



DNR Waters

Helping people ensure the
future of our water
resources

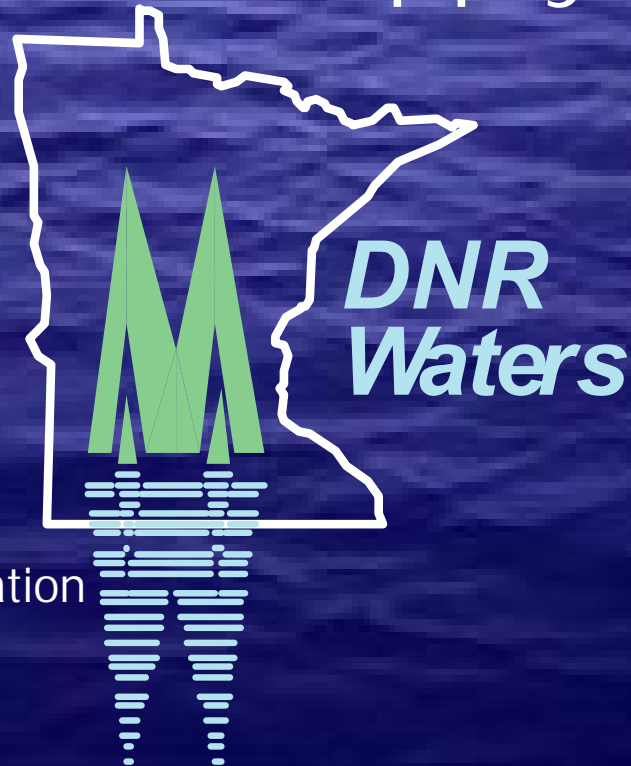
Minnesota Department of Natural Resources

Management of Ground Water Use and Supply

Tim Crocker & Julie Ekman,
MN DNR Waters

Presented to the
Minnesota Ground Water Association

April 12, 2006





Shoreland



Floodplain



Public Waters Inventory



Dam Safety

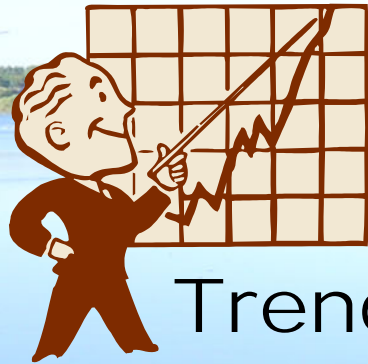


Work In Public Waters



Water Appropriation

Topics For Today



Trends



Tools



Issues

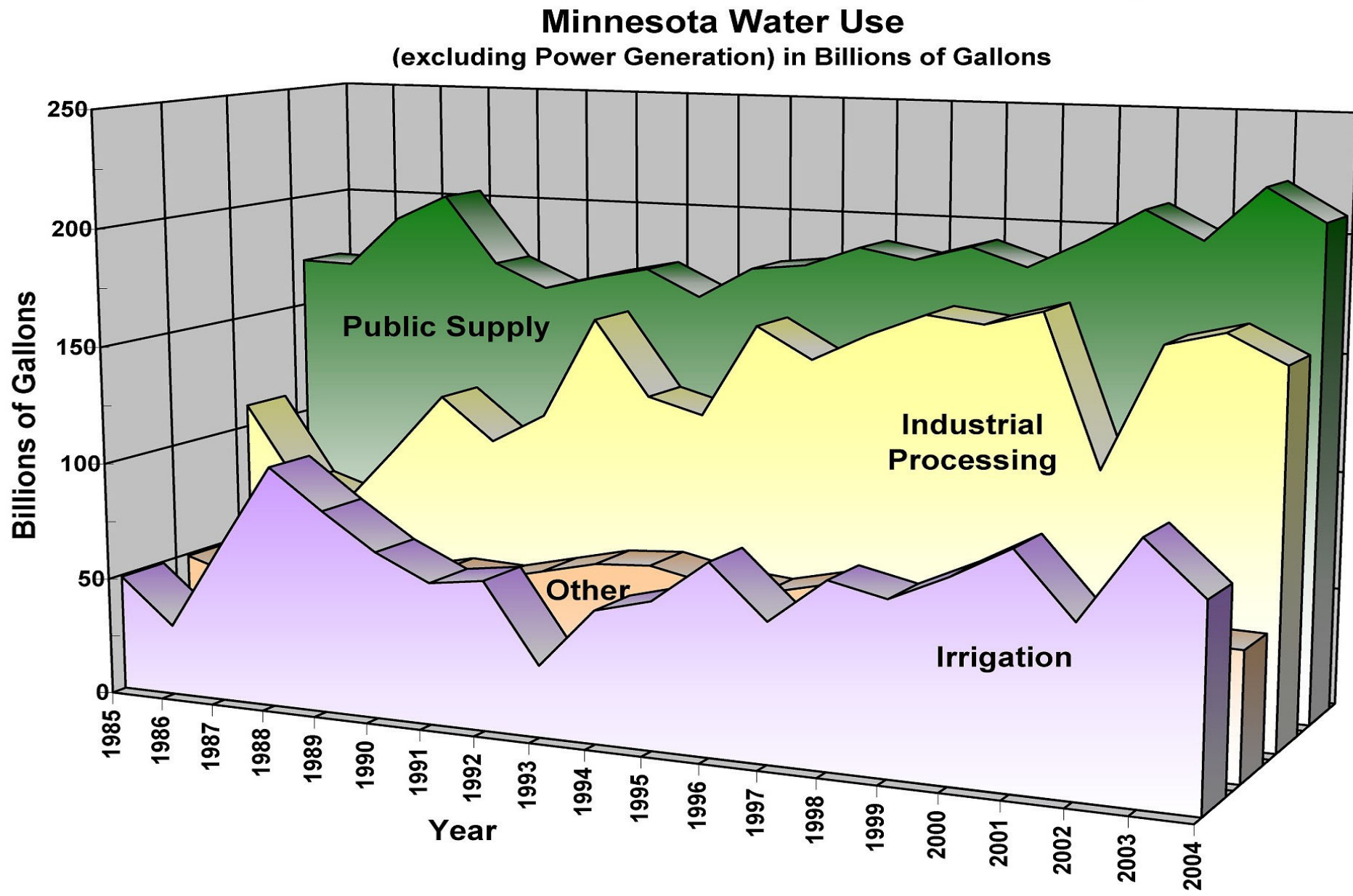


Future

Water Use Facts, Figures, Trends

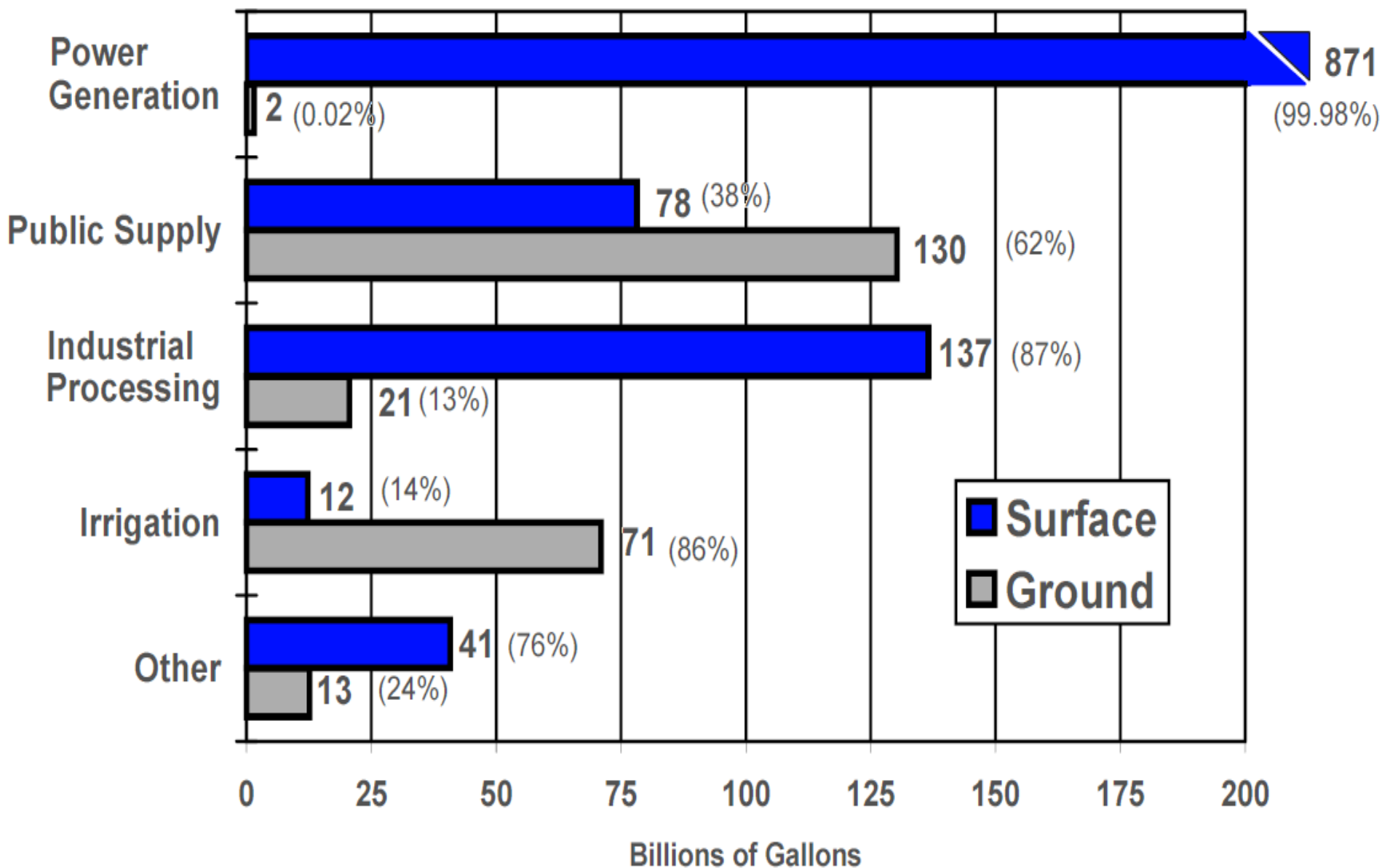


Minnesota Water Use, 1985 thru 2004



Comparison of Surface and Ground Water Use by Category - 2004

Billions of Gallons (% of category)



Appropriations by the Counties with the Greatest Use in CY 2003

	County	Surface Water	Ground Water	Total	Primary Use
1)	Goodhue	208.7	2.4	211.1	Nuclear Power Cooling
2)	Wright	116.3	3.7	120.0	Nuclear Power Cooling
3)	Washington	103.3	13.6	116.9	Steam Power Cooling
4)	Dakota	87.7	29.9	117.6	Steam Power Cooling
5)	Hennepin	77.5	39.6	117.1	Steam Power Cooling
6)	Cook	68.3	0.0	68.3	Mine Processing
7)	Itasca	68.2	1.0	69.2	Steam Power Cooling
8)	St. Louis	87.4	2.1	89.5	Steam Power Cooling
9)	Ramsey	69.6	12.5	82.1	Steam Power Cooling
10)	Lake	48.9	0.0	48.9	Mine Processing
11)	Anoka	37.8	12.5	50.3	Municipal Waterworks
	Total	973.7	117.3	1091.0	

