

Use of Minnesota's Renewable Water Resources: Moving Toward Sustainability



**Princesa VanBuren
Environmental Quality Board**

**Minnesota Air, Water and Waste
Environmental Conference**

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Overview

- **Minnesota Environmental Policy Act – 1973**

“It is the continuing policy of the state government...to create and maintain conditions under which human beings and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations.”

- **Background on the EQB**

- **2007 EQB water sustainability report**

- **2008 EQB Water Availability Work Group**

Environmental Quality Board

- **9 Commissioners**
- **5 citizen members**
- **Governor's representative**
- **Administration**
- **Agriculture**
- **Commerce**
- **Employment & Economic Development**
- **Health**
- **Natural Resources**
- **Pollution Control**
- **Transportation**
- **Water & Soil Resources**

EQB Mission

- **The board develops strategic plans for Minnesota's environment & development, including the state water plan, and oversees the state's environmental review process**



Governor's Vision for Water

- **Keep Minnesota's waters clean, in the present and future**
- **Restore waters that are impaired**
- **Maintain an accurate picture of waters for citizens, managers and policy-makers**
- **Ensure adequate reserves of safe water**

Water Sustainability Project

➤ **Minnesota Statutes**

- **M.S. 103A.43(c) Water Assessment and Reports**
- ***The EQB shall work with DNR to coordinate an assessment and analysis of the quantity of surface and ground water in the state and the availability of water to meet the state's needs.***

➤ **April 2007 report**

- ***Use of Minnesota's Renewable Water Resources: Moving Toward Sustainability***

➤ **Lead agencies**

- **EQB and DNR**

➤ **Other partners**

- **USGS, MGS, U of M, Met Council, MDH and EPRI**

Adding Value

- **Highlights what we know & don't know**
- **Informs planning**
- **Raises important questions**

Use of Minnesota's Renewable Water Resources *Moving Toward Sustainability*



A report of the Environmental Quality Board
and Department of Natural Resources
April 2007

Sustainable Supply and Use

- ***Sustainable supply or renewable resource*** defined:
 - **The quantity of water that can be removed from the system on a renewable basis without drawing down the resource**
- ***Sustainable use*** defined:
 - ***Sustainable water use* is the use of water to provide for the needs of society, now & in the future, without unacceptable social, economic or environmental consequences**

Project Need

- Understand how Minnesota is doing
- Define unknowns in quantity & use
- Recognize the importance of water in planning for growth
- Highlighted by drought of 2006 & 2007



Project Steps

- **Determine current water use (2005)**
- **Estimate future use (2030)**
- **Quantify sustainable supply**
- **Compare supply & demand on a county scale**



A Preview - Project Findings

➤ 2005

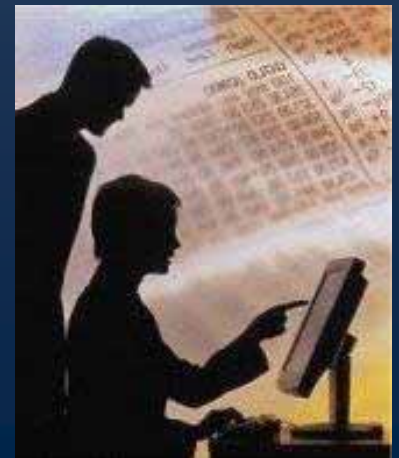
- Four counties used more than 50%
- Range was 1% to 135%

➤ 2030

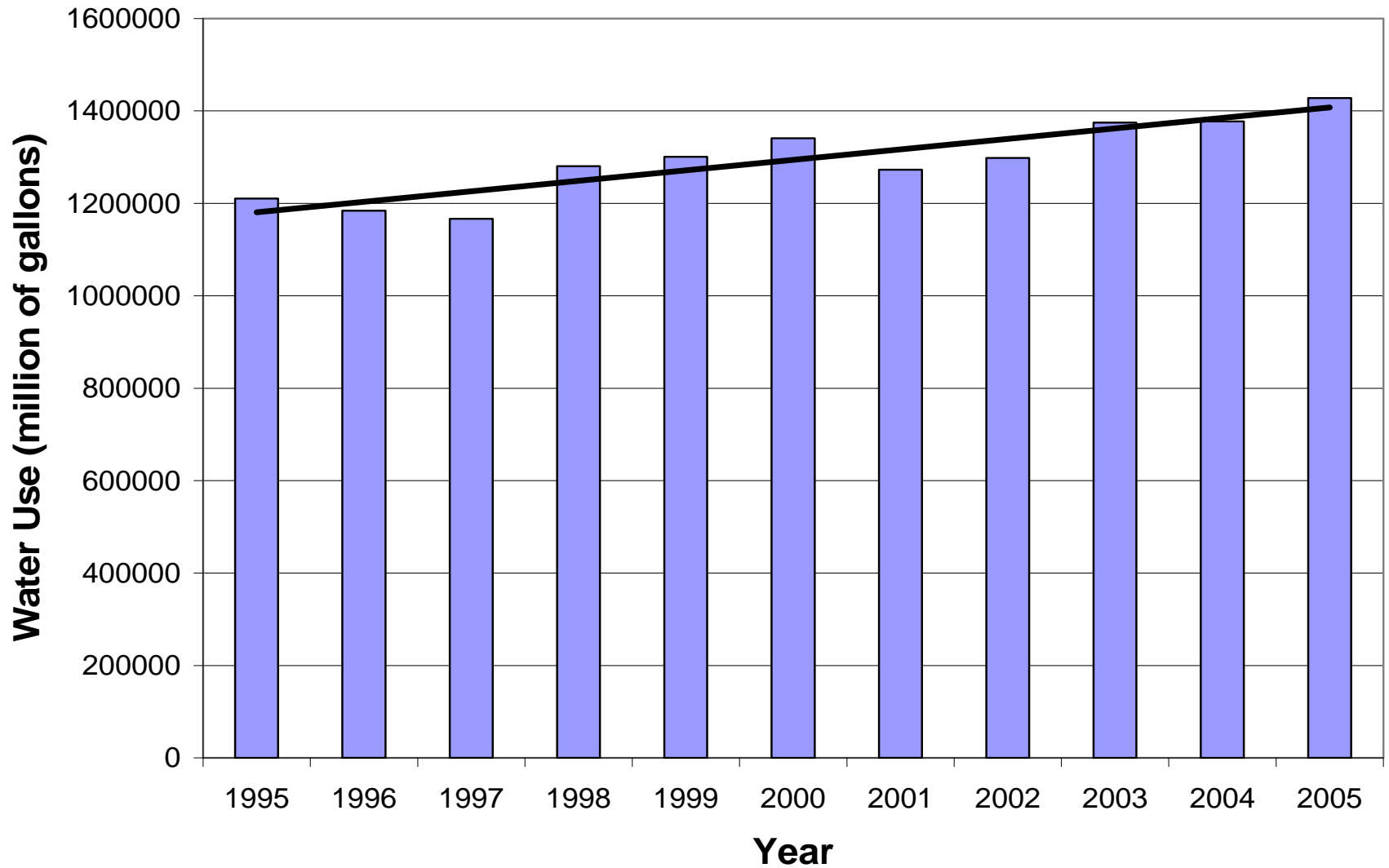
- Seven estimated at more than 50%
- Range was 1% to 177%

