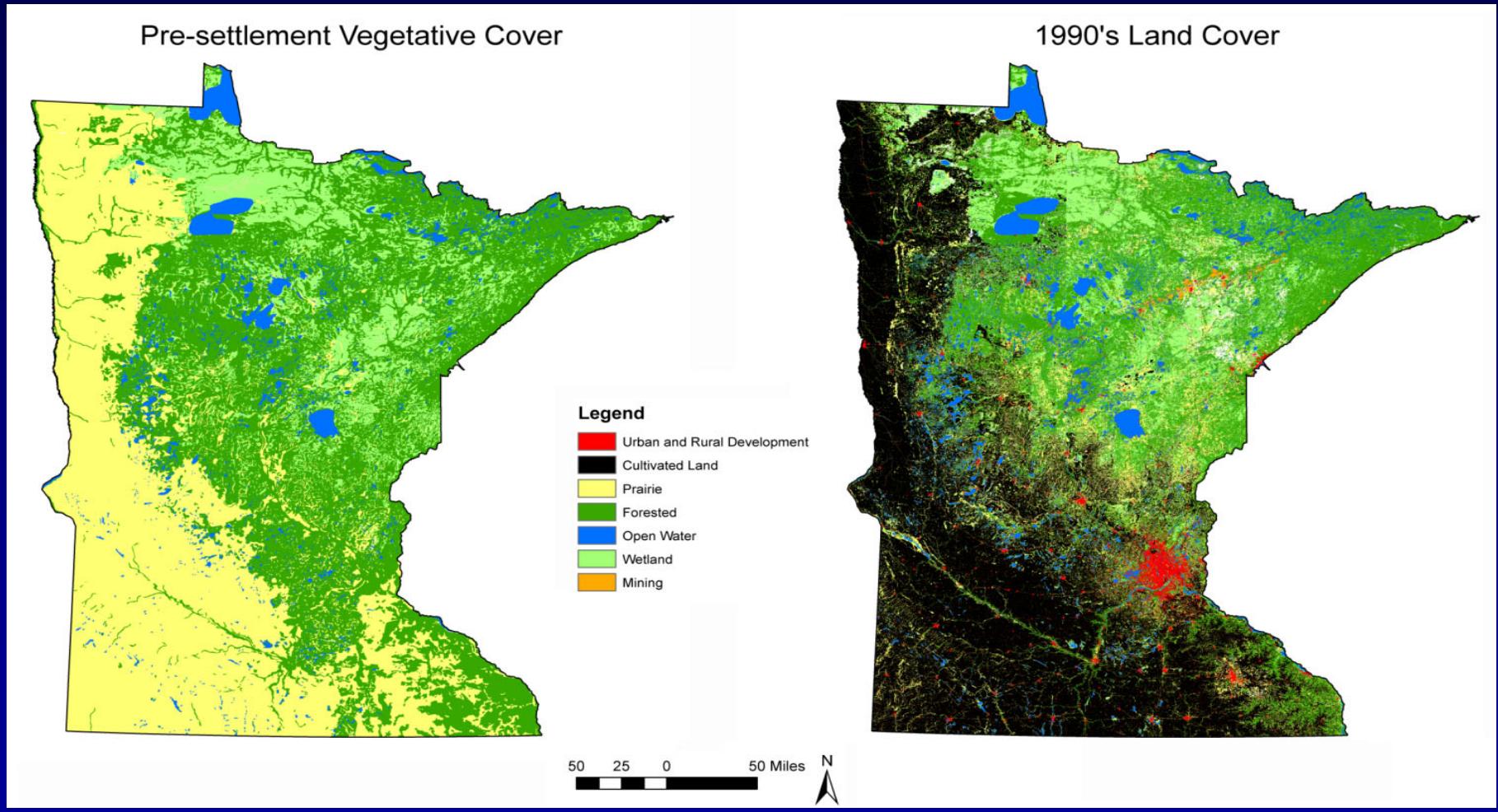
Ecosystem Protection Areas



Surface Water Areas of Concern as Defined by MPCA July 2009



Scope of the Challenge



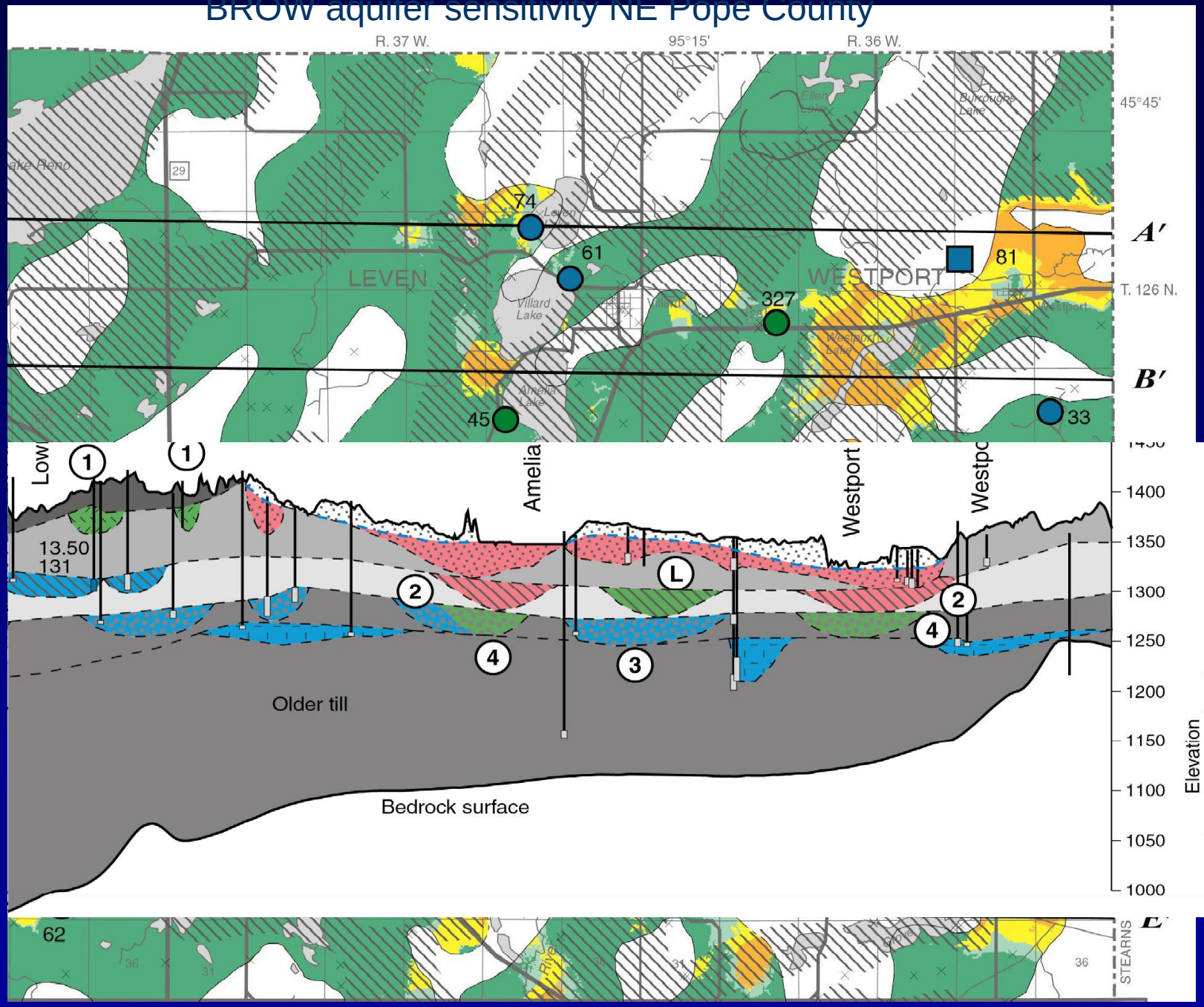