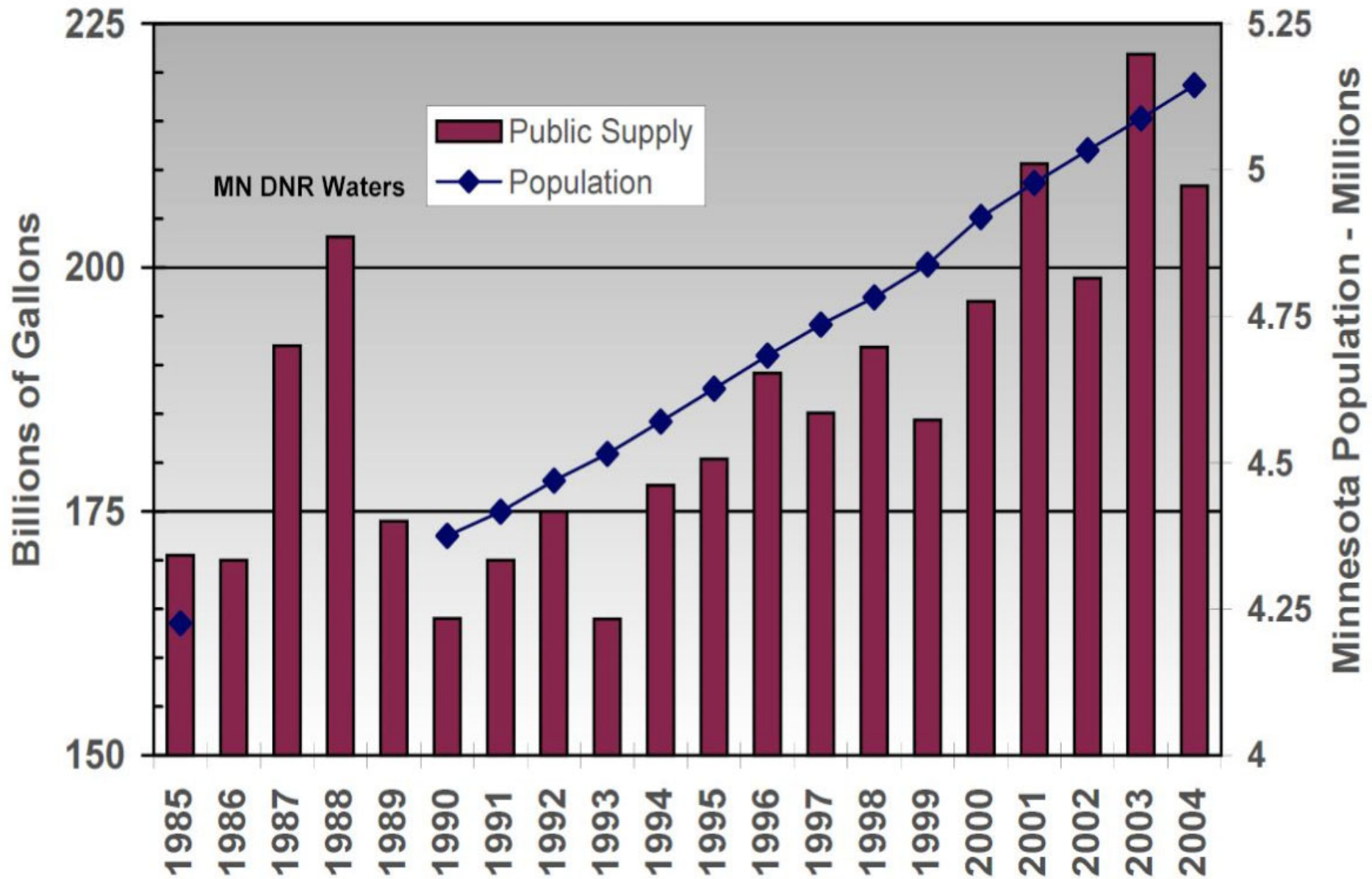
Billions of gallons

*88% of
SW Use*

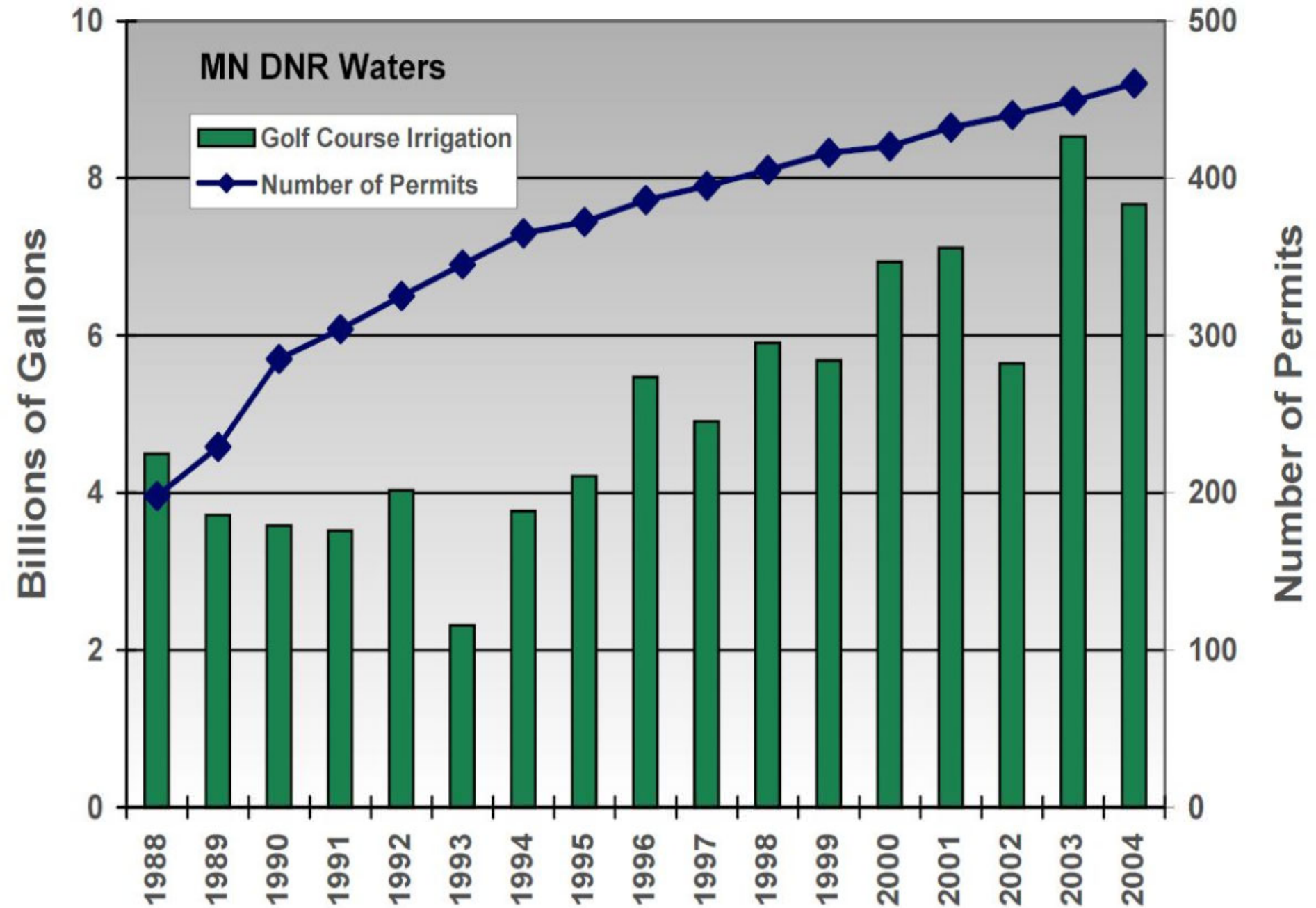
*43% of
GW Use*

*79% of
Total Use*

Minnesota Public Water Supply Use and Minnesota Population

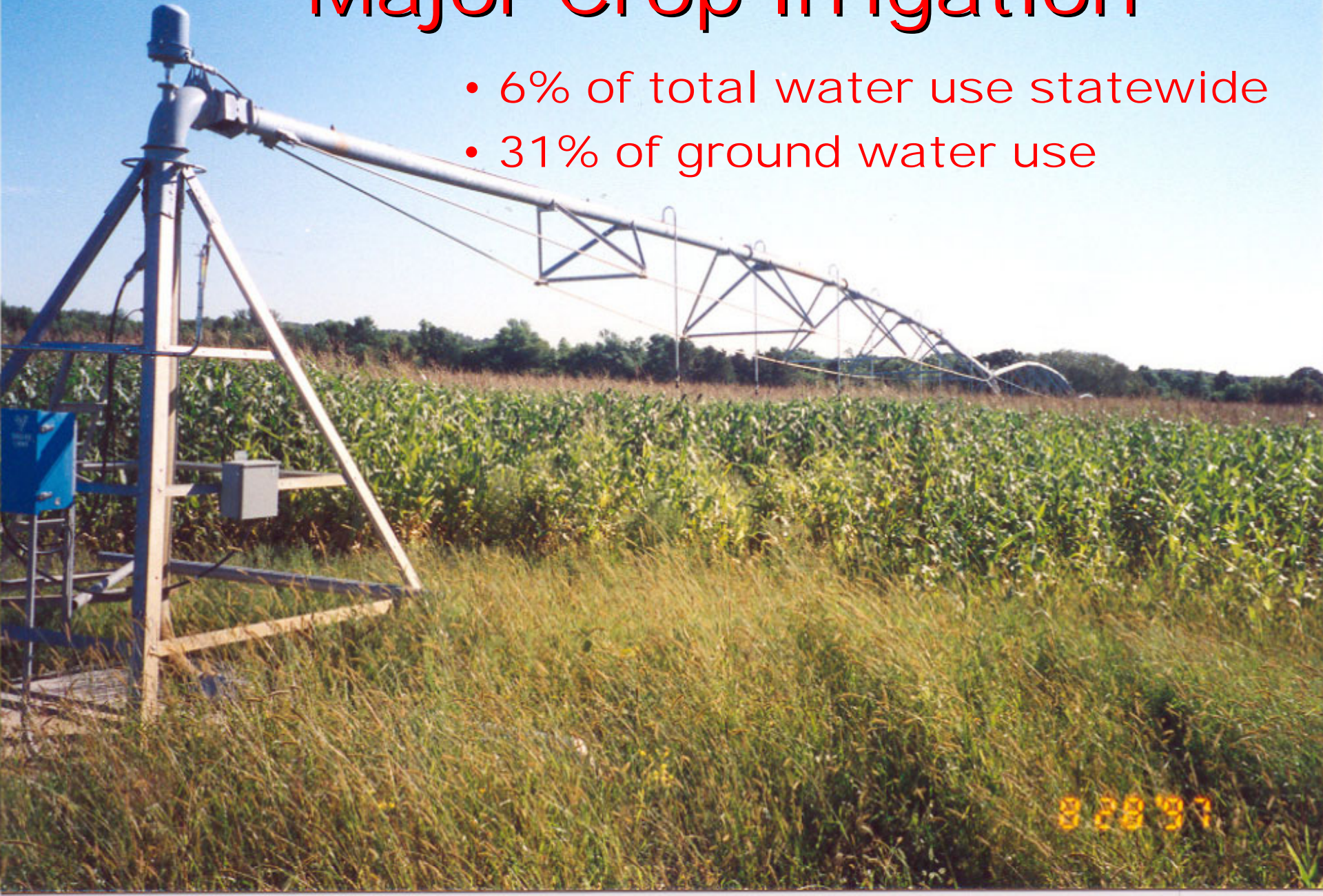


Golf Course Irrigation



Major Crop Irrigation

- 6% of total water use statewide
- 31% of ground water use





How Does DNR Waters Get
Involved?

Permit Program

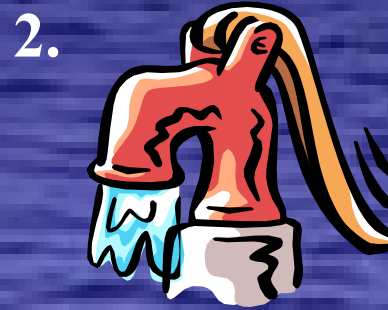
- enacted in 1937
- 10,000 gallons/day or 1 million gallons/year
- based on “riparian rights”



Water Allocation Priorities



Domestic water supply



**Consumptive
less than 10,000
gallons/day**



**Agricultural
irrigation &
processing**



Power production



**Consumptive uses in
excess of 10,000
gallons/day**

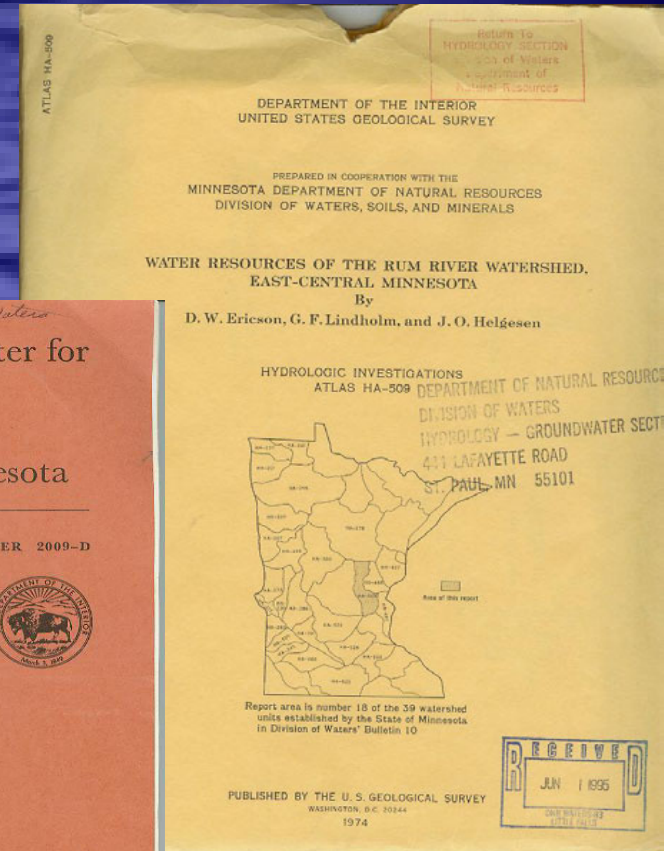
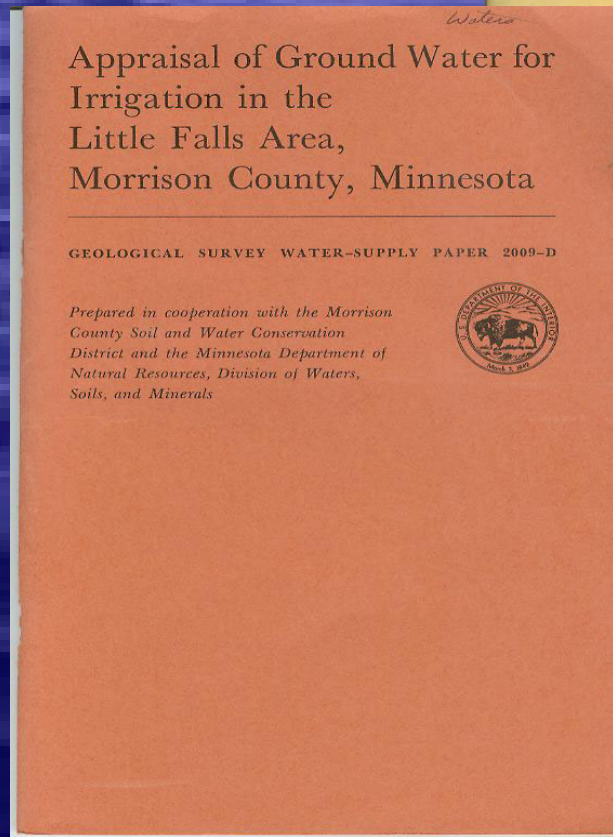
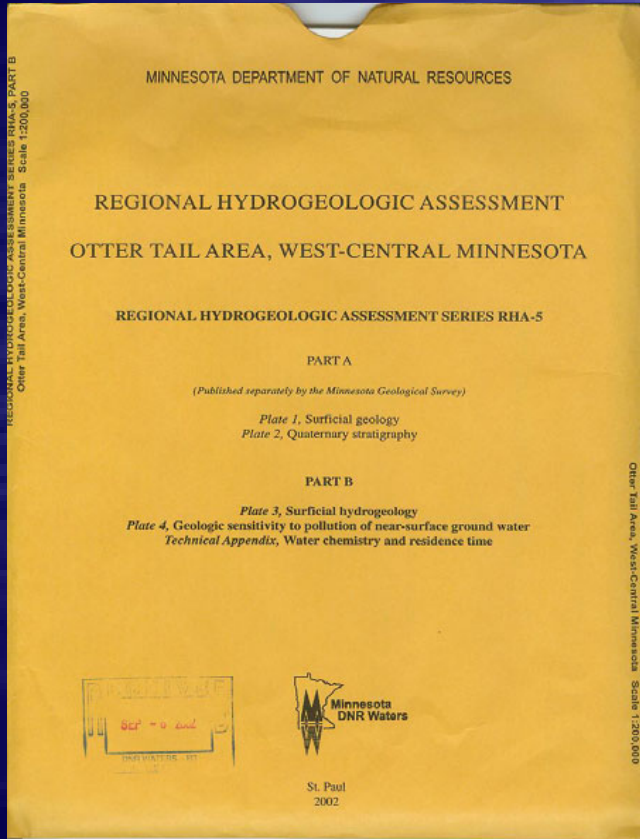


