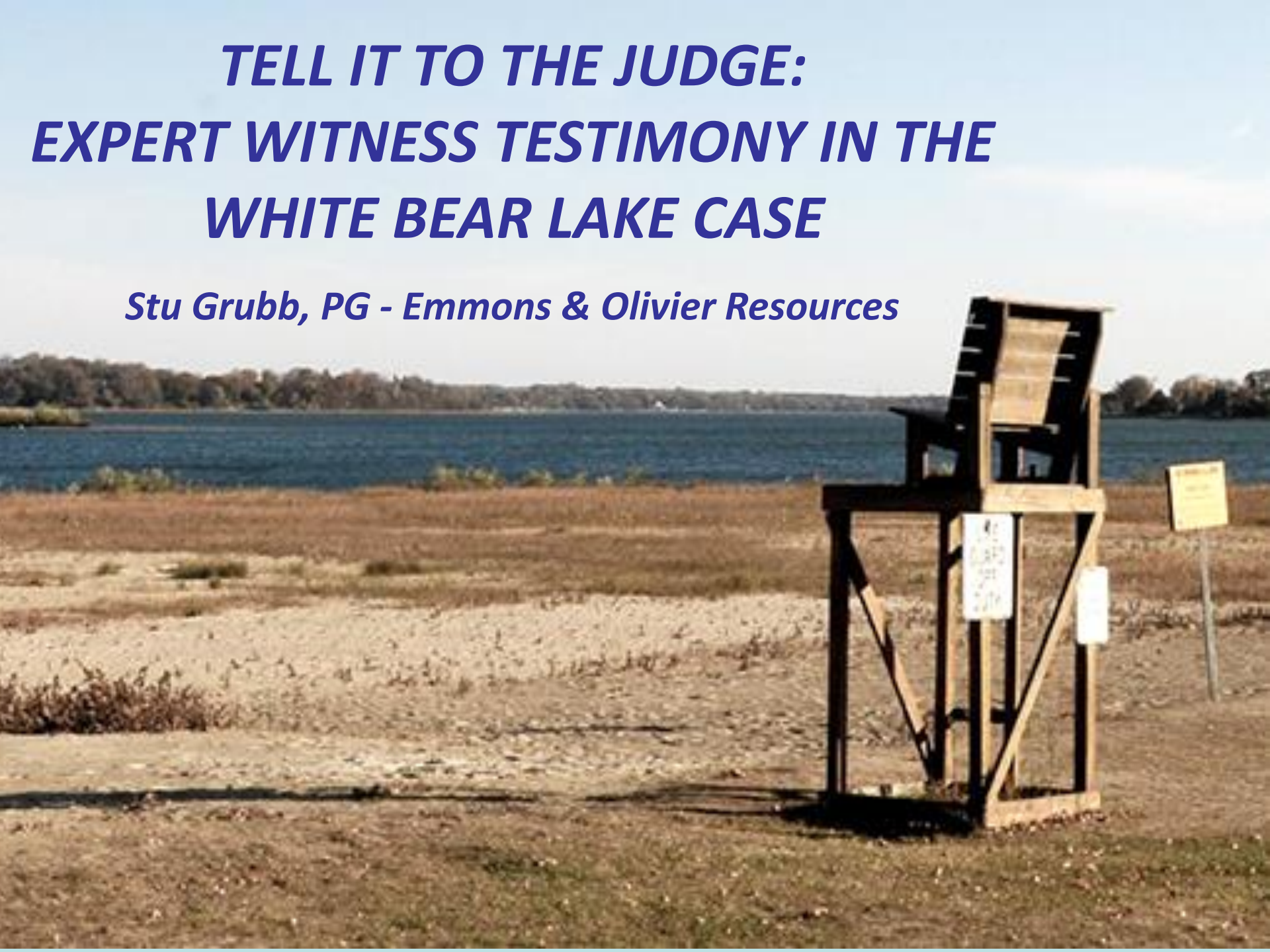
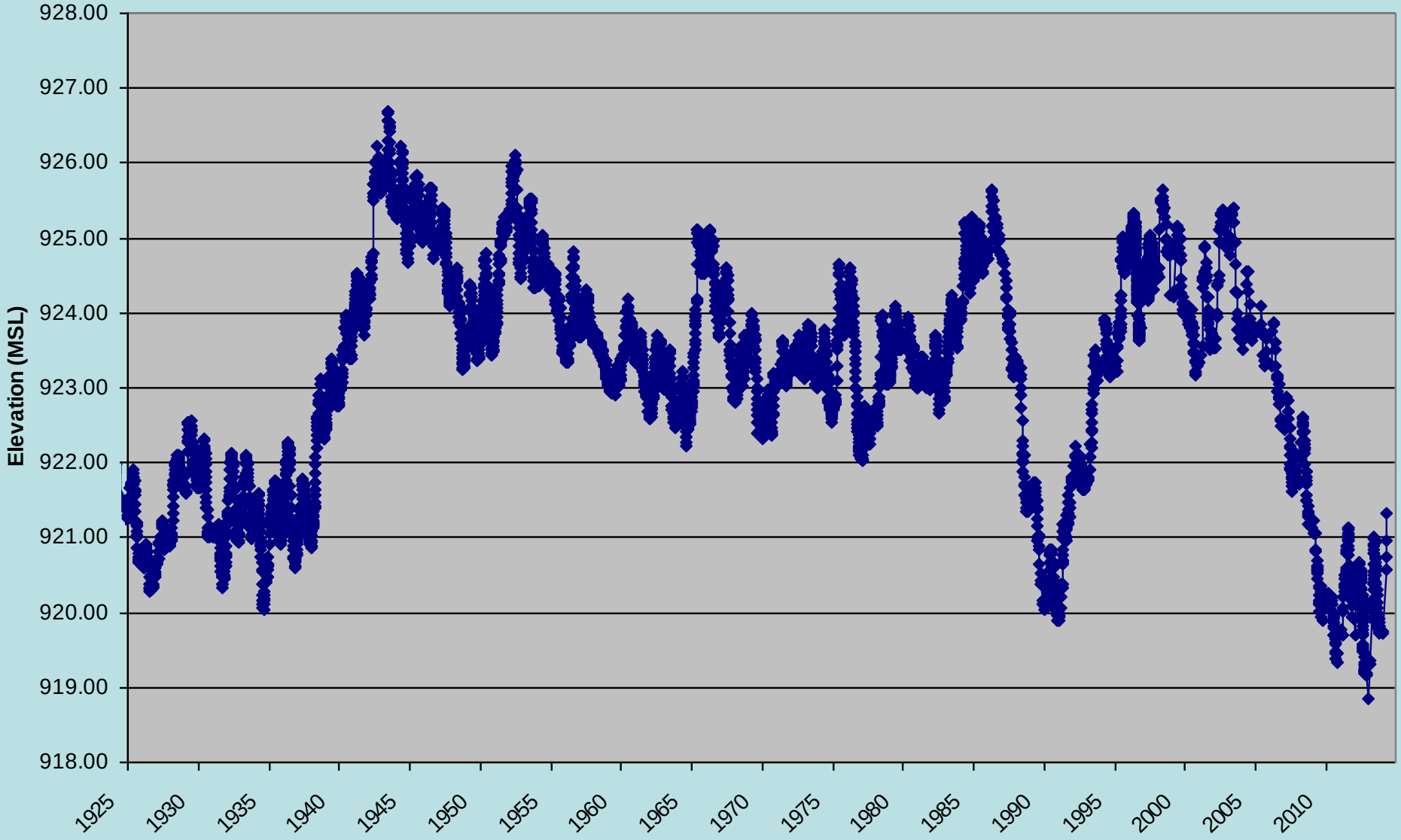
TELL IT TO THE JUDGE: EXPERT WITNESS TESTIMONY IN THE WHITE BEAR LAKE CASE