Case Study: Groundwater Management Area

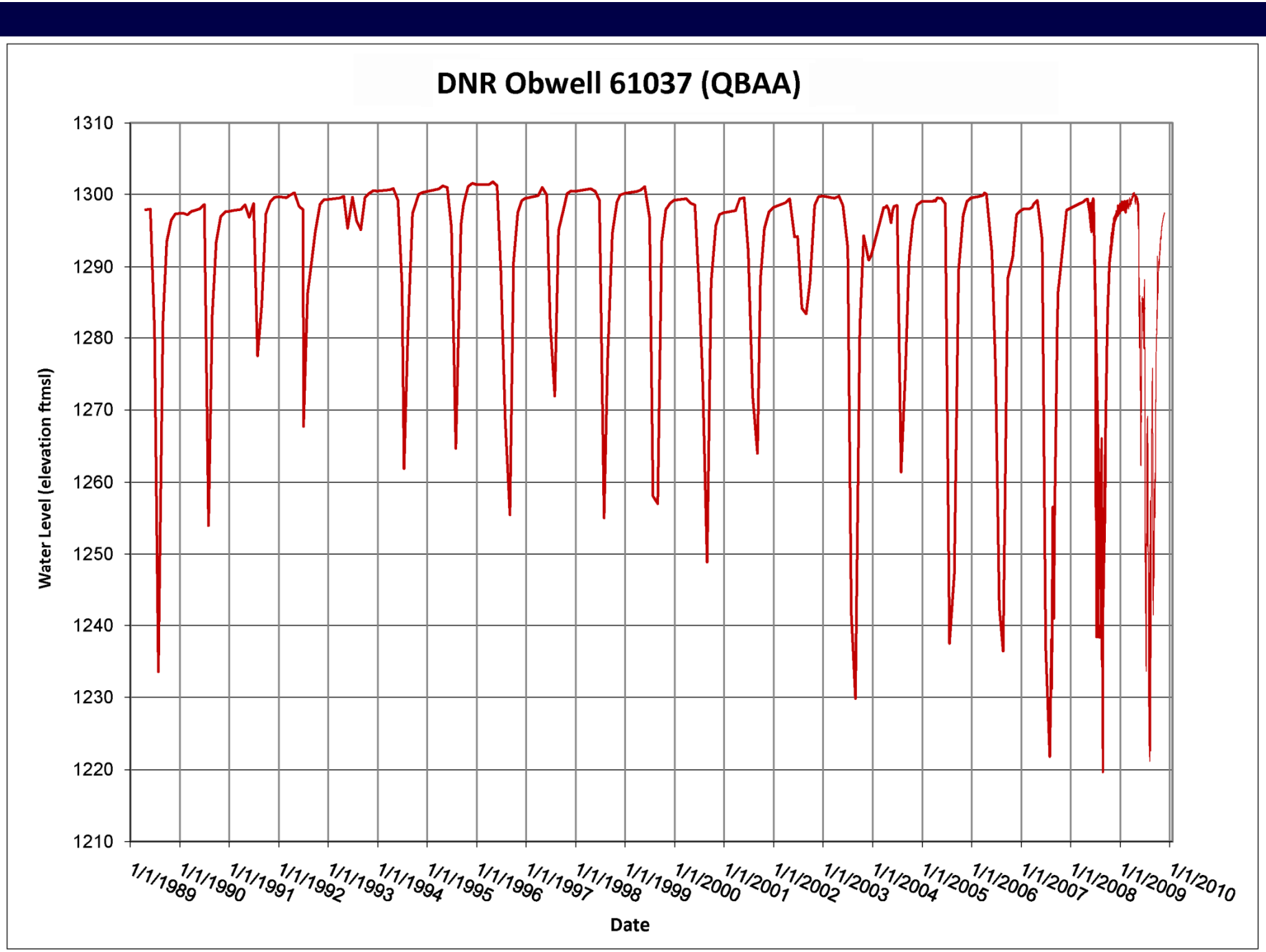
Bonanza Valley Irrigation Area

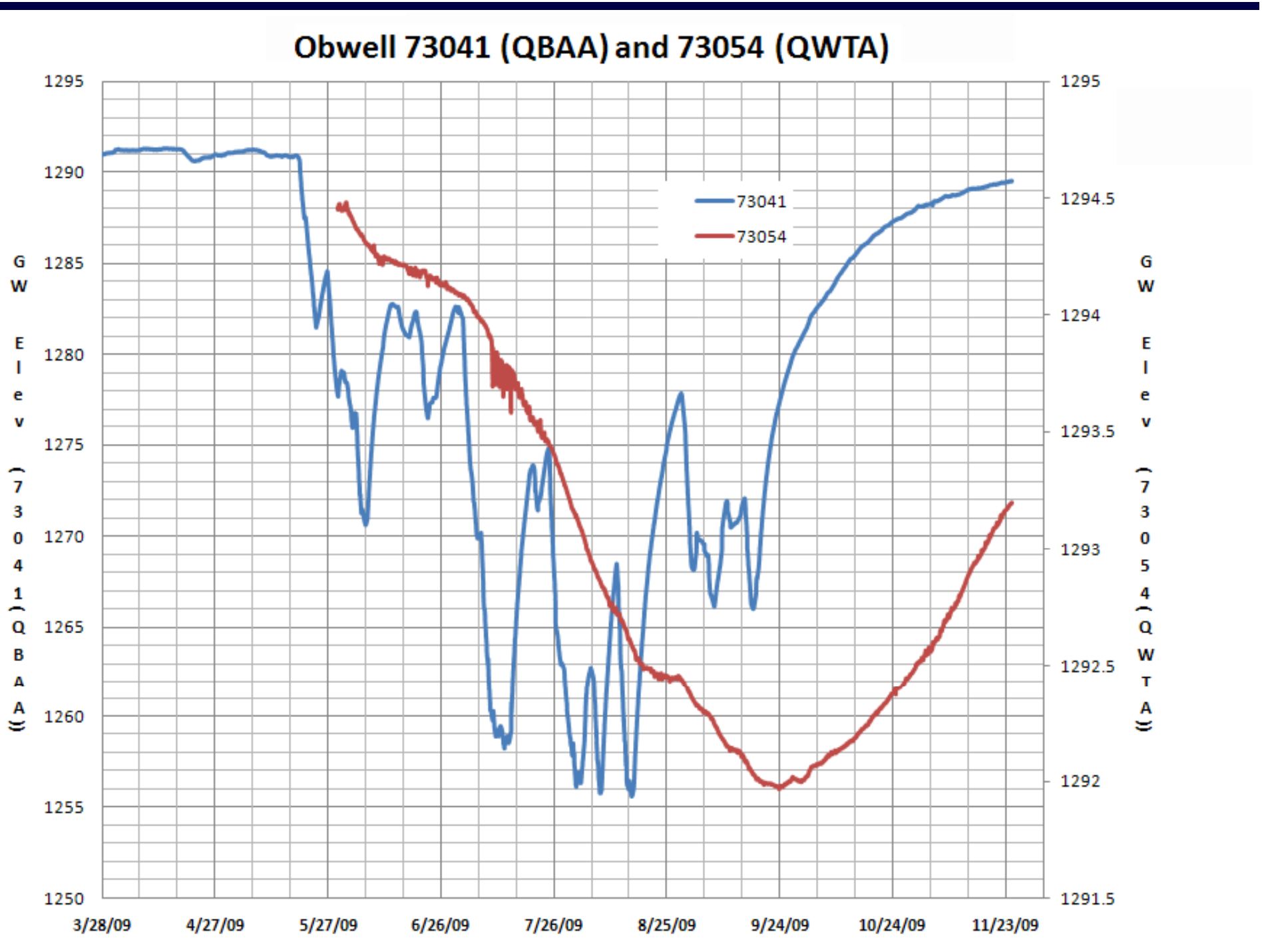

Brooten
The Heart of
BONANZA
VALLEY
Welcomes You
to irrigation country


2007-0326
1977-1859
1990-1199
1990-1200
1977-1294
1980-3092
1971-1179
1995-3129
1976-1301
1976-1238
1976-1238
1977-3455
1996-3182
1981-3176
1973-3053
1968-1008
1977-1421
1978-1073
1984-3213
1984-3213
1976-3345
1970-0664
1977-3840
1973-3054
1978-3316
1976-3278
1977-1613
1976-3280
1998-3163
1976-3279
1977-1616
1975-3286
2001-3154