Non-essential uses

Permit Process

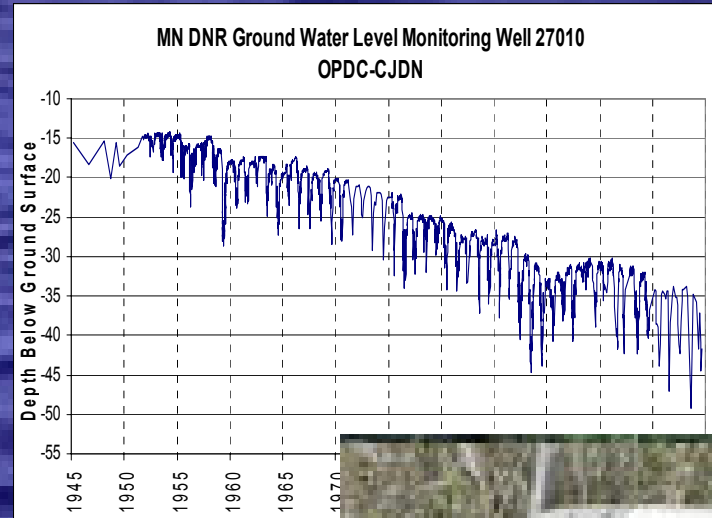
- Purpose
- Volume and rate
- Well information
- Additional information

Permit Process information



Permit Process information

Unique No. 666211		MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <small>Minnesota Statutes Chapter 1031</small>		Update Date 2003/02/04	
County Name Swift				Entry Date 2002/12/26	
Township Name Township Range Dir Section Subsection 120 41 W 1 AAA		Well Depth 100 ft. Depth Completed 100 ft. Date Well Completed 2002/12/03			
Well Name CARRUTH FARMS		Drilling Method Cable Tool			
Contact's Name CARRUTH FARMS/CARRUTH, JOHN 934 70TH SW ST DANVERS MN 56231-		Drilling Fluid		Well Hydrofractured? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No From ft. to ft.	
GEOLOGICAL MATERIAL COLOR HARDNESS FROM TO TOPSOIL 0 3 SANDY CLAY 3 15 CLAY BLUE HARD 15 50 SANDY CLAY 50 75 DIRTY SAND 75 80 COARSE SAND & ROCK 80 95 FINE SAND 95 100		Use Irrigation			
		Casing Drive Shoe? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> N Hole Diameter			
		Casing Diameter Weight(lbs/ft) 16 in. to 80 ft 62.58			
		Screen Y Open Hole From ft. to ft.			
		Make JOHNSON Type L			
		Diameter Slot Length Set Fitting			
		12 120 10 80 ft. to 90 ft			
		12 80 5 90 ft. to 95 ft			
		12 30 5 95 ft. to 100 ft			
Static Water Level 19 ft. from Land surface Date 2002/12/03					
PUMPING LEVEL (below land surface) 45 ft. after 5 hrs. pumping 500 g.p.m.					
Well Head Completion Pitless adapter mtr. Model Casing Protection <input checked="" type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)					
Grouting Information Well grouted? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
Nearest Known Source of Contamination 1300 ft. direction type Well disinfected upon completion? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
Pump <input checked="" type="checkbox"/> Not installed Date installed N					
Mtr name Model HP Capacity Volts g.p.m.					
Drop Pipe Length ft. Type					
Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 10318 License Business Name					
USGS Quad Elevation Aquifer Alt. Id:					

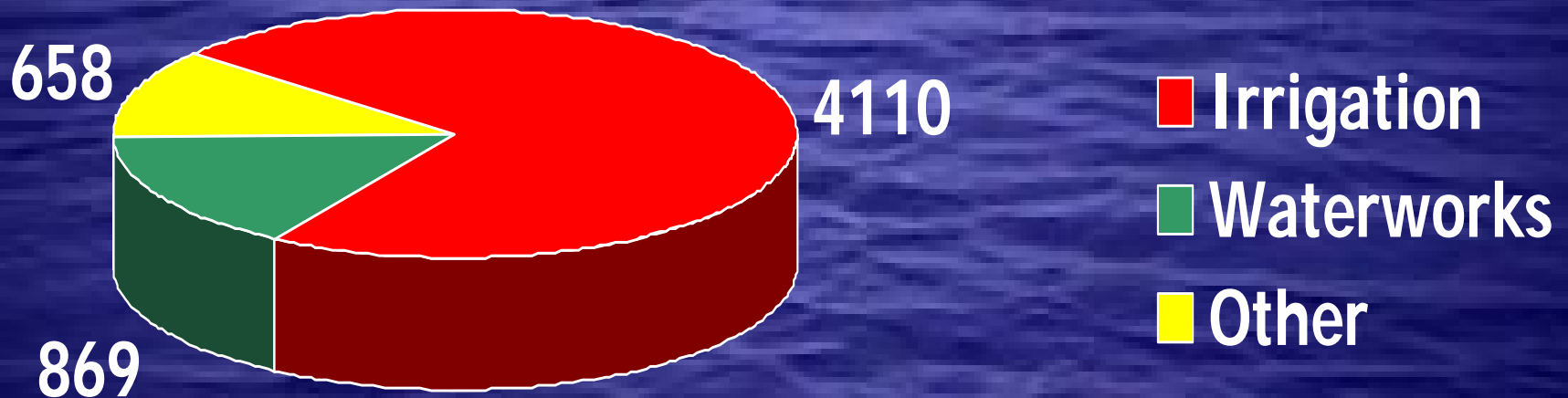


County Well Index  Online

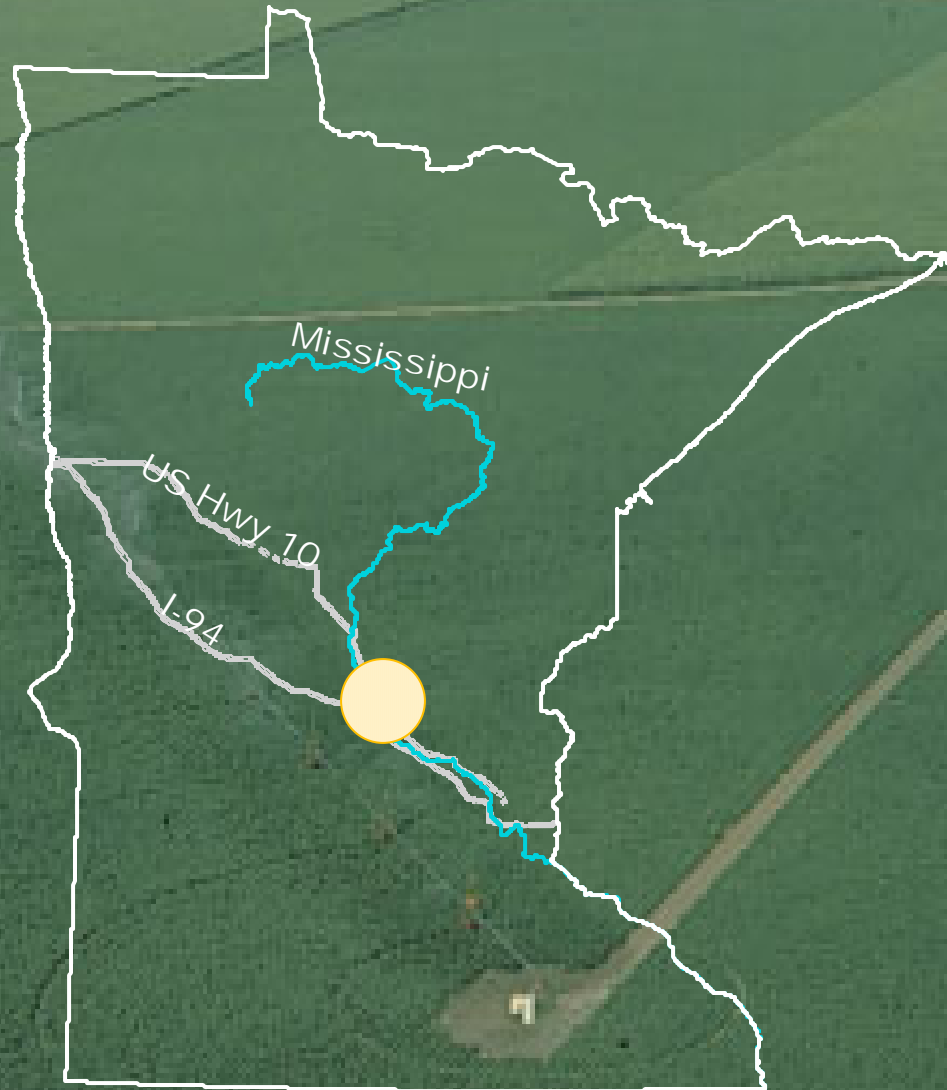
Permit Process review

- City
- County
- Conservation Districts (SWCD, etc.)
- DNR Fish & Wildlife, Ecological Services, other as appropriate
- U.S. Army Corps of Engineers
- Watershed Authority
- Other State Agencies as appropriate