Current Water Use: Permitted Use

- Focused on 1995-2005
- Summarized DNR permit database
- Compiled population by county
- Calculated per capita usage



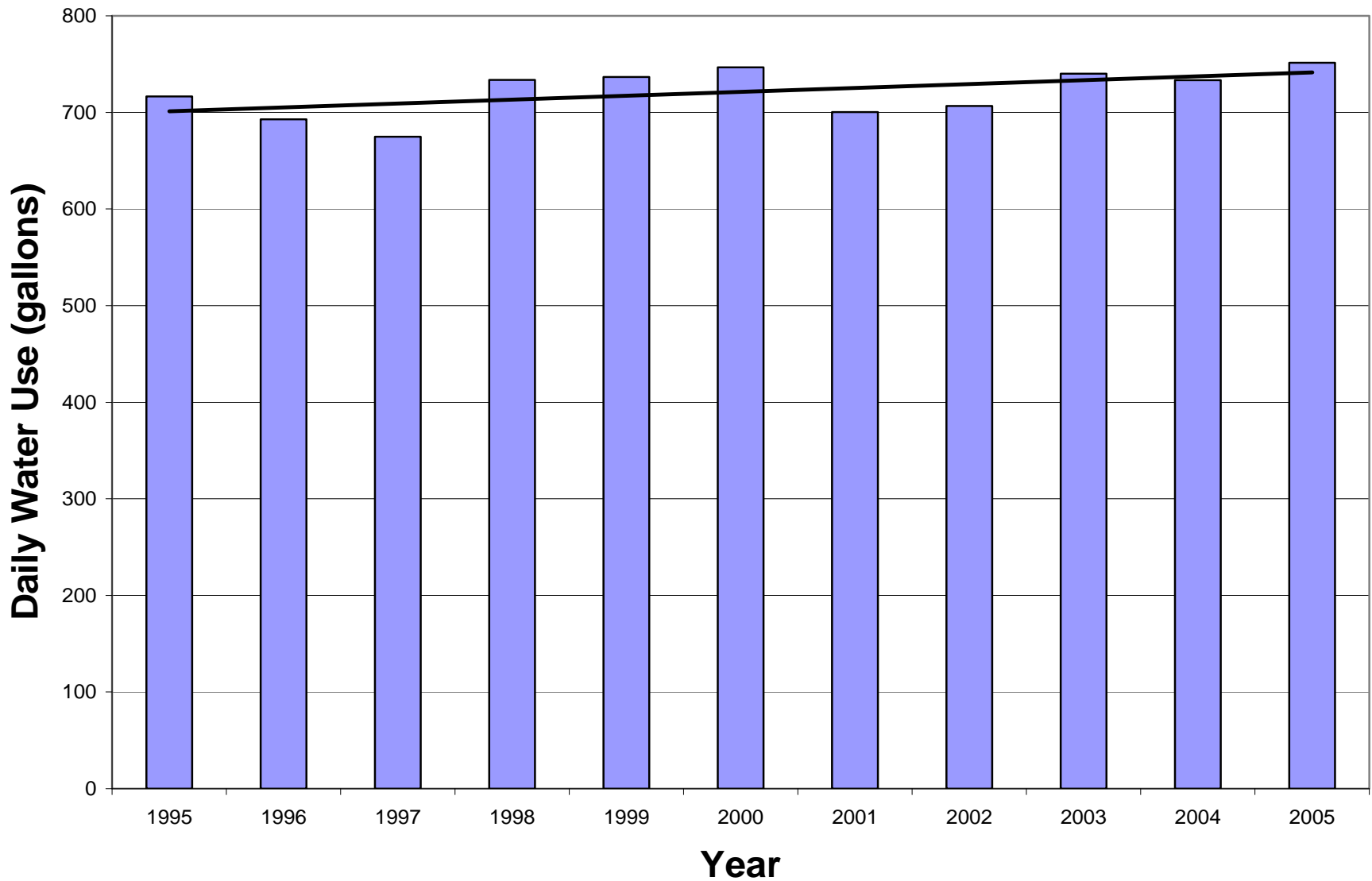
Minnesota Annual Water Use



Water Use Trends 1995-2005

- **12% increase in population**
- **18% increase in total water use**
- **6% increase in per capita use**

Daily Per Capita Water Use



Current Water Use: “Unpermitted”

- Established population on private wells
- Used MDH & census data
- Calculated unpermitted use