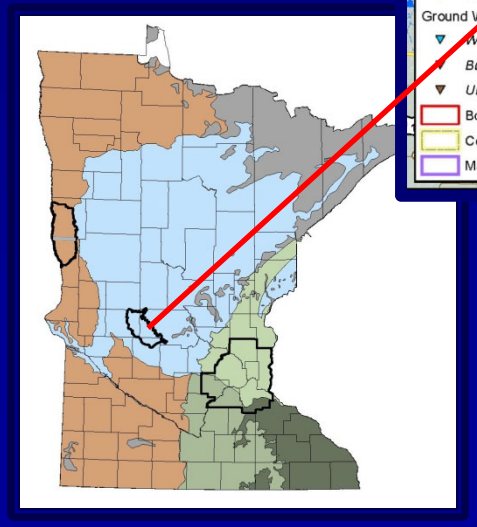
BROW aquifer sensitivity NE Pope County

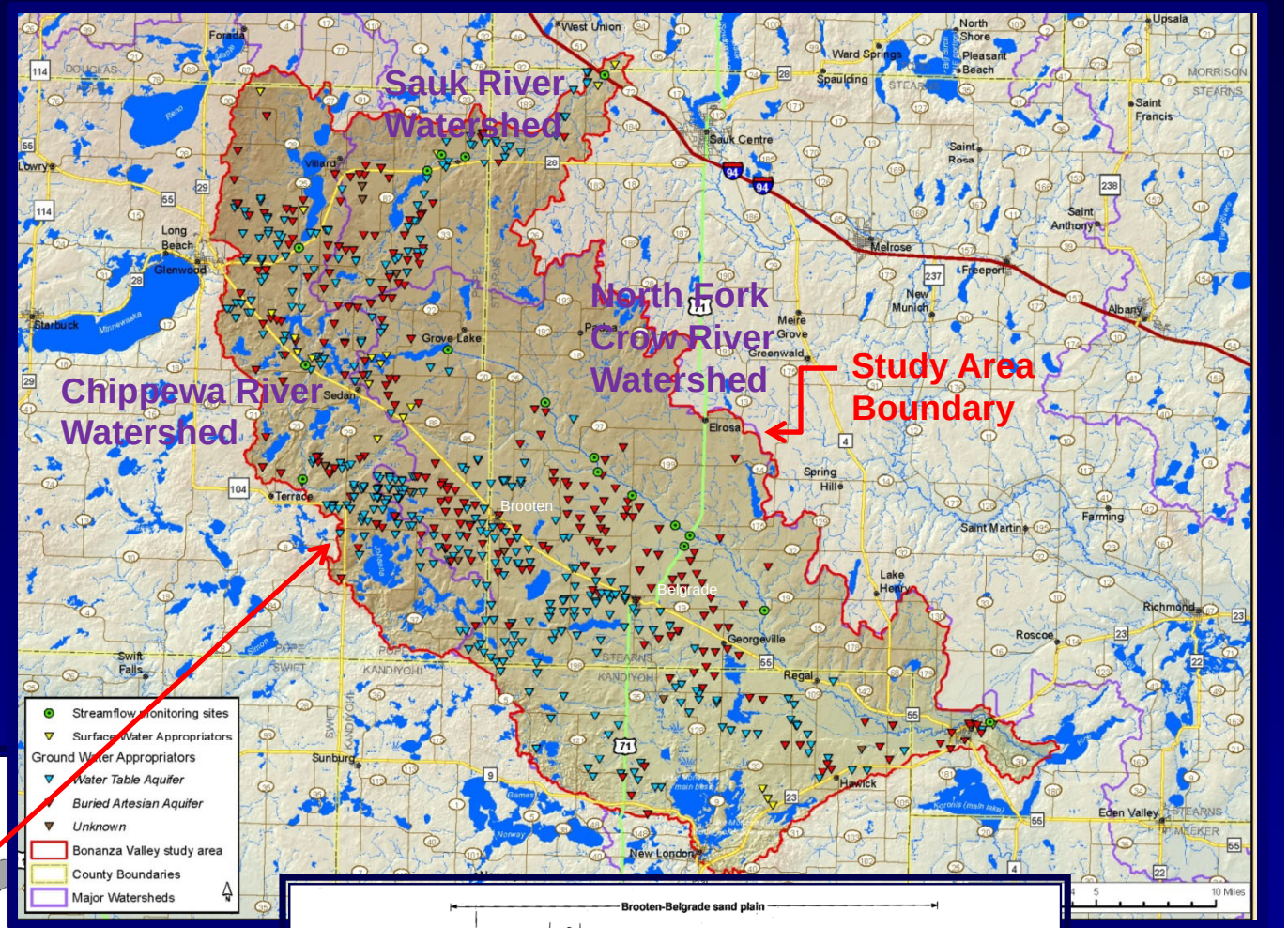


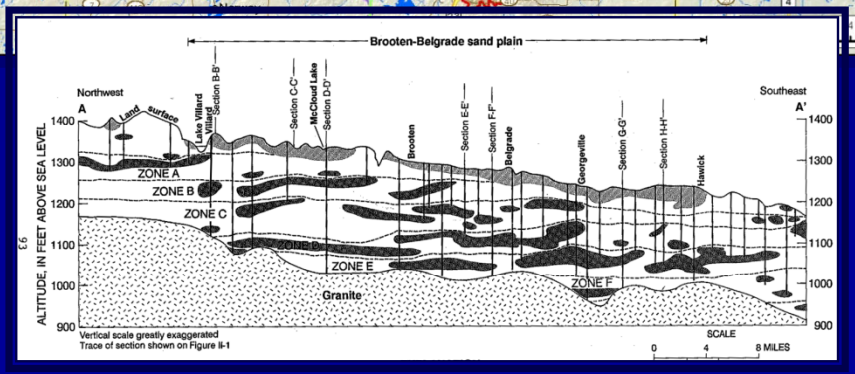

DNR Obwell 61037 (QBAA)
Water Level (elevation ftmsl)
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210
1/1/1989
1/1/1990
1/1/1991
1/1/1992
1/1/1993
1/1/1994
1/1/1995
1/1/1996
1/1/1997
1/1/1998
1/1/1999
1/1/2000
1/1/2001
1/1/2002
1/1/2003
1/1/2004
1/1/2005
1/1/2006
1/1/2007
1/1/2008
1/1/2009
1/1/2010
Date


Obwell 73041 (QBAA) and 73054 (QWTA)
GW Elev (73041 QBAA)
GW Elev (73054 QWTA)
73041
73054
1295
1290
1285
1280
1275
1270
1265
1260
1255
1250
1295
1294.5
1294
1293.5
1293
1292.5
1292
1291.5
3/28/09
4/27/09
5/27/09
6/26/09
7/26/09
8/25/09
9/24/09
10/24/09
11/23/09

Bonanza Valley Study Area







Water Management Concerns

Well Interference:

The well(s) can be fixed or replaced.

Water Use Conflict:

There isn't enough water to go around. Fixing wells isn't enough. There may be unsustainable water level or flow declines. Surface water resources may be unacceptably impacted by groundwater withdrawals.

Well Interferences Resolved

- The process worked and the homeowners now have wells that are deep enough to withstand summer decreases in water levels.

Aquifer and Surface Water Resource Impacts Unresolved

- Wherever there is not enough water for all uses, including the environment, human use must be mindfully managed.
- In collaboration with local interests a Groundwater Management Area planning effort has begun.
- Monitoring networks are being upgraded to provide basic data for management decisions.

Adaptive Management Concept

NWQMC Proposed Framework for Water Quality Monitoring Programs

Partner Funding Needs

Strategies-Actions	*LGU Funding Needs*	*Land Occupier Incentives*	*Other State Agencies Funding Needs*	*Other Partners **