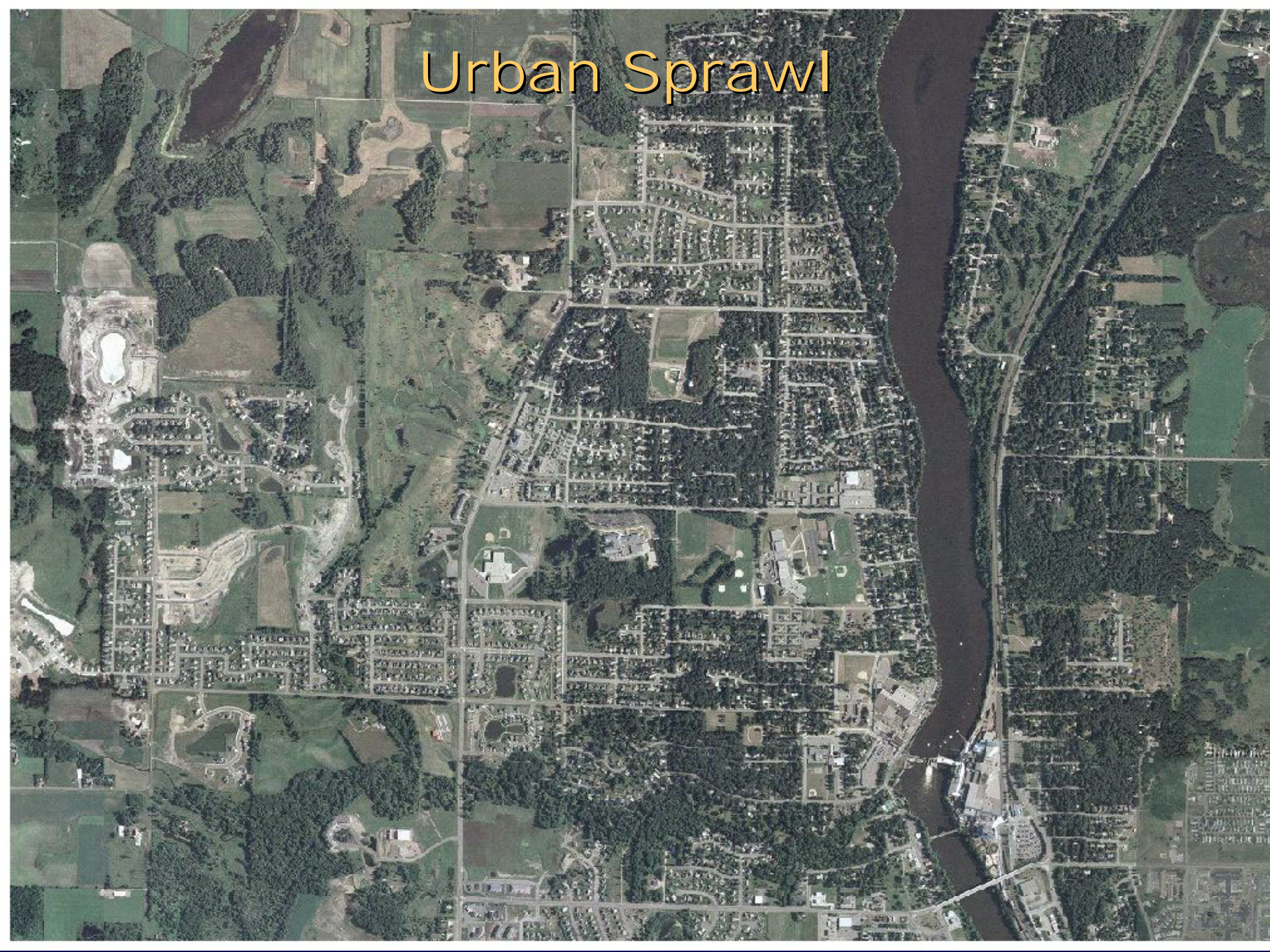
Ground Water Permits



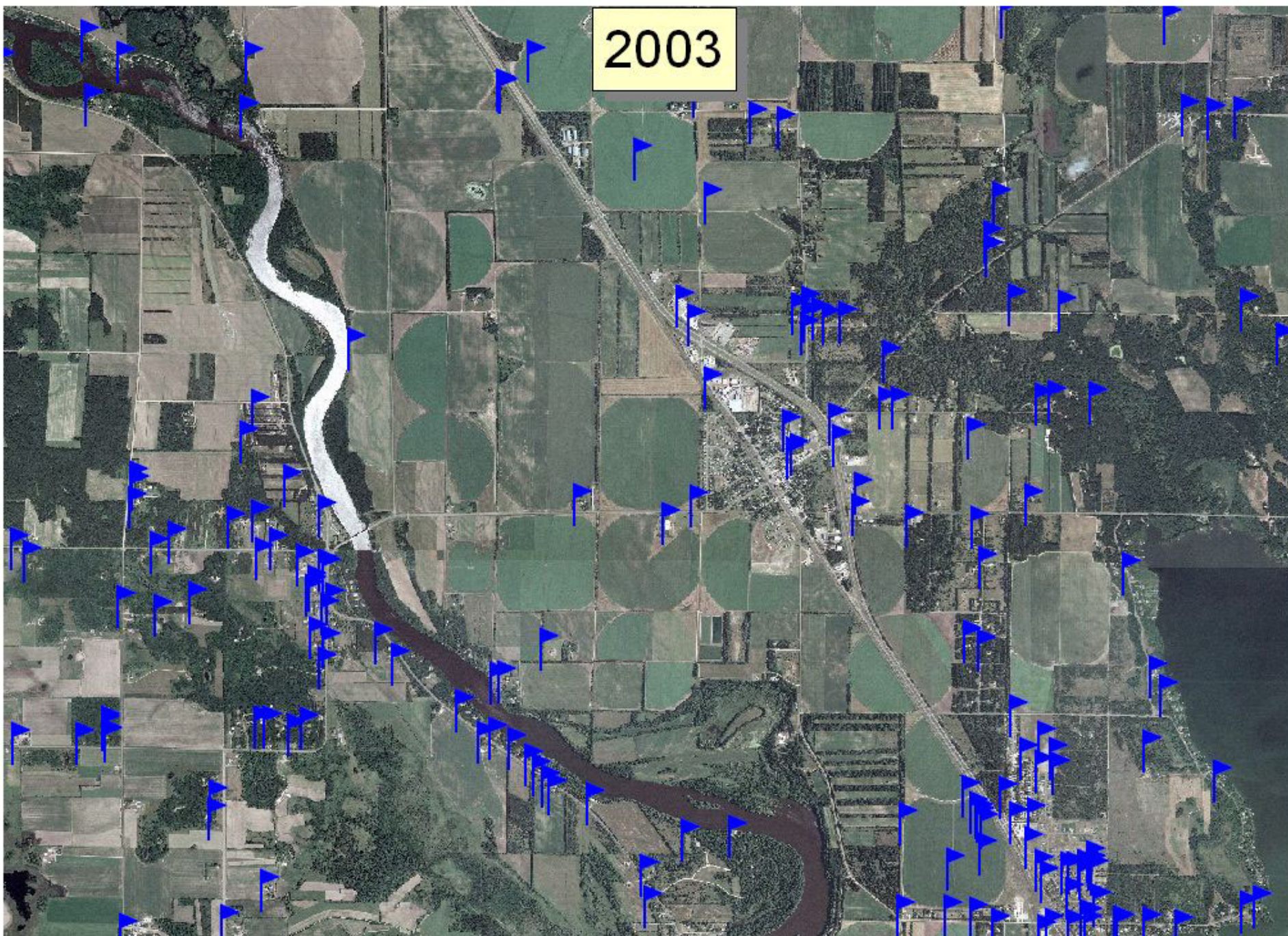
Rural Water Issues



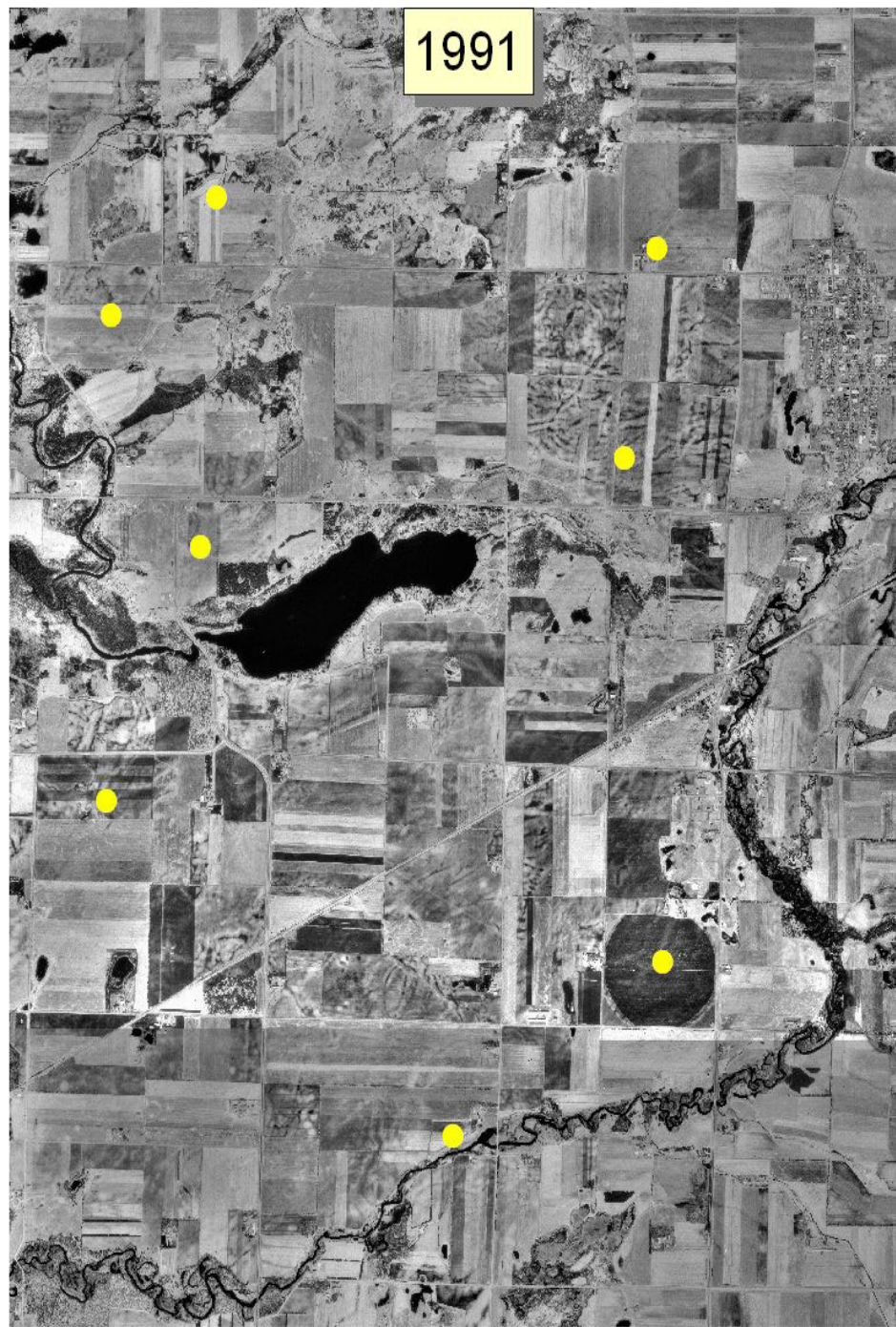
Urban Sprawl



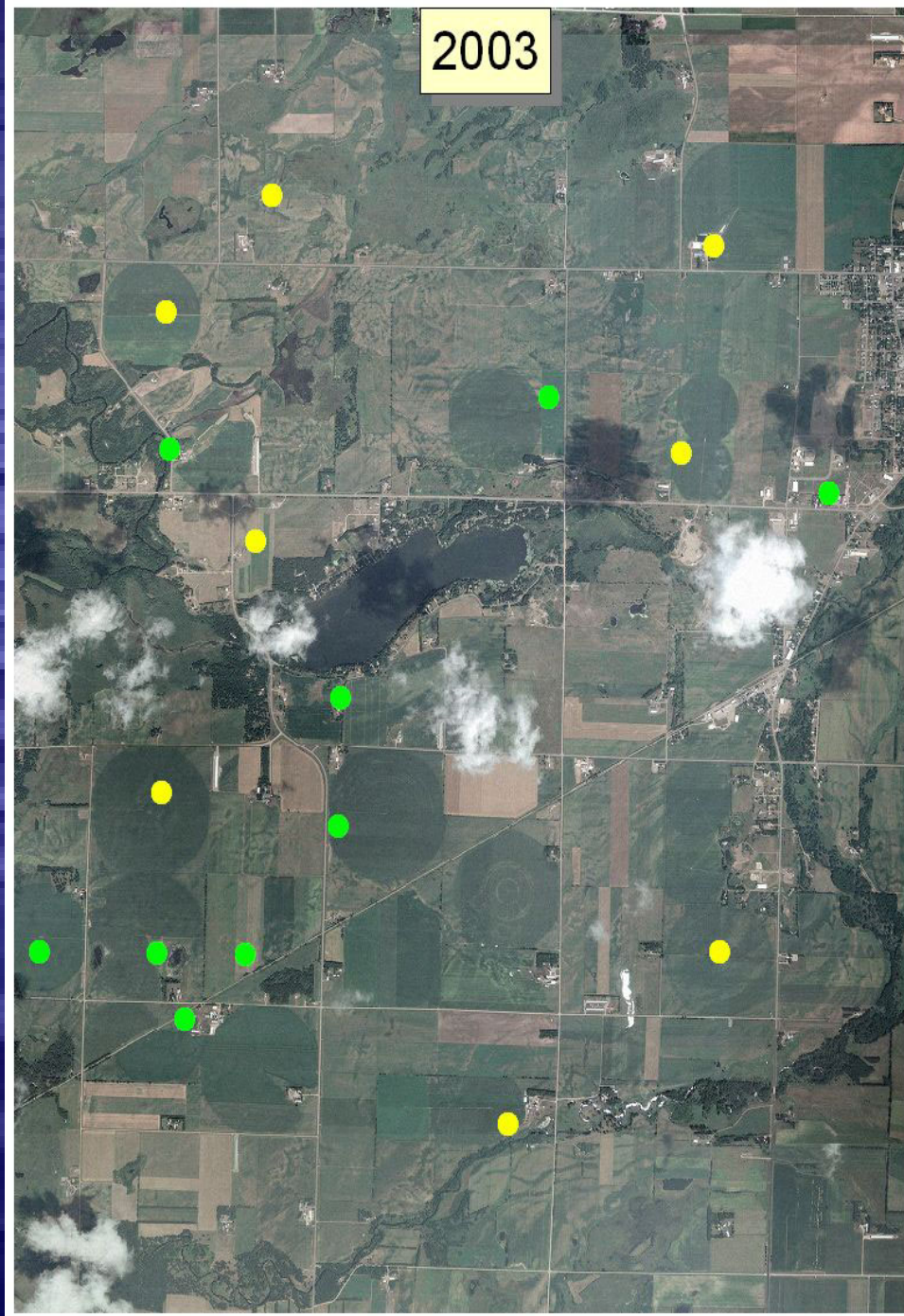
2003

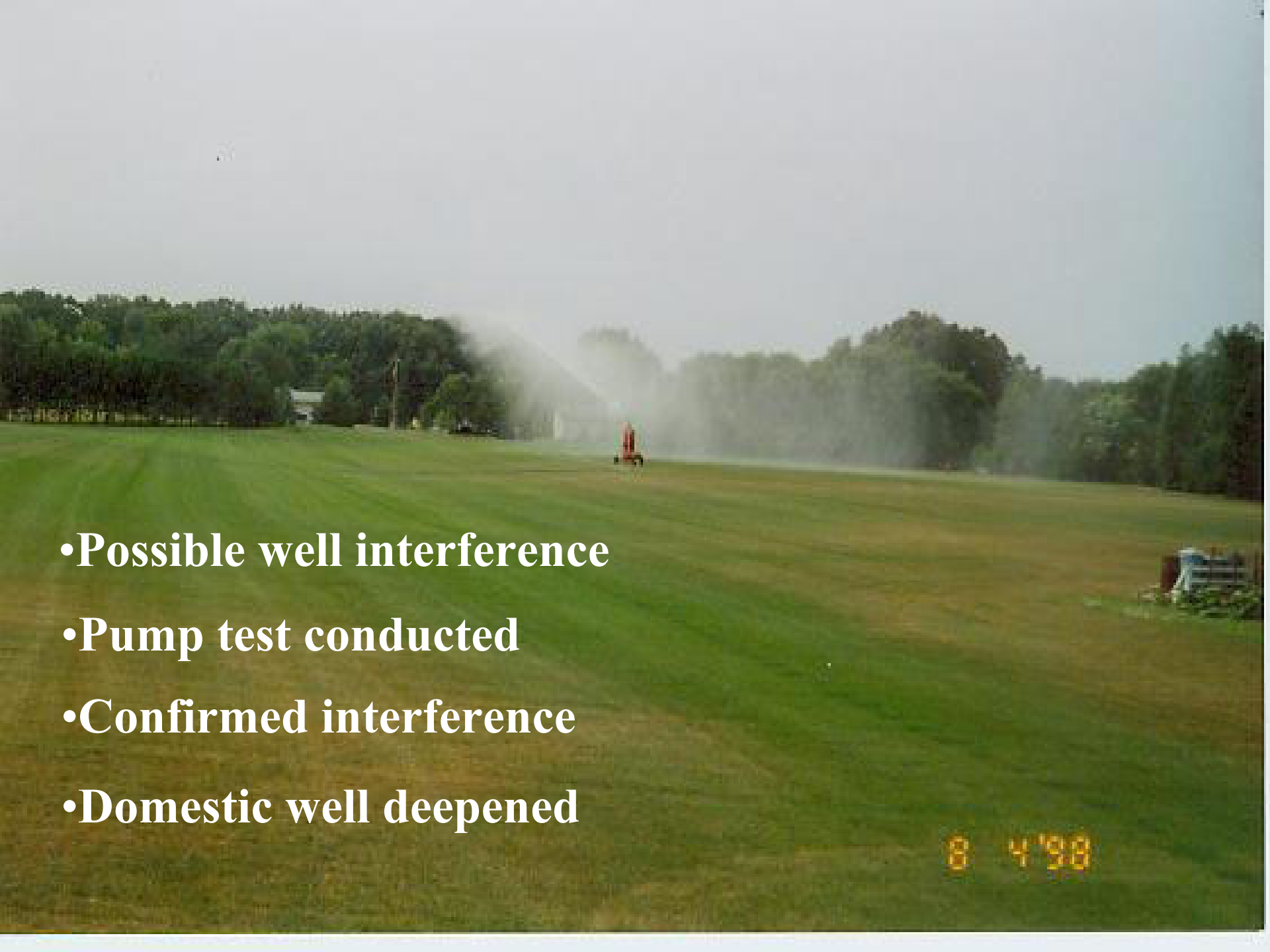


1991



2003



- 
- Possible well interference
 - Pump test conducted
 - Confirmed interference
 - Domestic well deepened