Baseline Per Capita Water Use

- **Added unpermitted & permitted to establish base use**

Per Capita 1995-2005 = Permitted + Unpermitted

2005 Gross Water Use

- **Calculated baseline**

2005 Gross Use = Per Capita 1995-2005 x Population 2005

- **Reduced impact of climatic variations**

2005 Net Water Use

- **Evaluated all 1,600 surface water permit**

- **Removed imported water & non-consumptive use**

Imported Waters

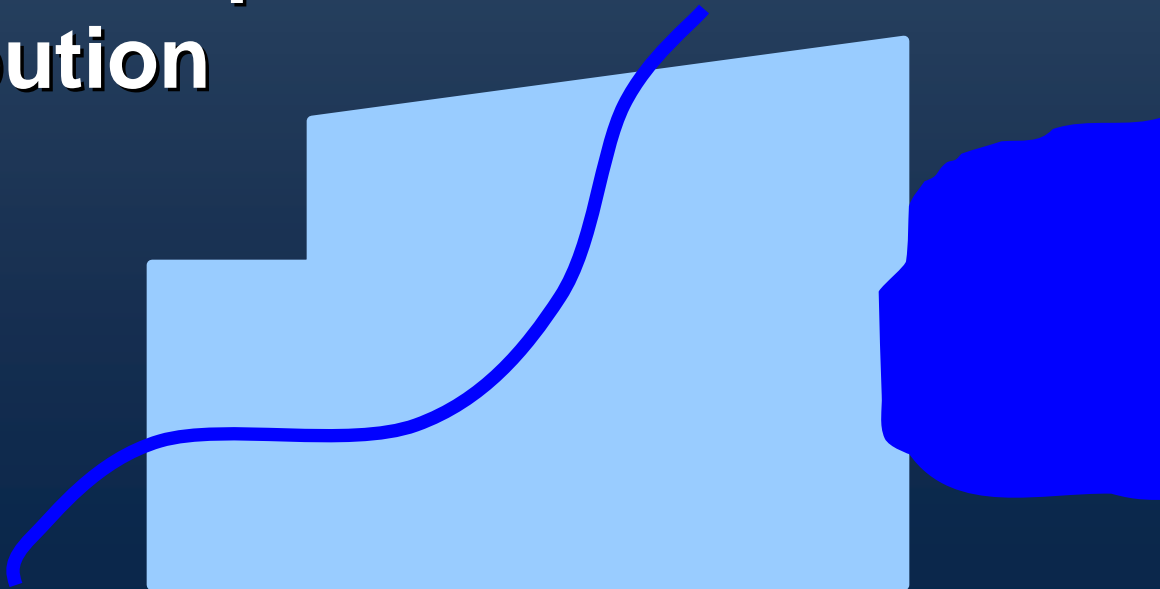
- Surface water originating outside of a county
- Removed in analysis
- Treated as ratio of upstream to in-county contribution

Examples:

Mississippi River

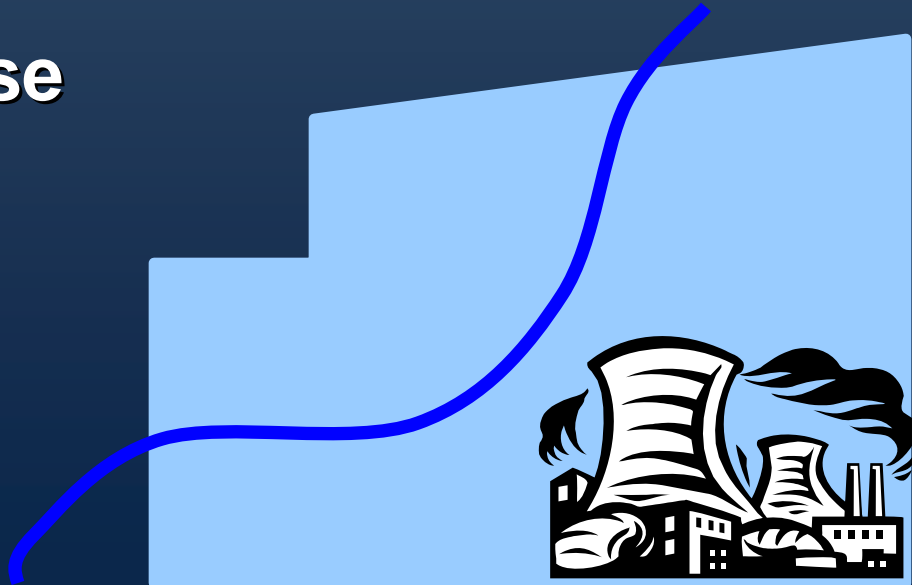
Minnesota River

Lake Superior



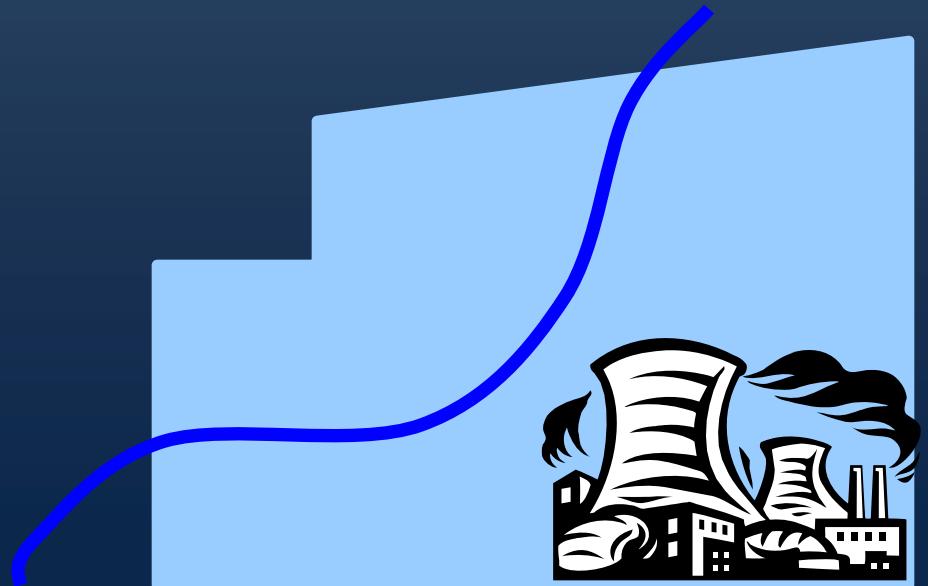
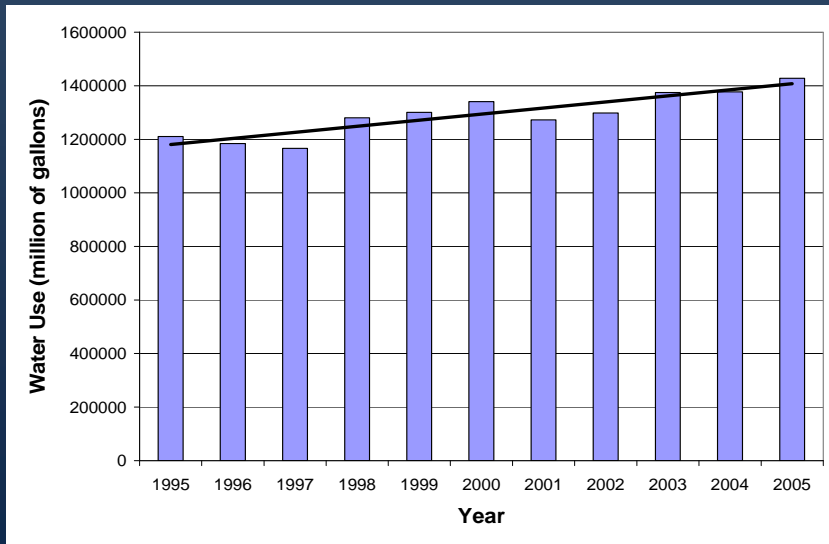
Non-Consumptive Use