1. Local management and prevention efforts	Ordinance development & administration Education & outreach	Technical assistance and implementation support	Continued community assistance and regulatory efforts	Education, cost-share, grants
2. Protection tools and recommended BMP's	Plan implementation & technical support of land occupiers	BMP's installation	Continued BMP development	Research and education
3. Long- term monitoring	Status and trends, Inspection/compliance monitoring		Technical monitoring QA/QC standard development	
4. Data collection and sharing	Collection and reporting		Oversight of technical data collection and analysis	
5. Key research studies			Interagency research steering committee. Develop & design practices for field application	Field scale applied research and modeling
6. Comprehensive hydrologic- ecological framework	Education, outreach and private land coordination	Technical assistance	Resource protection and management strategies	

Resource Management Investment Needs

Current Dollars			
Activity	*Funding Amounts (10-Year)*	*Funding Amounts (25-Year)*	*Outcomes*
Mapping Needs	**$81,000,000**	**$203,500,000**	Watershed models using LIDAR & GIS tools, Statewide County Groundwater Atlas completion with technological updates, Spring & Seep Mapping, Aquifer flow pathways, timing & movement, CBS completion, status and trends
Monitoring Needs	**$70,500,000**	**$176,250,000**	Streamflow subwatersheds; Groundwater contributions to baseflow, water budget for lakes, Statewide groundwater monitoring network for quantity/quality; Aquitard flow rates; Ecosystem needs, status and trends
Managing needs	**$16,500,000**	**$32,500,000**	Integrated federal, state, local, & landowner programs for TMDL implementation and Aquifer management areas to protect quantities and quality; Drainage reform