8 4'98



Minnesota Ethanol Producers

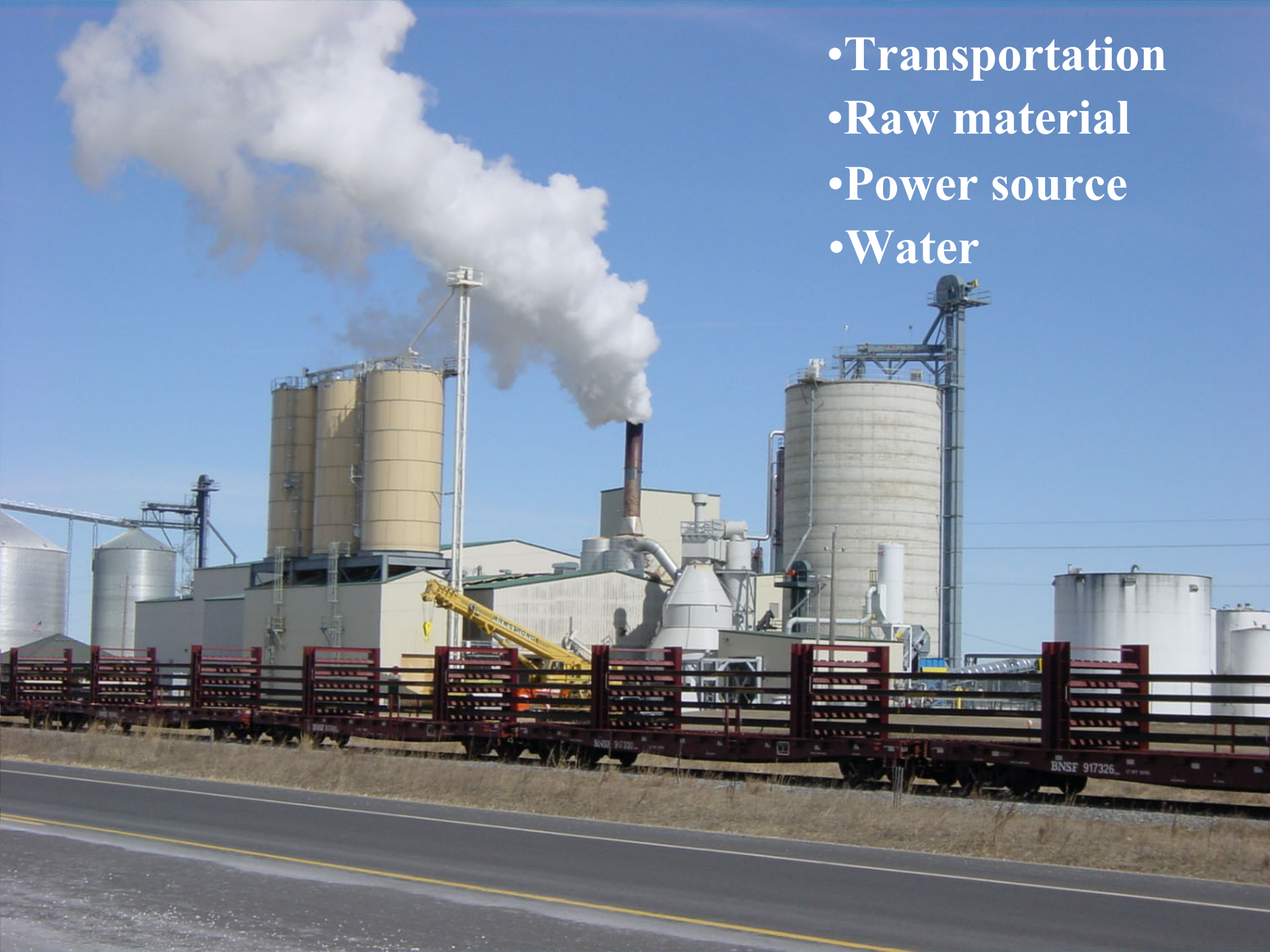
Water Use Data

City	MGY Water Use		MGY Ethanol Produced		Water gallons used for each Ethanol gallon produced	
	2003	2004.0	2003.0	2004.0	2003	2004
Albert Lea	210.0	205.4	37.9	39.9	5.5	5.2
Benson	91.0	146.4	29.4	45.2	3.1	3.2
Bingham Lake	142.5	134.0	30.1	31.7	4.7	4.2
Buffalo Lake	100.6	87.2	17.3	19.0	5.8	4.6
Claremont	168.0	141.2	31.1	31.2	5.4	4.5
Little Falls	80.8	75.9	21.0	21.9	3.8	3.5
Luverne	93.3	94.0	20.3	21.1	4.6	4.5
Marshall			40.0	40.0		
Melrose	1.0	1.0	26.2	2.6	0.4	0.4
Morris	131.7	134.2	21.6	22.6	6.1	6.0
Preston	157.1	159.6	38.4	41.7	4.1	3.8
St Paul	457.1	65.9	14.0	5.4	32.6	12.2
Winnebago	164.0	182.0	39.9	46.4	4.1	3.9
Winthrop	132.9	163.8	35.6	36.5	3.7	4.5
Totals Sum / Ave	1930.0	1590.6	402.8	405.2	6.5	4.6

Gallons of water used per gallon of ethanol produced

Ethanol Producers	1998	1999	2000	2001	2002	2003	2004
Albert Lea (Exol/Agri Resources)	6.3	6.3	6.0	6.1	5.6	5.5	5.2
Benson (Chippewa Valley Ethanol)	3.3	3.5	4.8	3.5	3.5	3.1	3.2
Bingham Lake (Ethanol2000)	4.0	4.2	4.7	4.6	4.3	4.7	4.2
Buffalo Lake (MN Energy)	10.6	6.2	7.1	6.9	7.0	5.8	4.6
Claremont (Al-Corn)	4.6	4.3	4.1	4.2	3.9	5.4	4.5
Little Falls (Central MN Ethanol)	-	7.2	-	4.2	4.1	3.8	3.5
Luverne (AgriEnergy LLC)	4.9	5.8	5.2	4.8	4.7	4.6	4.5
Marshall (MCP)	7.7	7.6					
Melrose (Kraft General Foods)	0.6	0.4	0.4	0.4	0.4	0.4	0.4
Morris (DENCO LLC)	9.3	10.0	12.3	8.2	6.0	6.1	6.0
Preston (Pro-Corn)	5.6	5.2	4.7	4.6	4.4	4.1	3.8
St. Paul (MN Brewing)	-	-	18.7	7.9	21.9	32.6	12.2
Winnebago (Corn Plus)	4.1	3.5	3.5	3.5	4.5	4.1	3.9
Winthrop (Heartland)	4.8	5.1	4.3	5.0	4.1	3.7	4.5

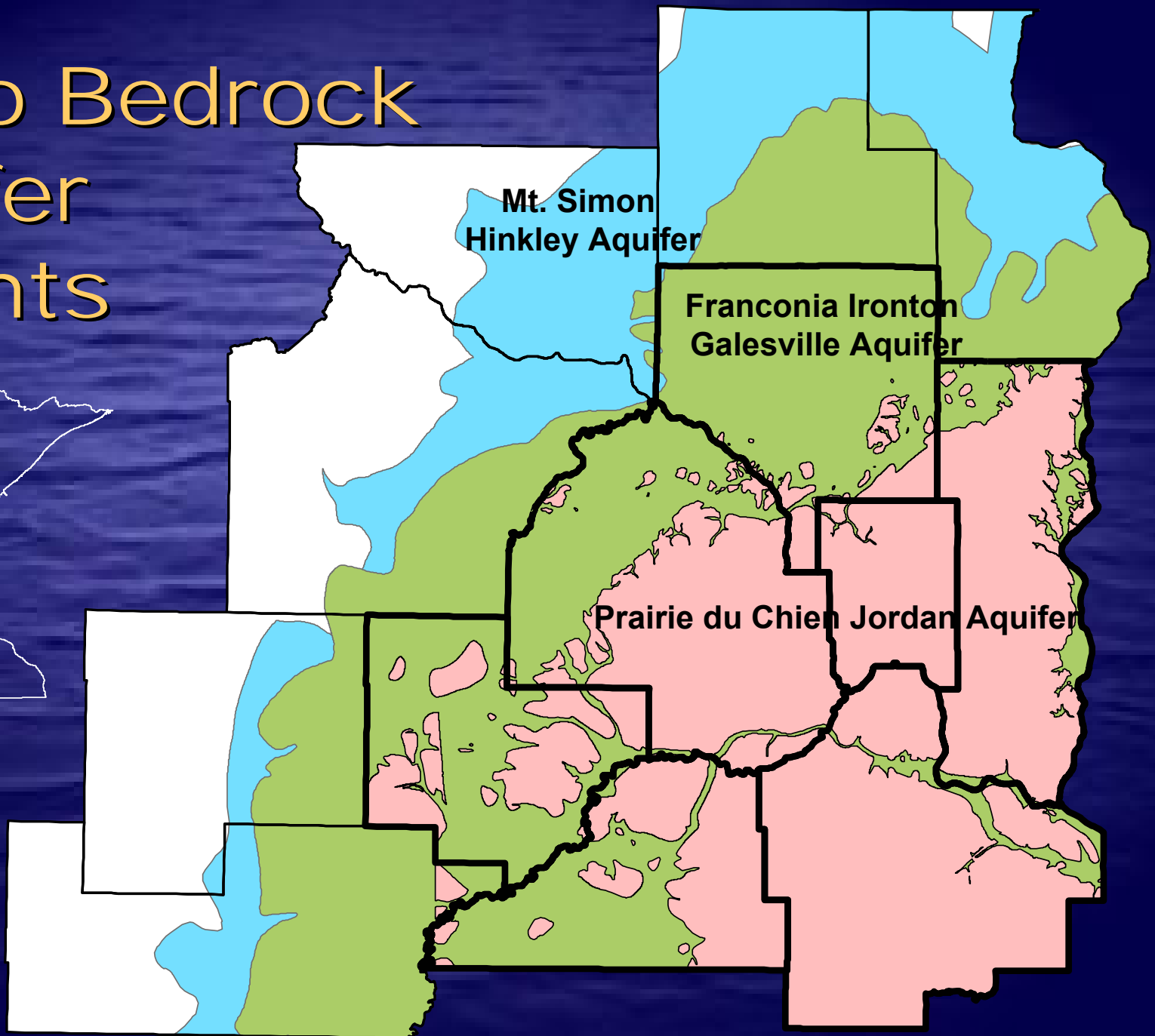
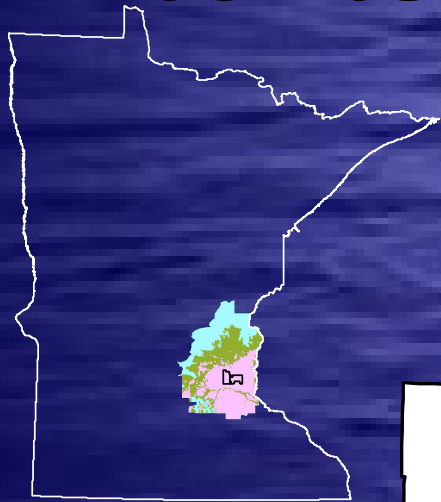
- Transportation
- Raw material
- Power source
- Water



Water Availability and Metropolitan Area Expansion

- 
- Aquifer Contamination
 - Statutory Requirements
 - Special Water Resources
 - Population Growth