- An industry may return much of its water to the hydrologic system
 - **Steam power cooling consumes only 2%**
- Ground water use considered consumptive



2005 Net Water Use

**2005 Net Water Use = 2005 Gross Use –
Imported Waters – Non-consumptive Use**



Future Water Use: Estimate 2030 Demand

➤ Assumed per capita use is constant to 2030

- Increase
- Constant
- Decrease



➤ Estimated 2030 population from State Demographer & Met Council

2030 Gross Water Use

2030 Gross Use = Per Capita 1995-2005 x Population 2030

2030 Net Water Use

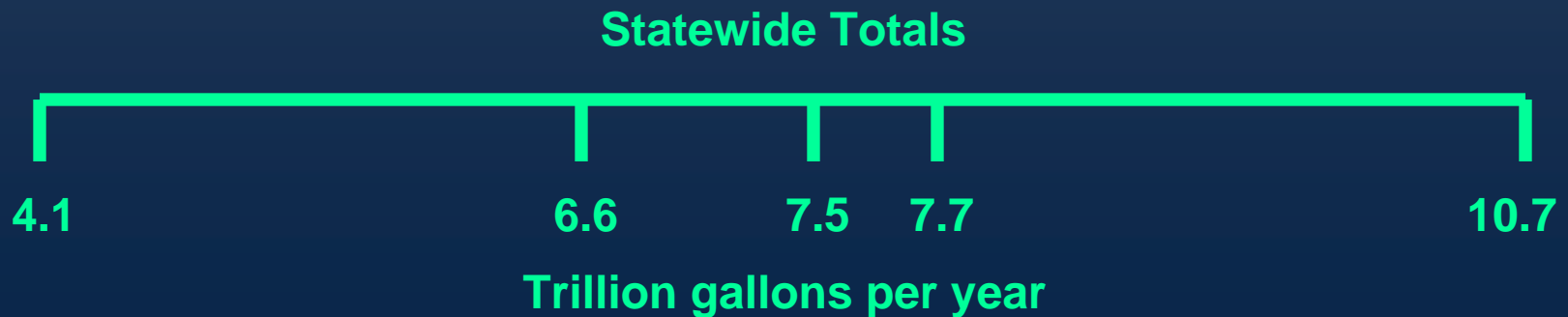
2030 Net Use = 2030 Gross – Imported – Non-consumptive

Quantify Renewable Resources

- **Published supply methods were used**
- **Surrogates for sustainable supply**
- **Quantified at county scale**
- **Considers:**
 - Soils, precipitation, watershed discharge, evapotranspiration, ecoregion, hydrology, etc.**

Supply Methods

- Regional regression recharge
- Watershed characteristics
- Net available precipitation
- Fractional precipitation



Supply Value

- RRR high & low bracket others
- Median of remaining three



Supply vs. Demand

- **County by county**
- **Use as percent of renewable resource**
- **2005 & 2030**