Metro Bedrock Aquifer Extents

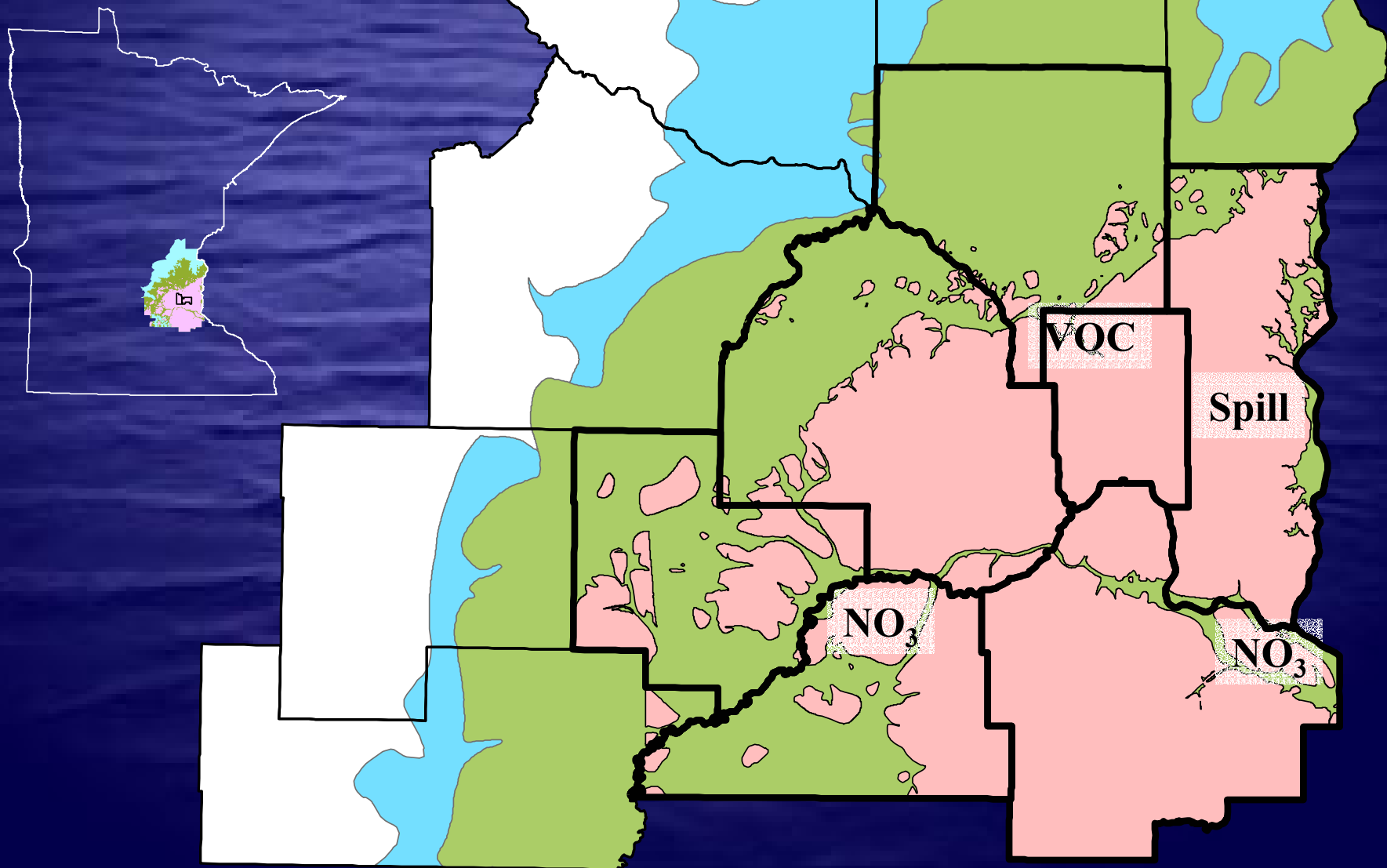


Mt. Simon
Hinkley Aquifer

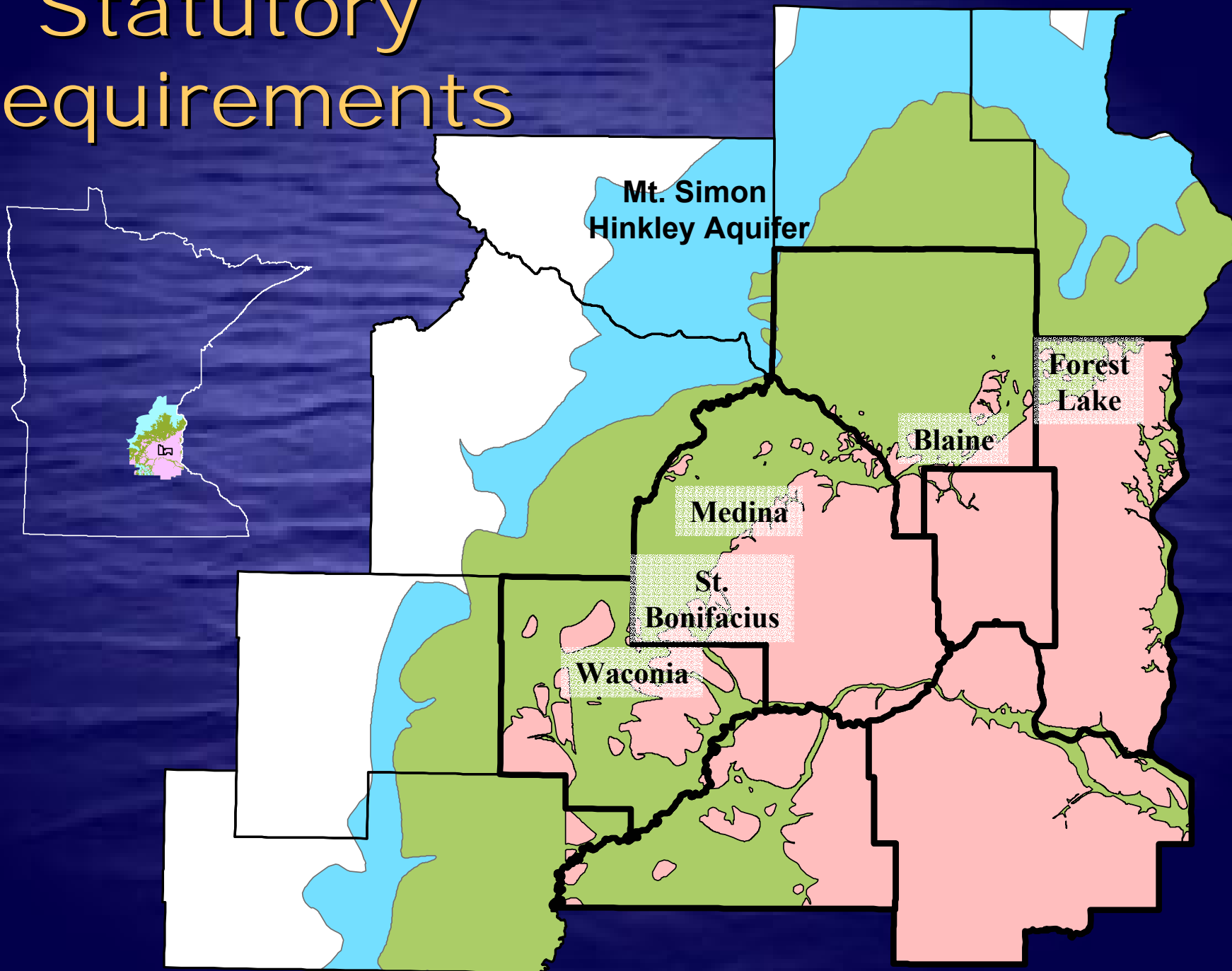
Franconia Ironton
Galesville Aquifer

Prairie du Chien Jordan Aquifer

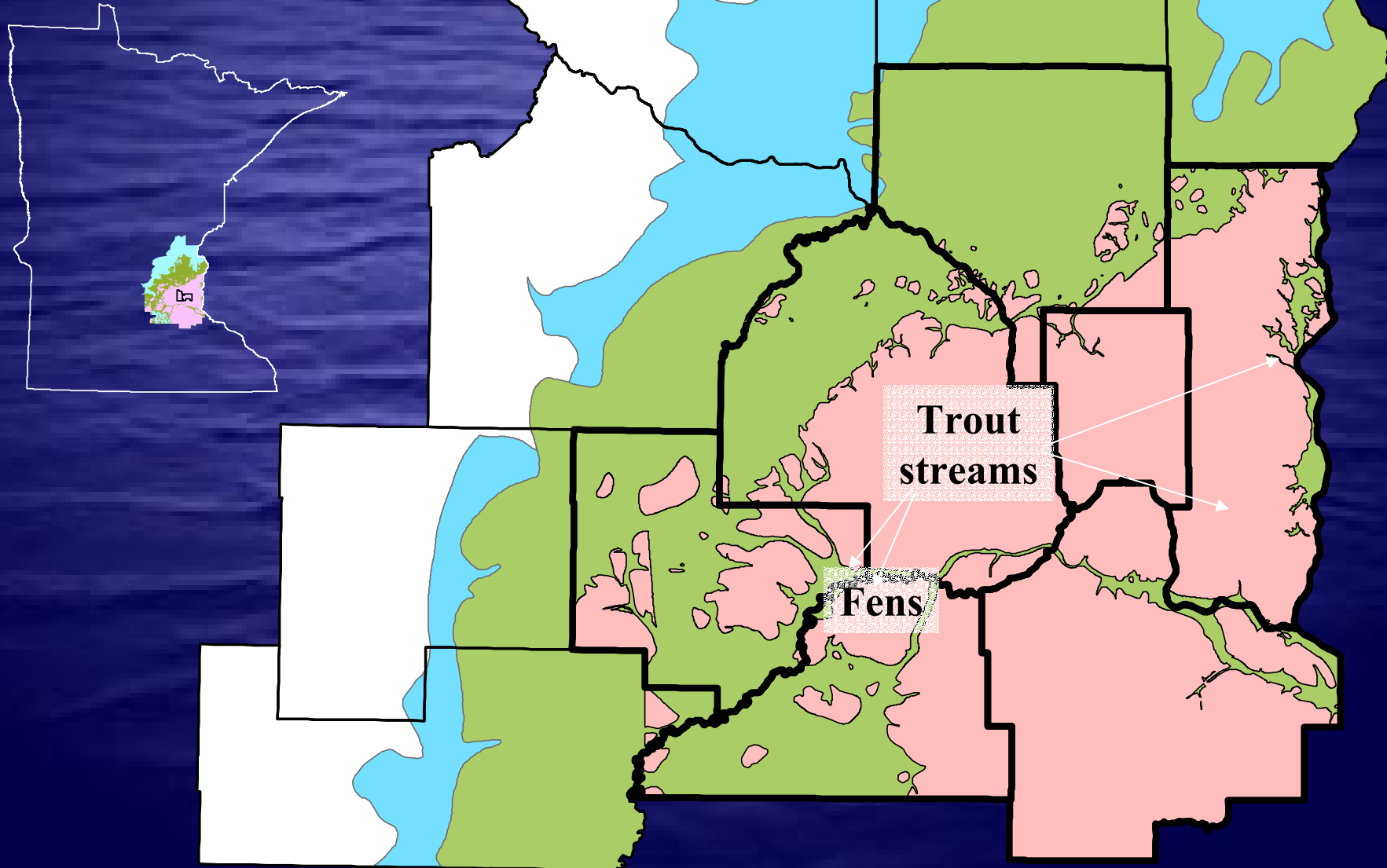
Aquifer Contamination



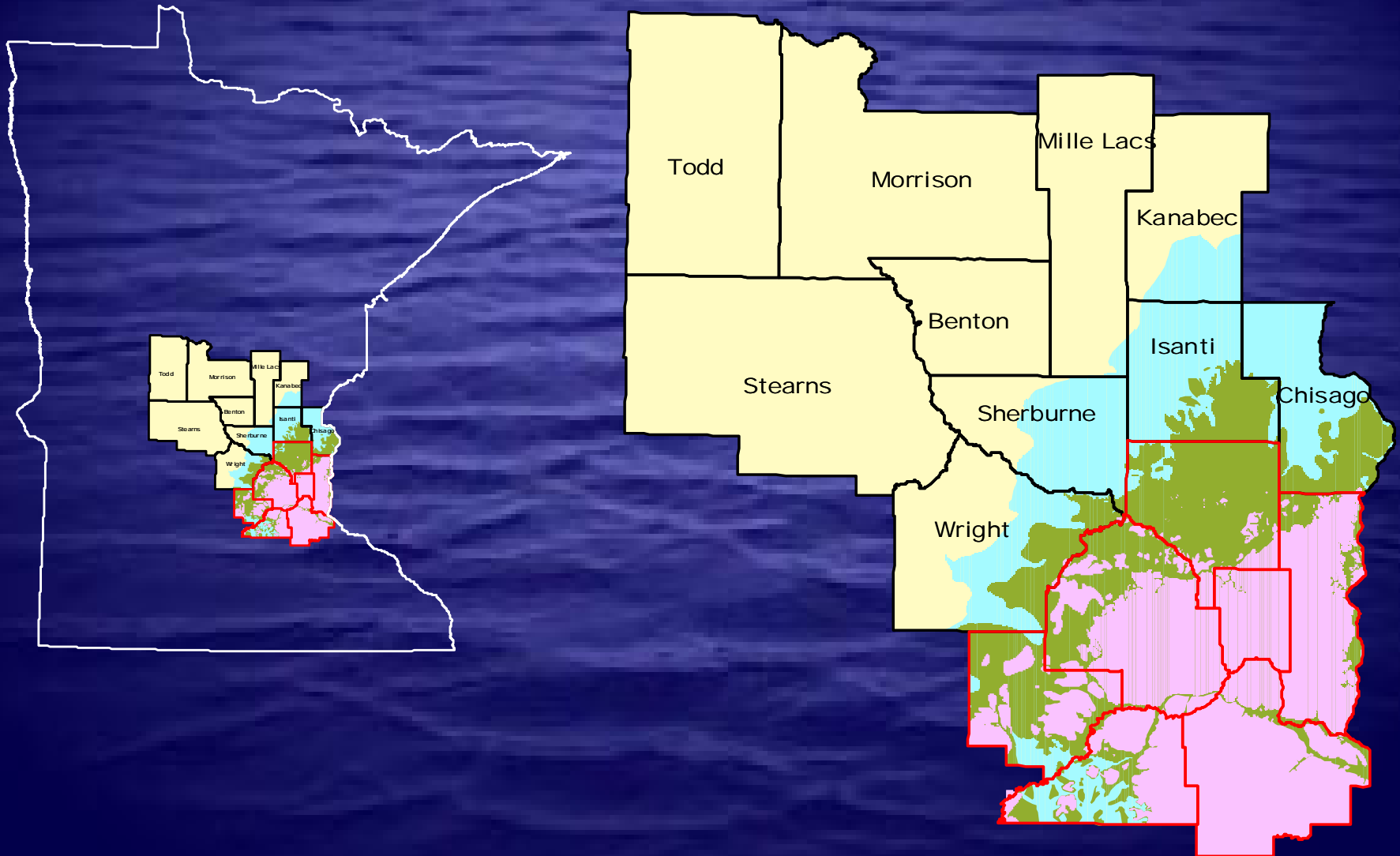
Statutory Requirements



Special Water Resources



Population Growth

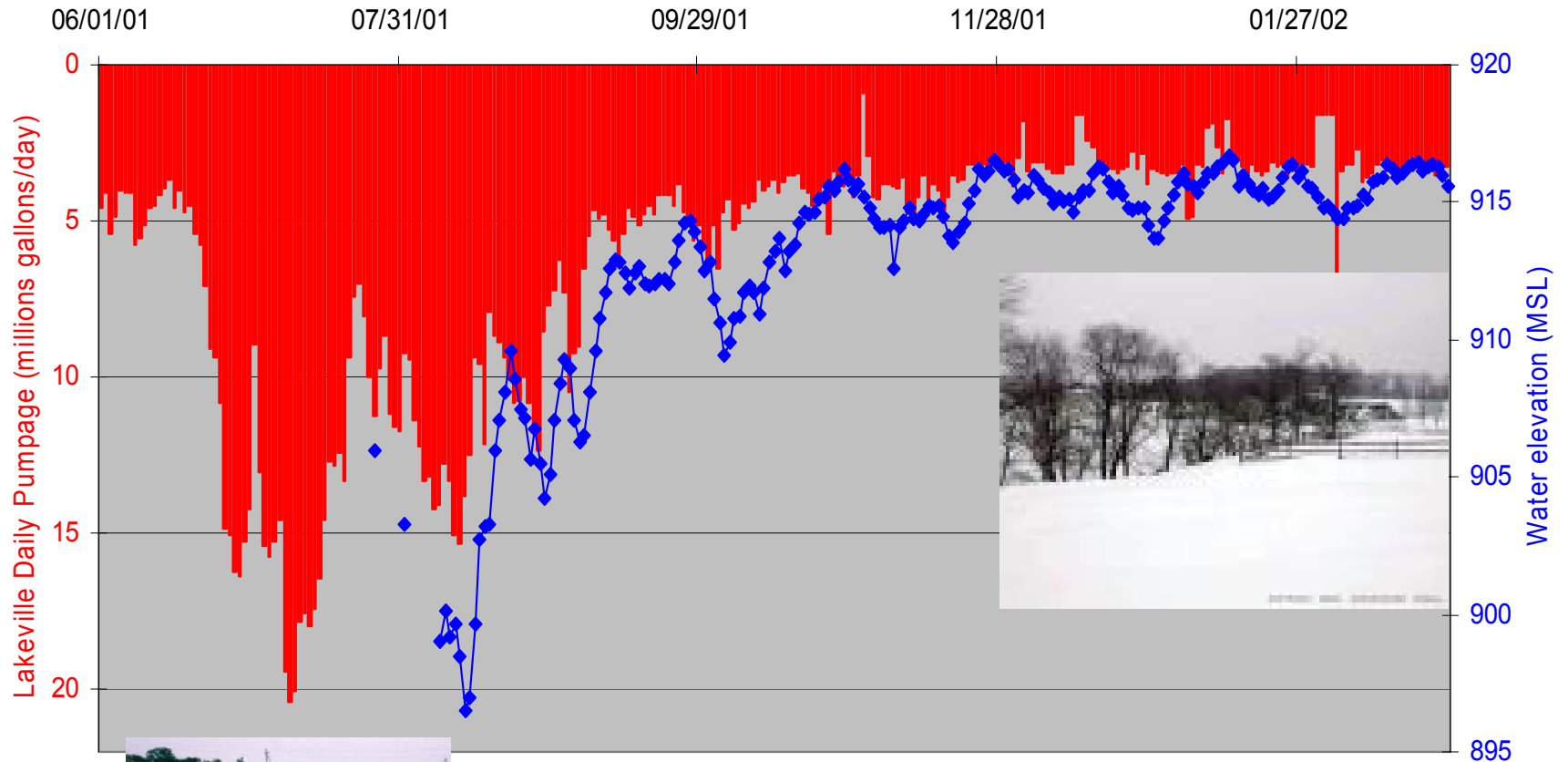


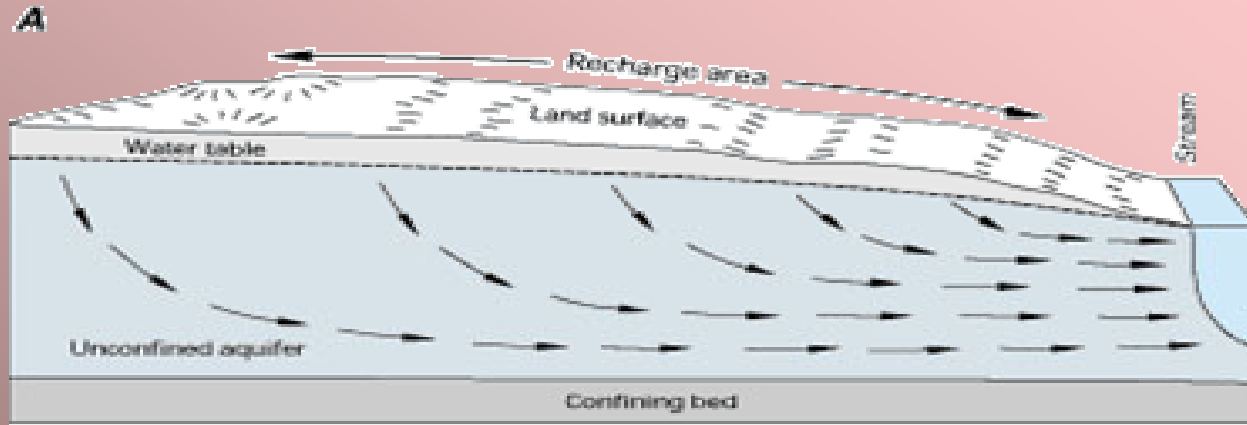
Other Problems & Solutions

- Summer peak demand