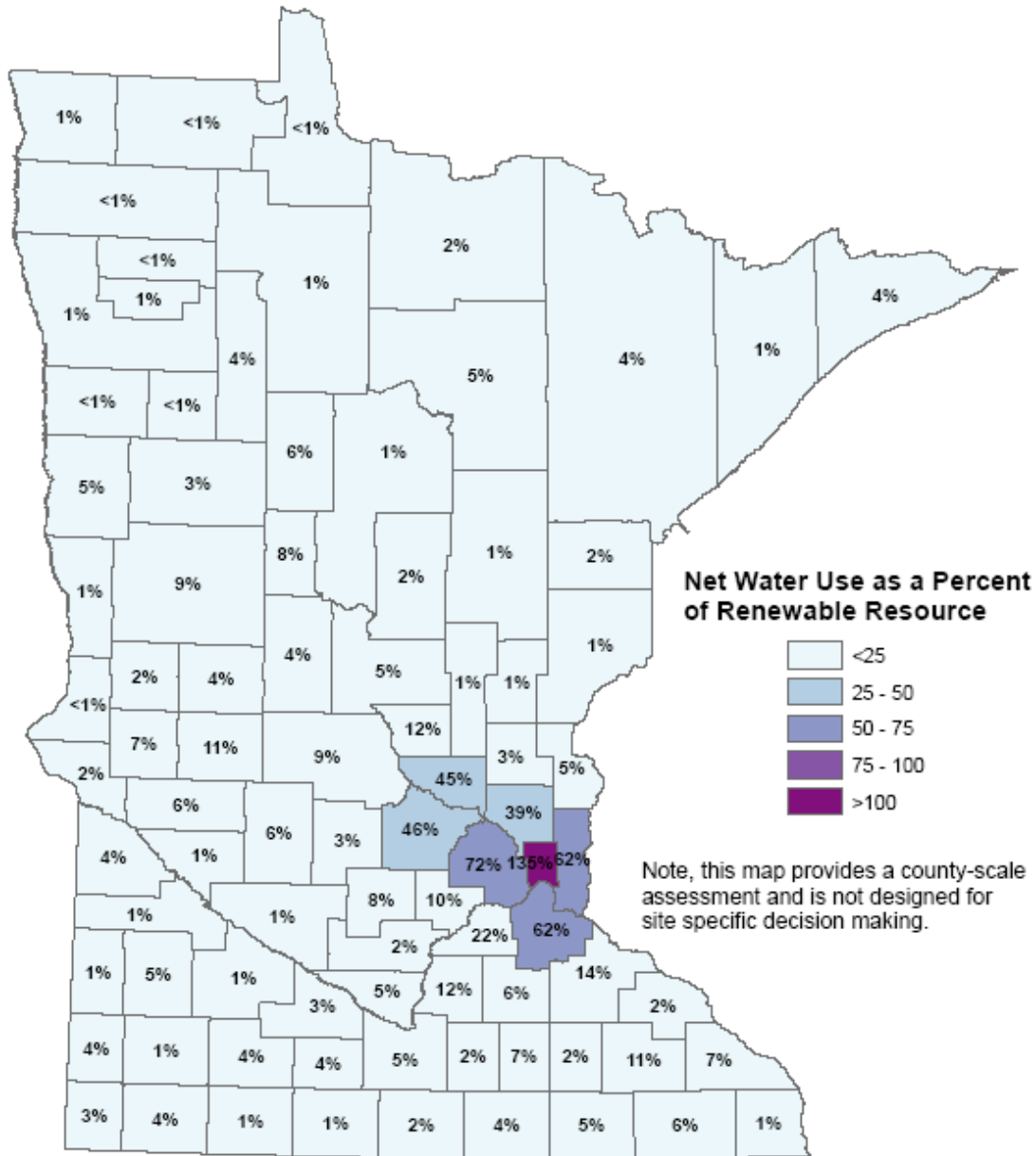


County Supply



County Demand

2005 Net Water Use as a Percent of the Renewable Resource

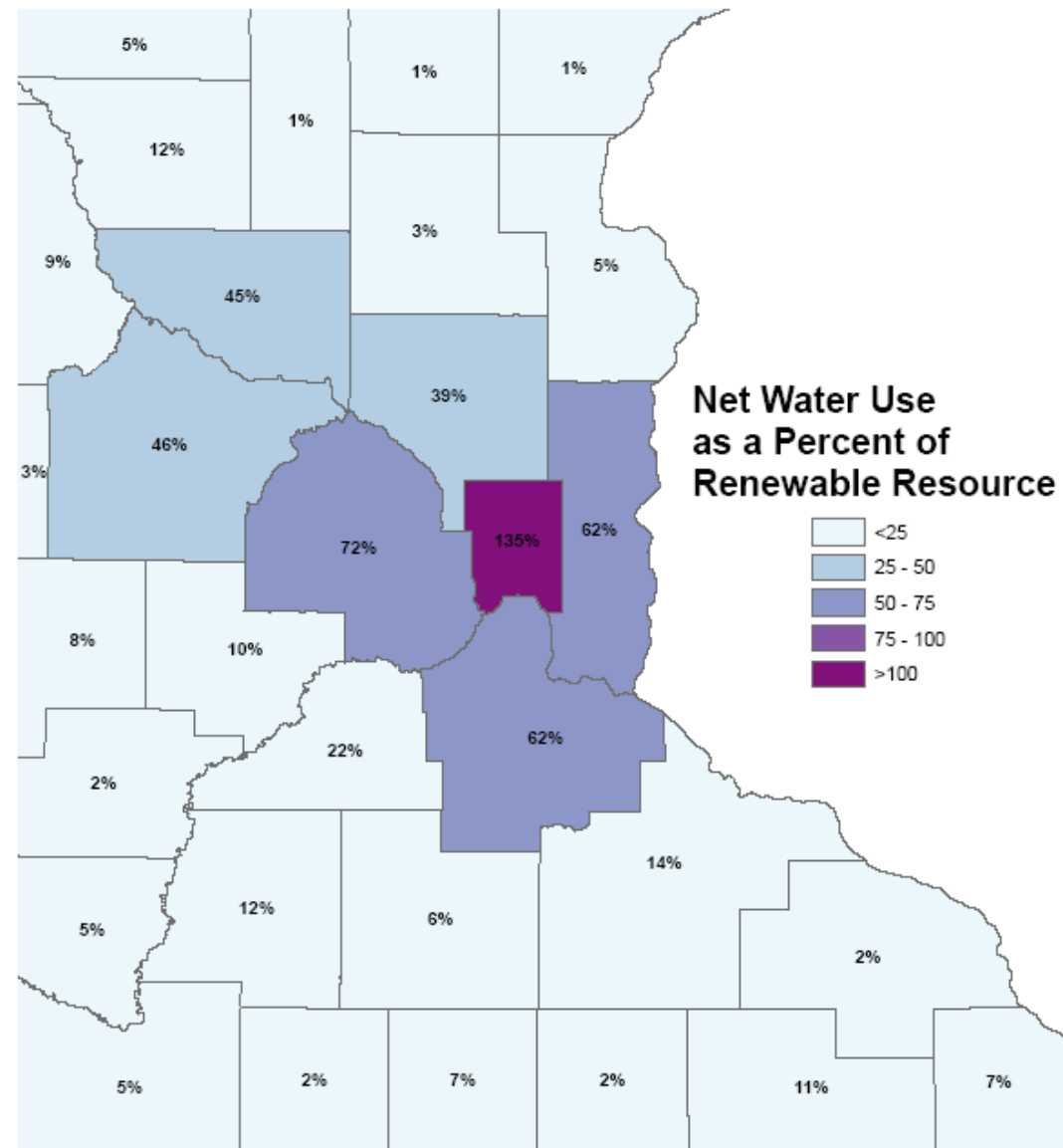


- **Ramsey County 135%**
- **Four counties used more than 50%**
- **Metro range was 10% to 135%**
- **Greater Minnesota range was <1% to 46%**

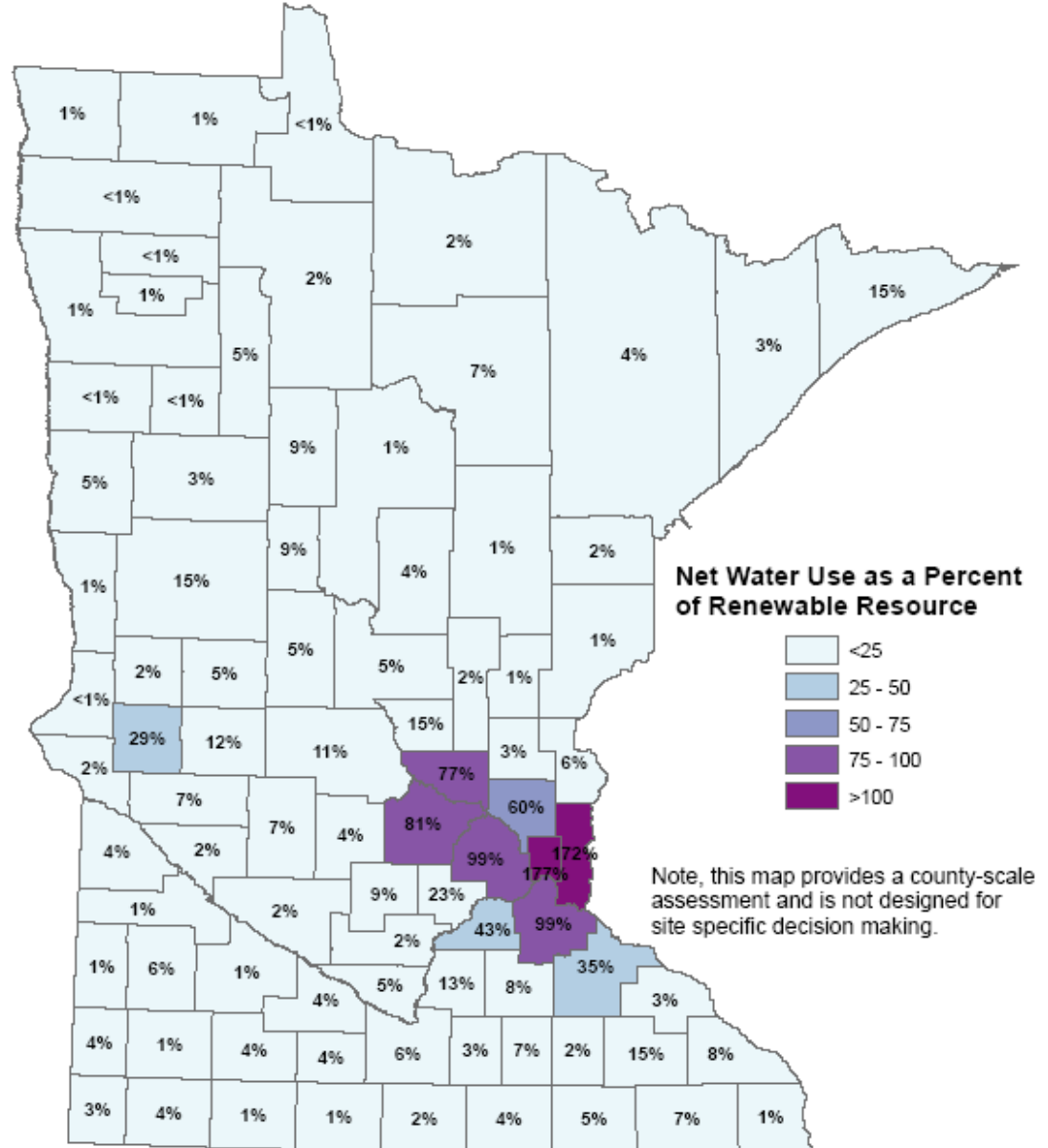
2005 Water Use in Minnesota

- Ramsey County 135%
- Four counties used more than 50%
- Metro range was 10% to 135%
- Greater Minnesota range was <1% to 46%