- Surface water impacts

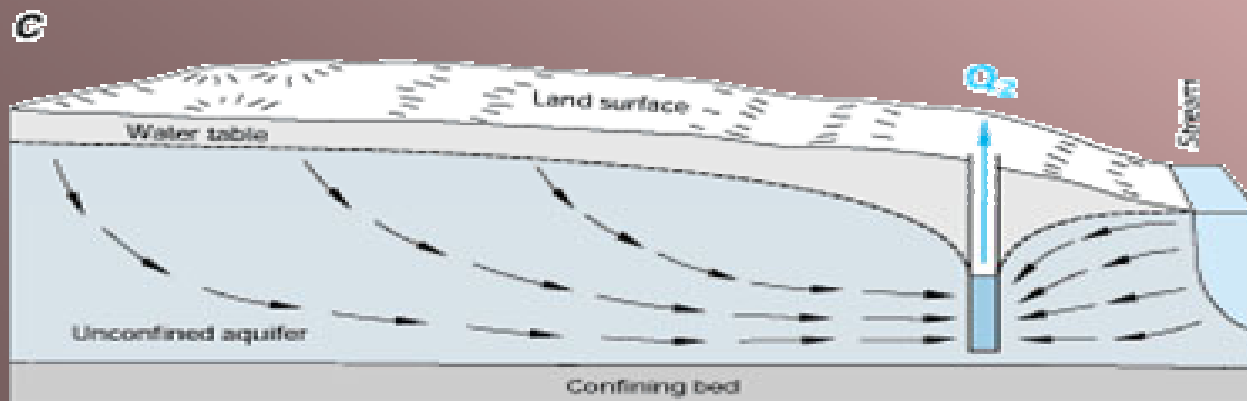
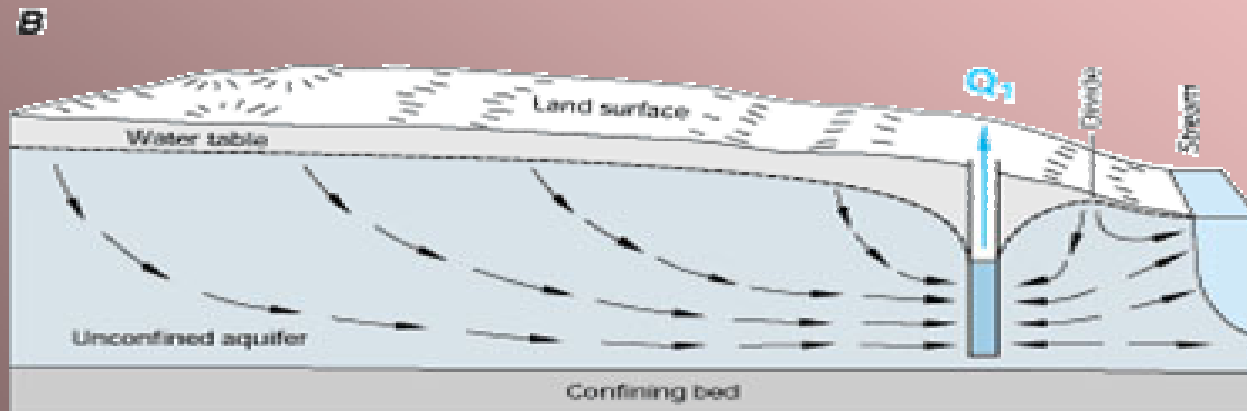
Lawn watering

City of Lakeville Daily Pumpage vs.
Water elevation in Paul Thomas Old Domestic well





ground water
withdrawal
affects
surface water



Surface Water Impacts

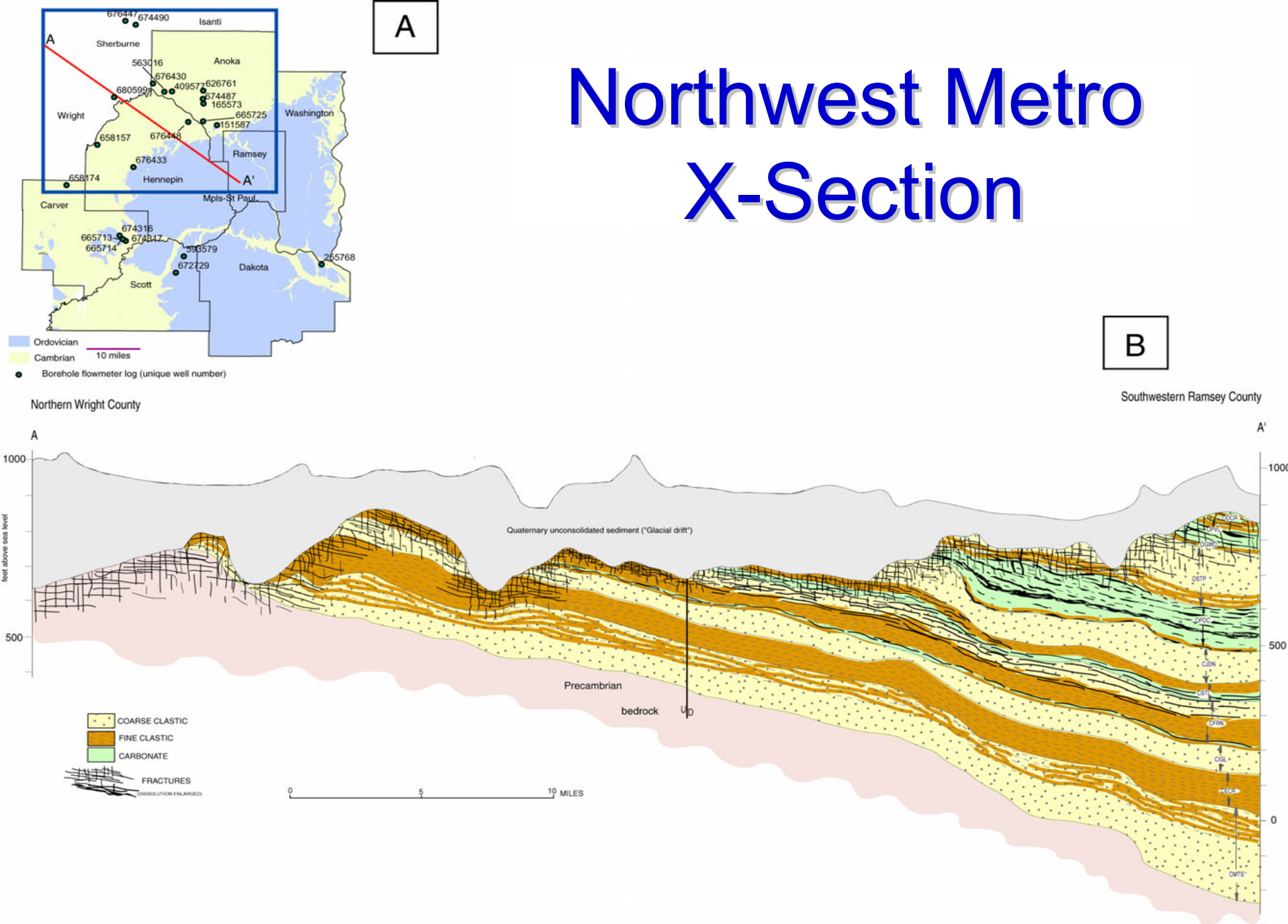
1976



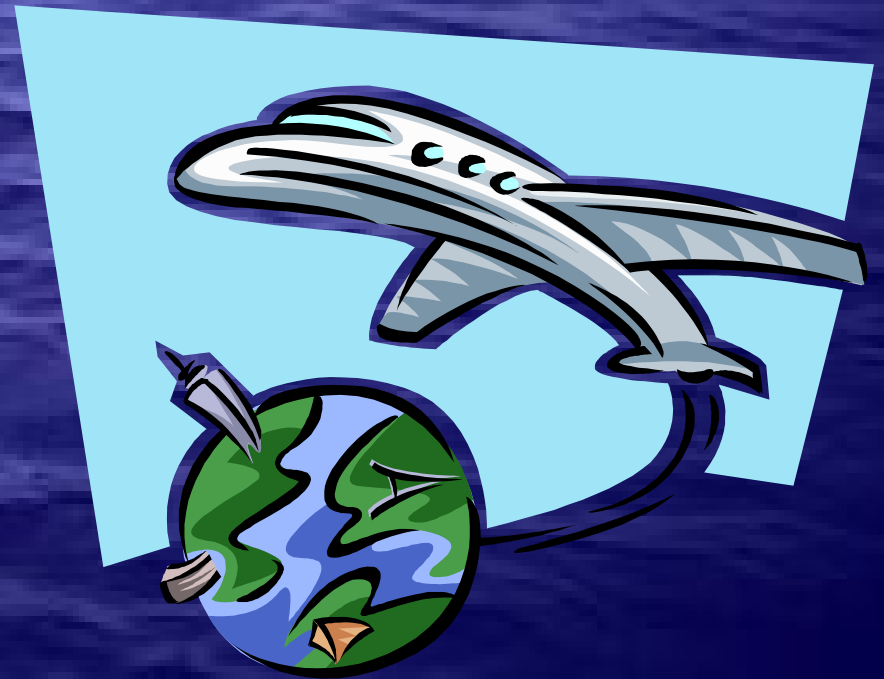
2000



Northwest Metro X-Section



Construction Dewatering

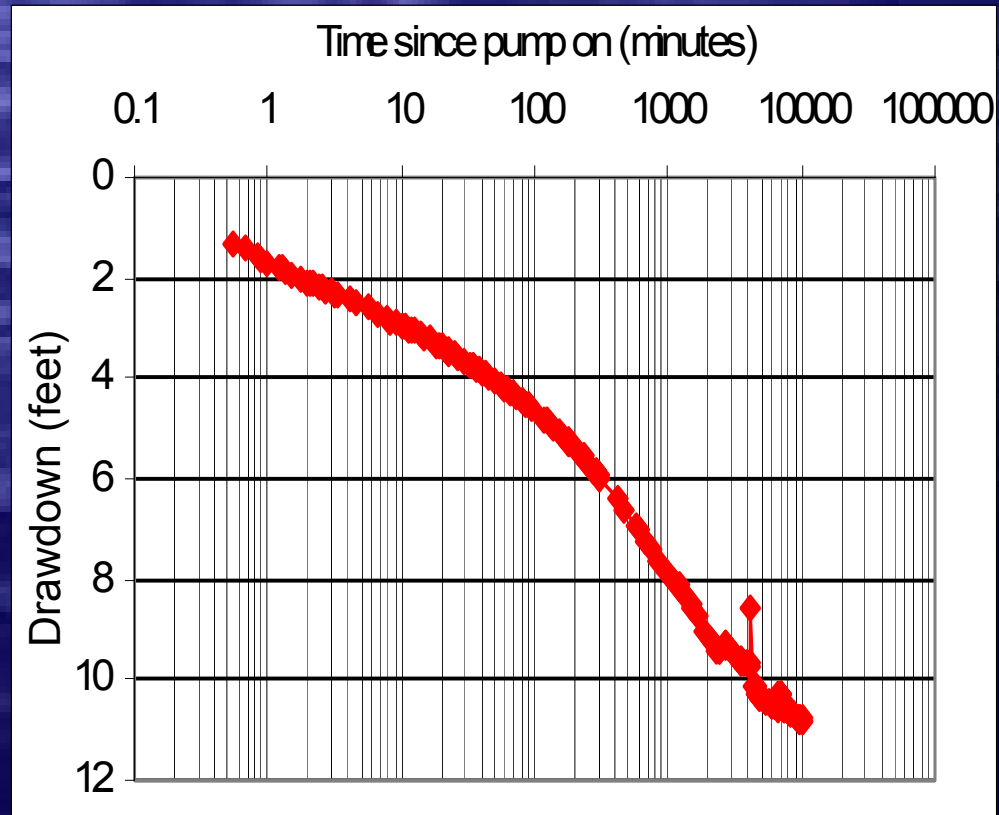
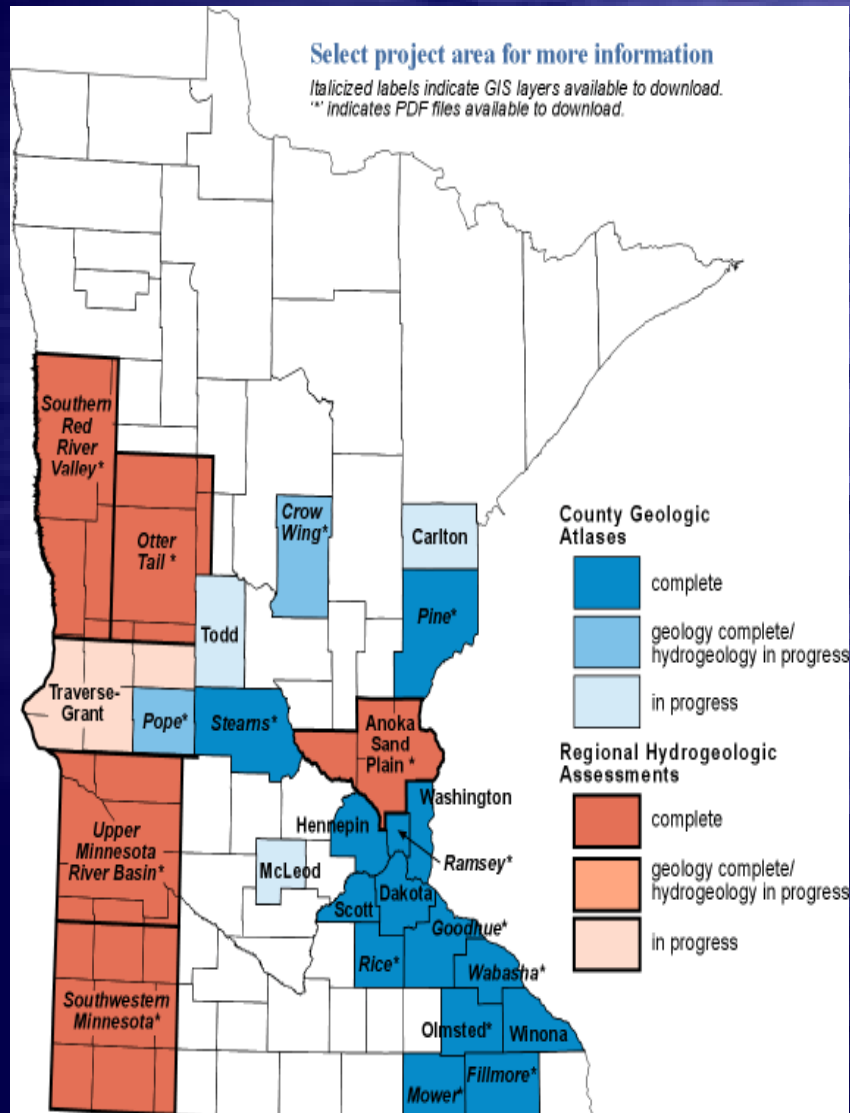