2005 Net Water Use as a Percent of the Renewable Resource



2030 Net Water Use as a Percent of the Renewable Resource



➤ **Ramsey County 177%**
Washington County 172%

➤ **Seven counties used more than 50%**

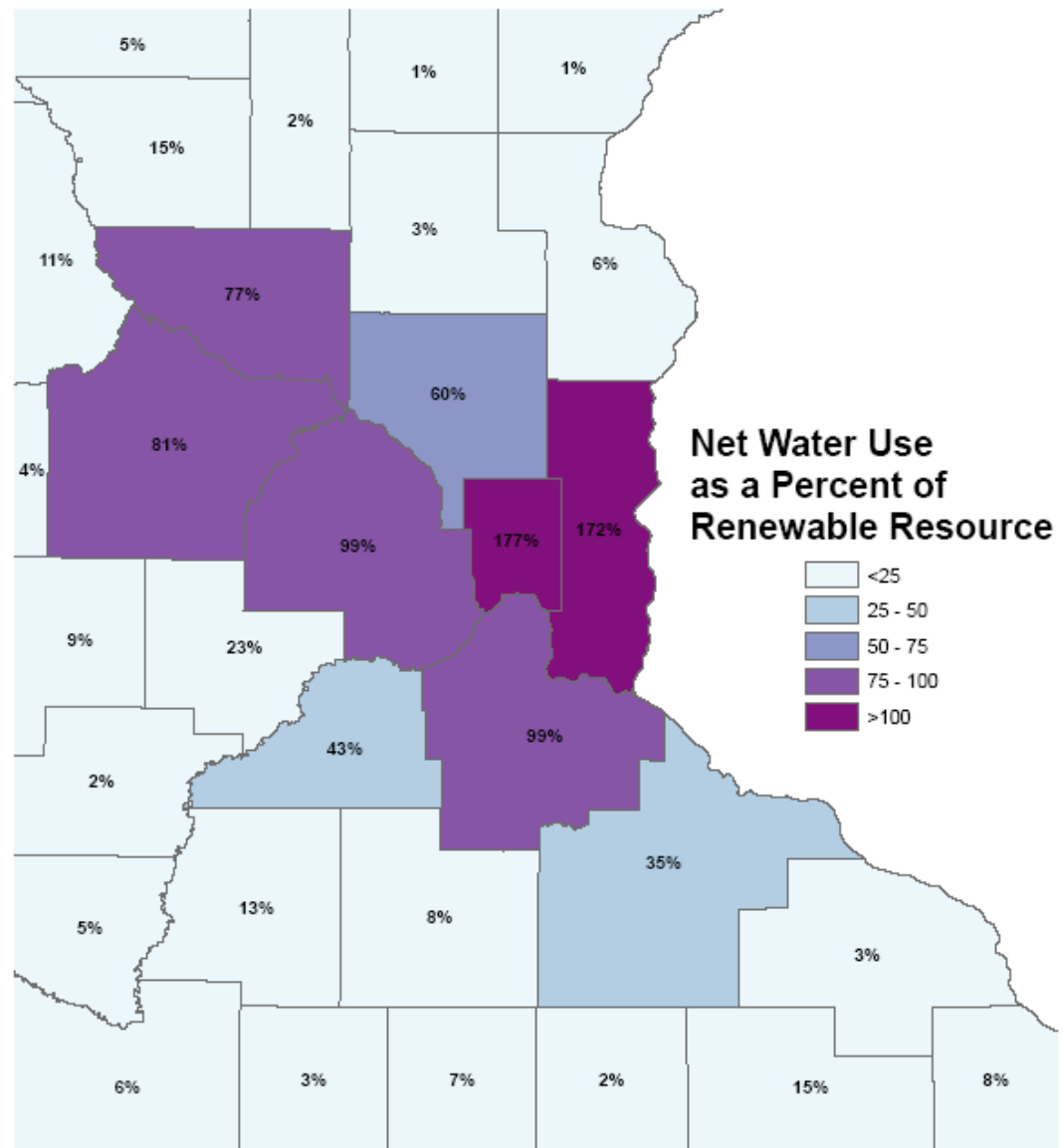
➤ **Metro range was 23% to 177%**

➤ **Greater Minnesota range was <1% to 81%**

2030 Water Use in Minnesota

- Ramsey County 177%
- Washington County 172%
- Seven counties used more than 50%
- Metro range was 23% to 177%
- Greater Minnesota range was <1% to 81%

2030 Net Water Use as a Percent of the Renewable Resource



Water Use in a Typical County

Typical County

Area = 716 sq mi

Renewable water resource of 54,722 MGY

Gross water use of 2,111 MGY

Net water use of 1,823 MGY

2005 net use at 3.3% of the county's
renewable water resource

Water Use in a Typical County

What if the county were to add a high water-using industry?

Example:

New Use = 750 MGY



Water Use in a Typical County

750 MGY

1.4% of the county's supply

**41% of the county's current net
water use**

10 square miles of renewable water



Water Use in a Typical County

- Assumes water supply evenly distributed over county
- Provides basic tool for putting a proposed use in perspective



APEC Ethanol Facility

Stevens County

Area = 574 sq mi

**Renewable ground water resource of
6,087 MGY**

Water use of 1,823 MGY

**2005 water use at 30% of the county's
renewable ground water resource**

APEC Ethanol Facility Water Use

526 MGY (based on 1,000 gpm)

9% of the county's supply

29% of the county's current water use

50 square miles of renewable ground water

County-wide use of resource goes from 30-38%



Study Characteristics

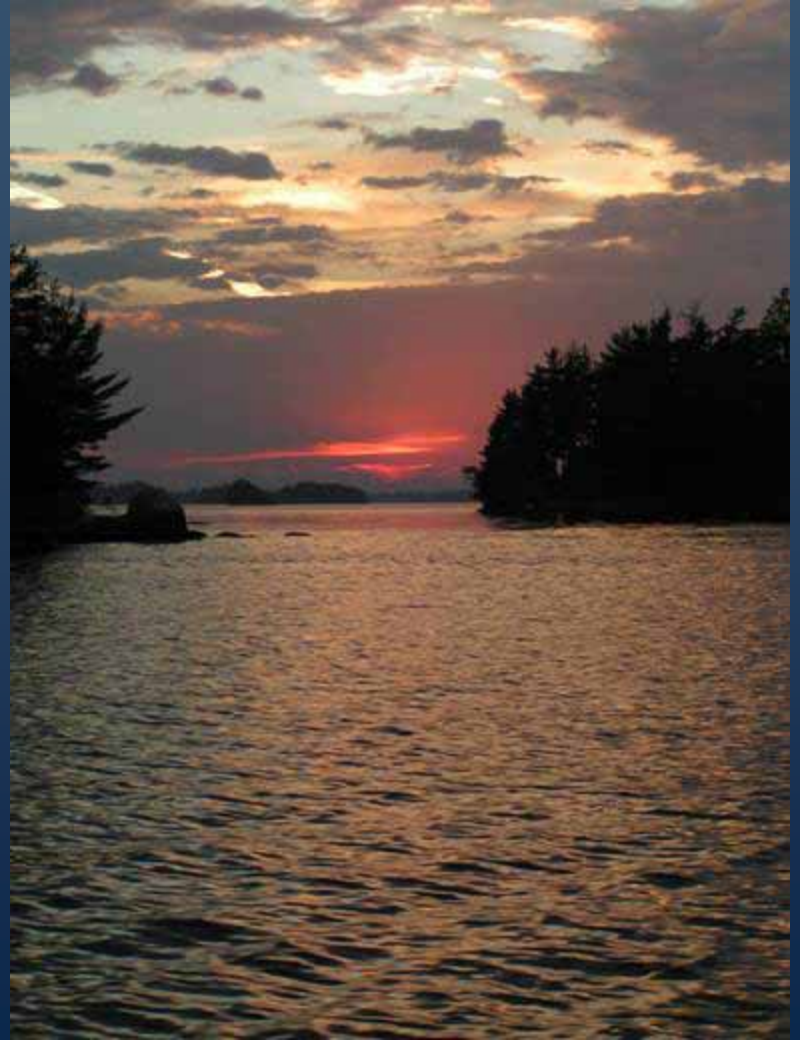
- **Used best available information**
- **High level of agreement in model predictions**
- **Developed “most likely” scenario**
- **Chose median values for population, use & supply**
- **Did not include “safety factor”**
- **Doesn't inform site-specific permitting**

A “Water Rich” State?

- **Can Minnesota still be considered water rich?**
- **Real limits exist ...**
 - **Regionally, the growth corridor**
 - **Locally, throughout the state**

Adding to this Foundation

- **Water quality**
- **Seasonal or monthly assessments, as well as annually**
- **Ecosystem needs for water**
- **Sub-county level work**



In Conclusion

- **First systematic assessment lays a strong foundation for future work**
- **Tool for planning**
 - **Local water commitments; need for conjunctive use; Minnesota's long-term needs**
- **Aids in call for better water resource information**
 - **Identifies research opportunities – ecosystem needs, impacts of land use & climate change**
 - **Informs monitoring & research priorities**

What's New in 2008?

EQB Water Availability Work Group

- **MPCA board request**
 - **RGU in ER for variety of projects**
 - **Need for information broader than individual projects**
- **EQB charge**
- **Interagency work group convened**
- **Work plan created and approved**



The Charge

- **Find a way to put consideration of proposed water uses into a broader framework**
- **Consider standards to address environmental impacts of water uses**
- **Summarize needs and options for collecting additional data**

Assumptions

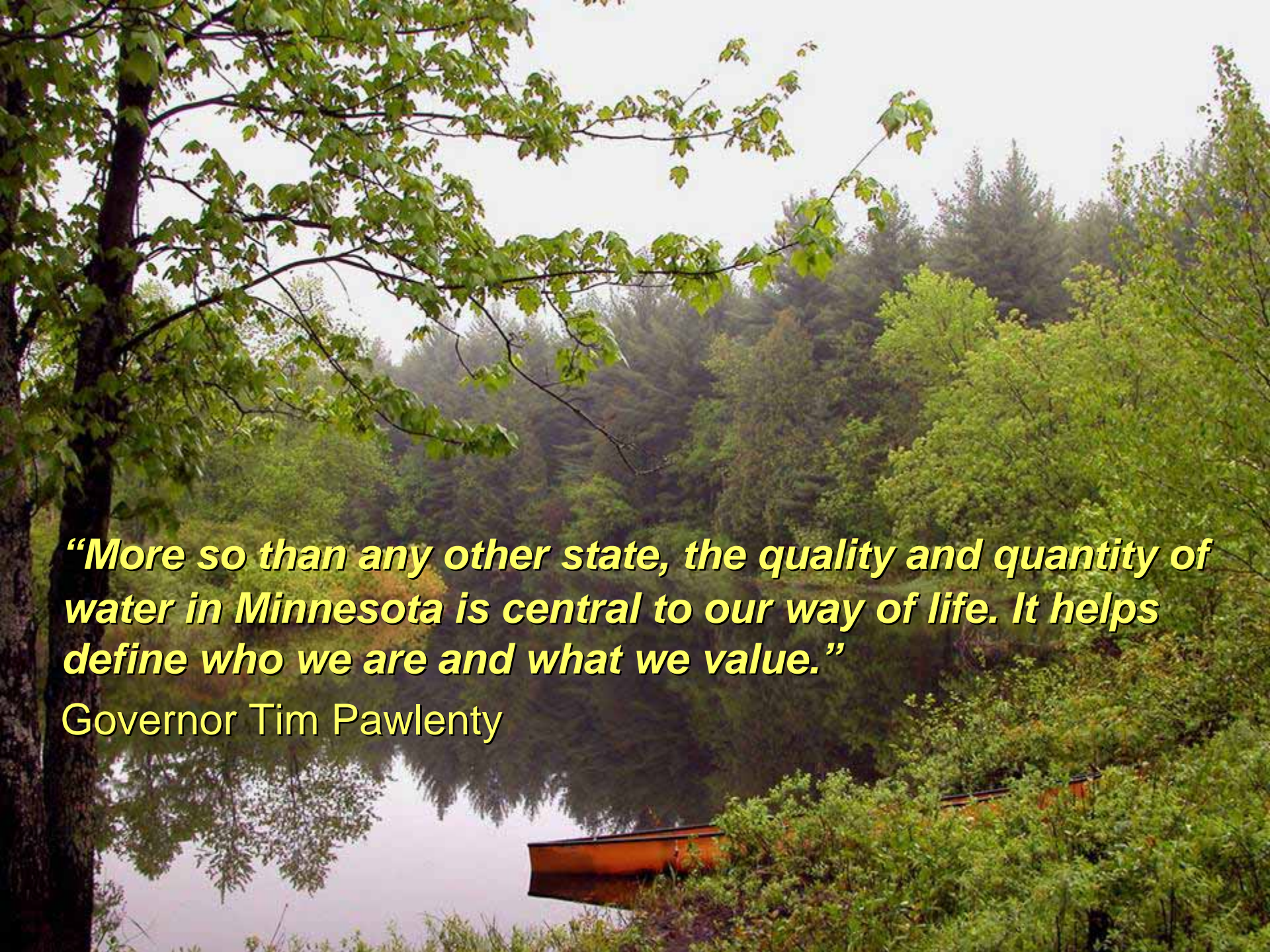
- **Complete project in six months**
- **Base work on existing data**
- **Project should give public a better understanding of water availability and sustainability**
- **Today's decisions would benefit from an understanding of the context of future needs**

Questions

- **What do and don't we know about Minnesota's ground water resources?**
- **Can we make any estimates on water availability in a broad sense?**
- **What's our water resources management strategy?**
- **Do we have a sustainable planning strategy? What is it?**
- **Can we identify the data gaps and develop tools to improve our understanding?**

Future Water Management

- **Puts water upfront in land use decisions**
- **Manages aquifers & watersheds as one**
- **Is well informed**
- **Accepts limits to growth**
- **Meets ecosystem, community & business needs**



“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 Tim Pawlenty