Future Needs

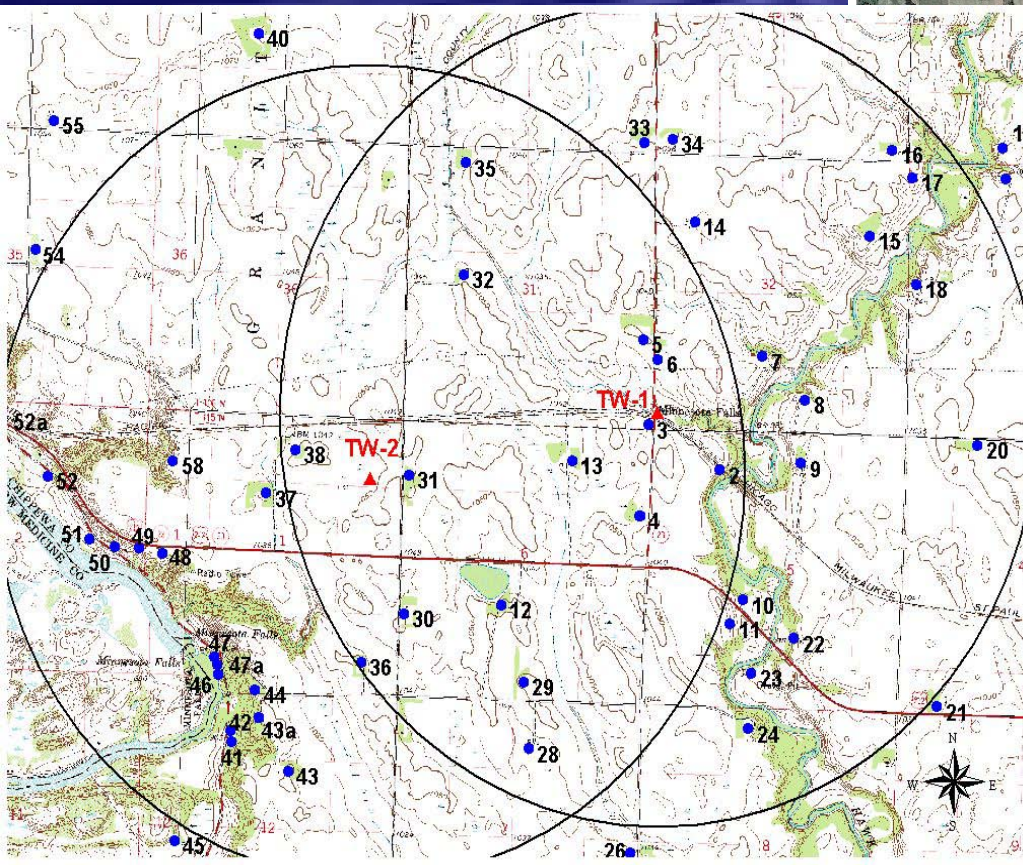
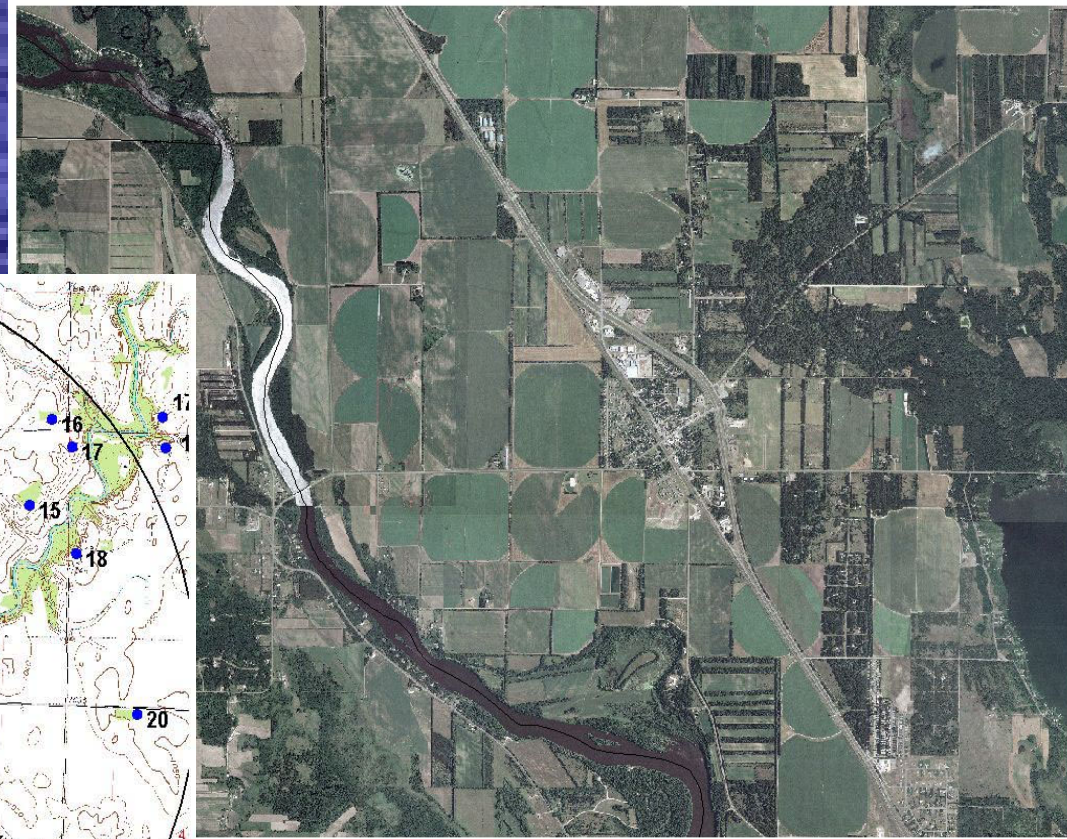
- Technical
- Planning
- Monitoring

Technical Needs

- Map aquifers
- Test aquifers
- Analyze Connections
- Modeling



Planning



Monitoring

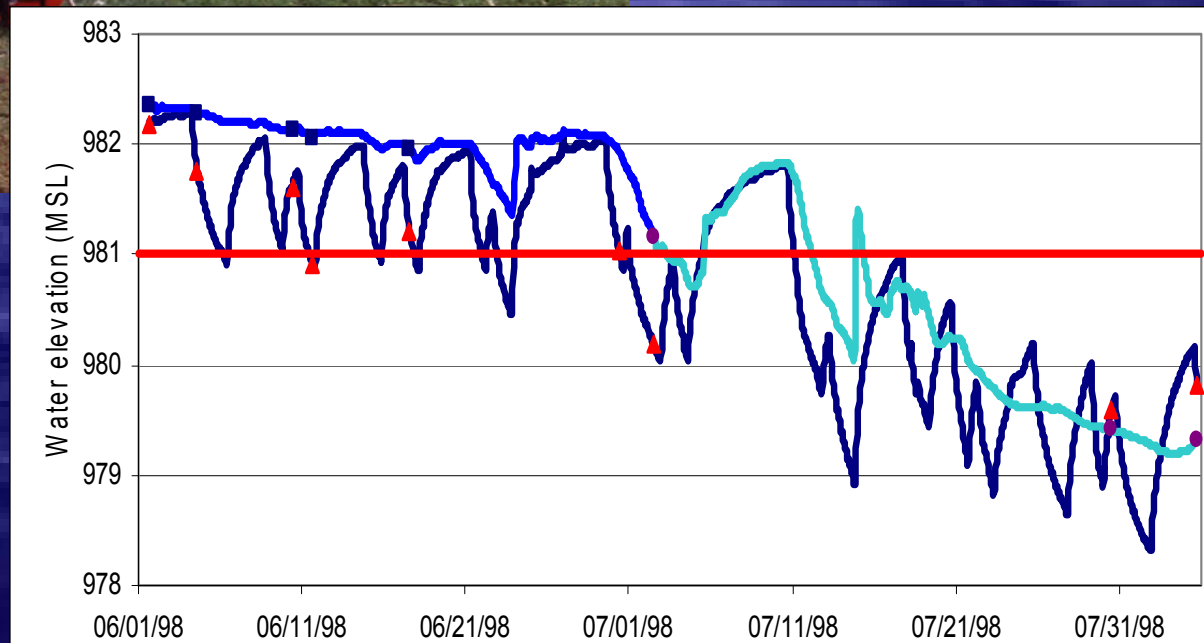
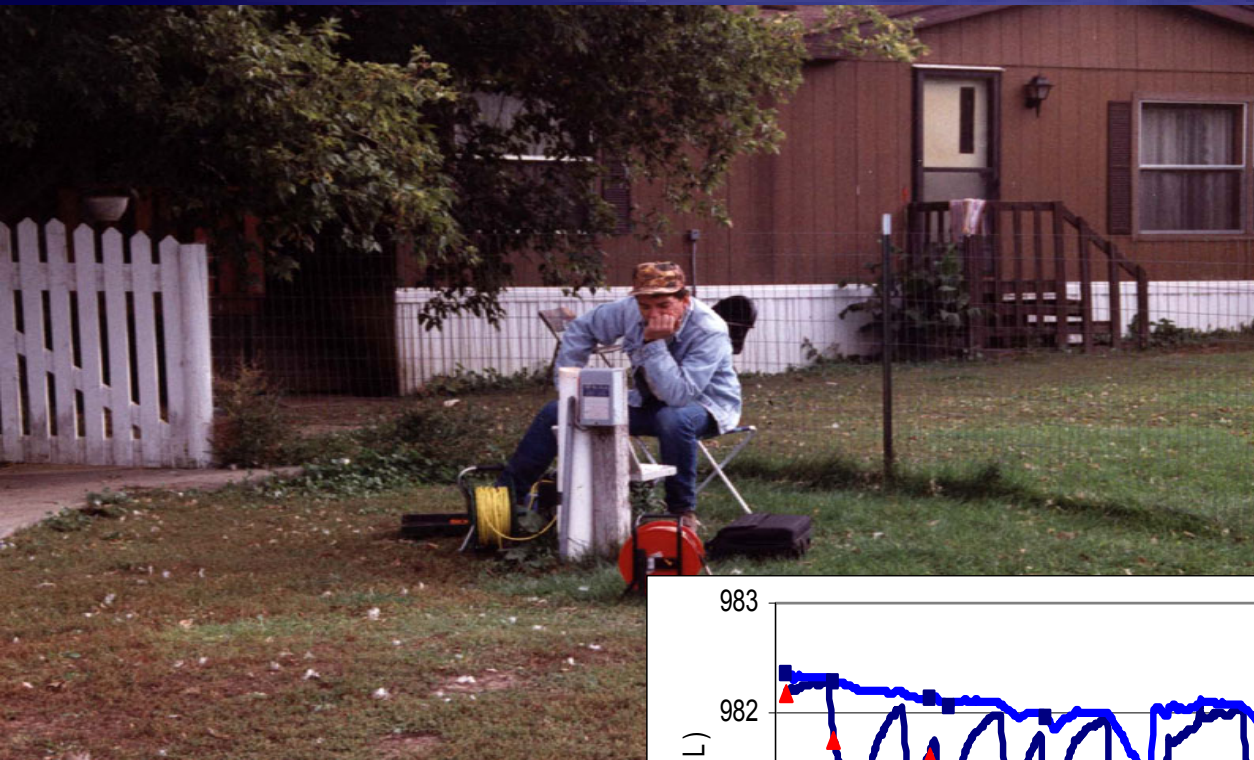




Photo credit: Kenneth Bradbury, Wisconsin

“More so than any other state, the quality and quantity of water in Minnesota is central to our way of life. It helps define who we are and what we value.”

Governor Pawlenty

<http://cwc.state.mn.us/>

Acknowledgements

- Met Council

- MGS

- DNR Waters Staff including:

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Laurel Reeves, Sarah Tufford

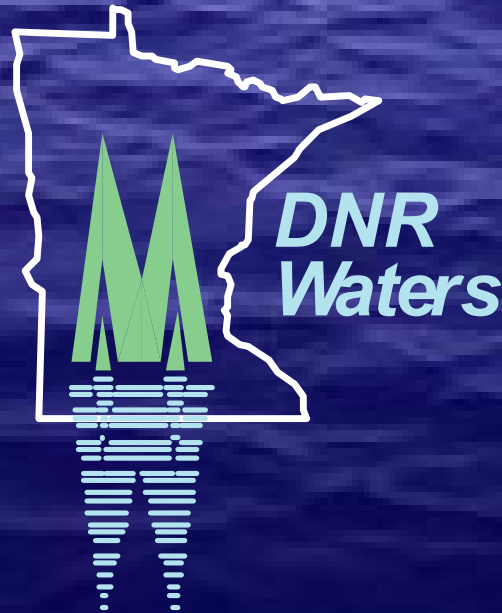
www.dnr.state.mn.us/waters

651-259-5700

Questions???

Please visit our web site at:
www.dnr.state.mn.us/waters

or contact the DNR Area Hydrologist serving your location



Thank you