Stu Grubb, PG - Emmons & Olivier Resources

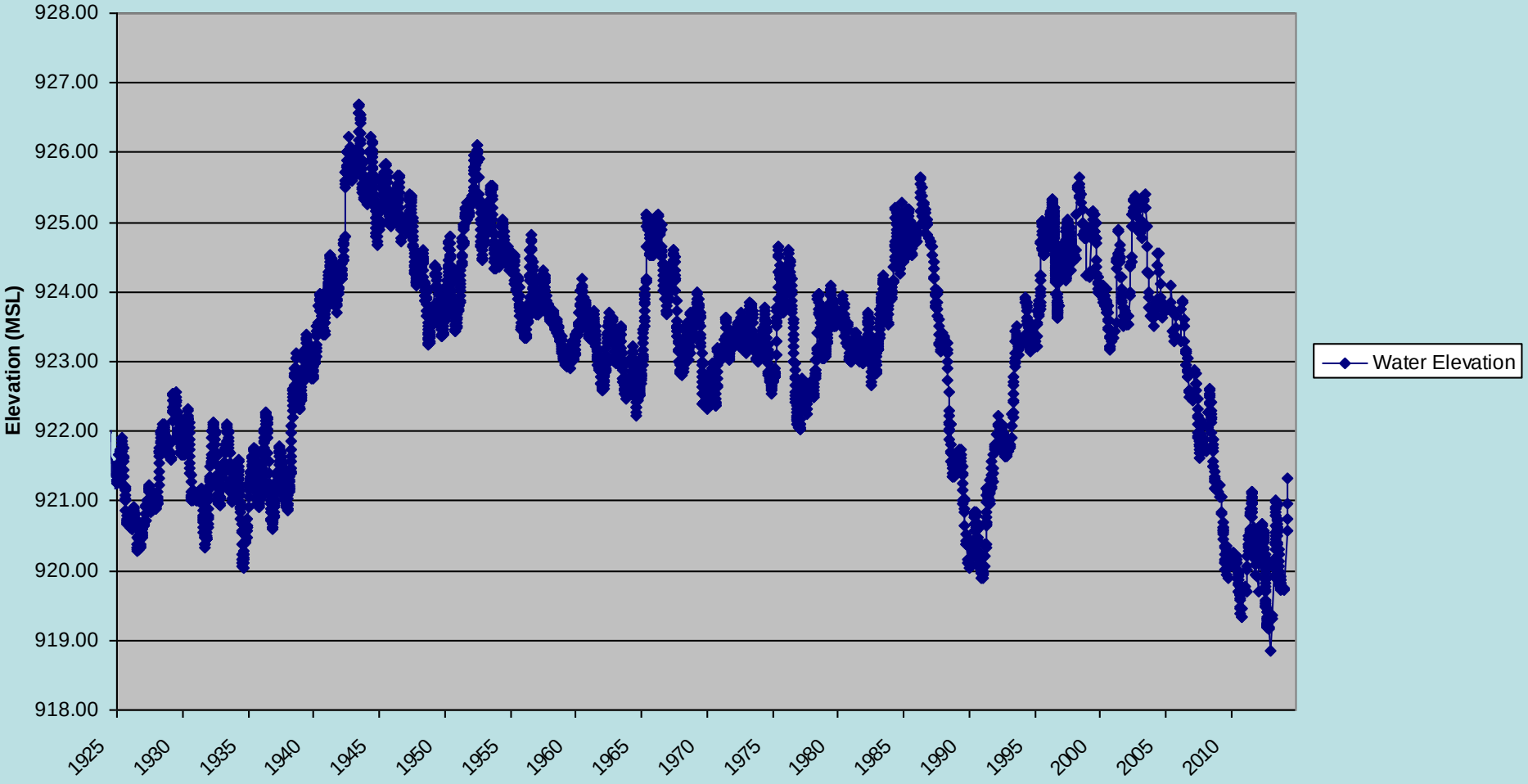


WHITE BEAR LAKE ELEVATION 1925 - 2015



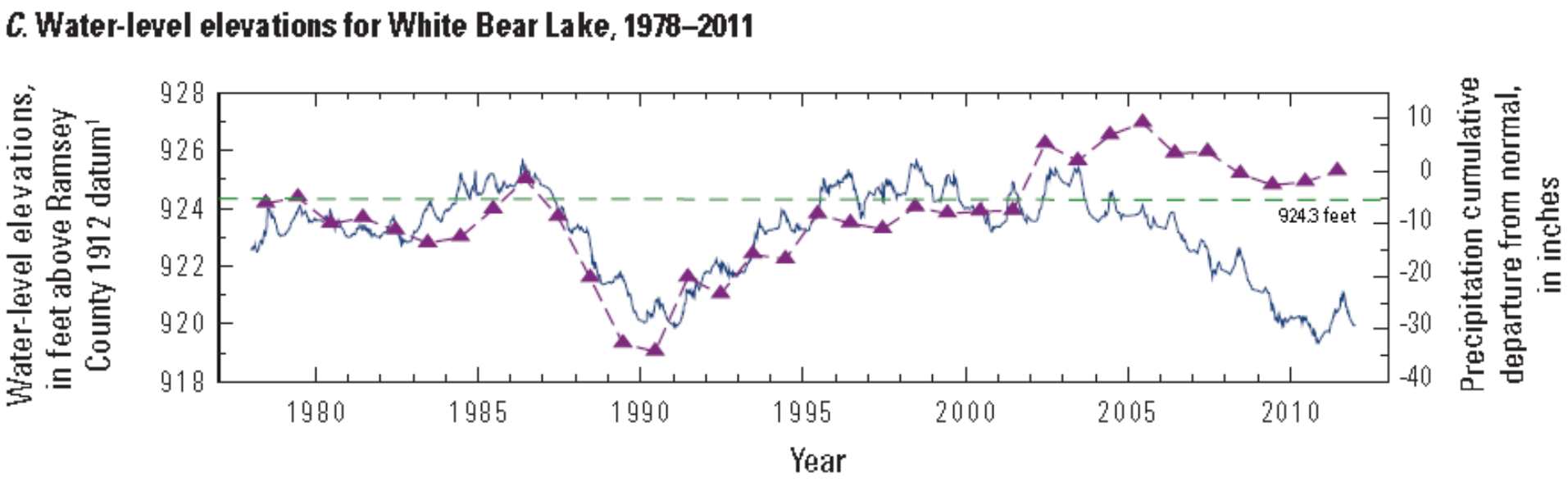

NO SWIMMING ALLOWED
BEACH CLOSED
due to water levels and drop offs

WHITE BEAR LAKE ELEVATION 1925 - 2015

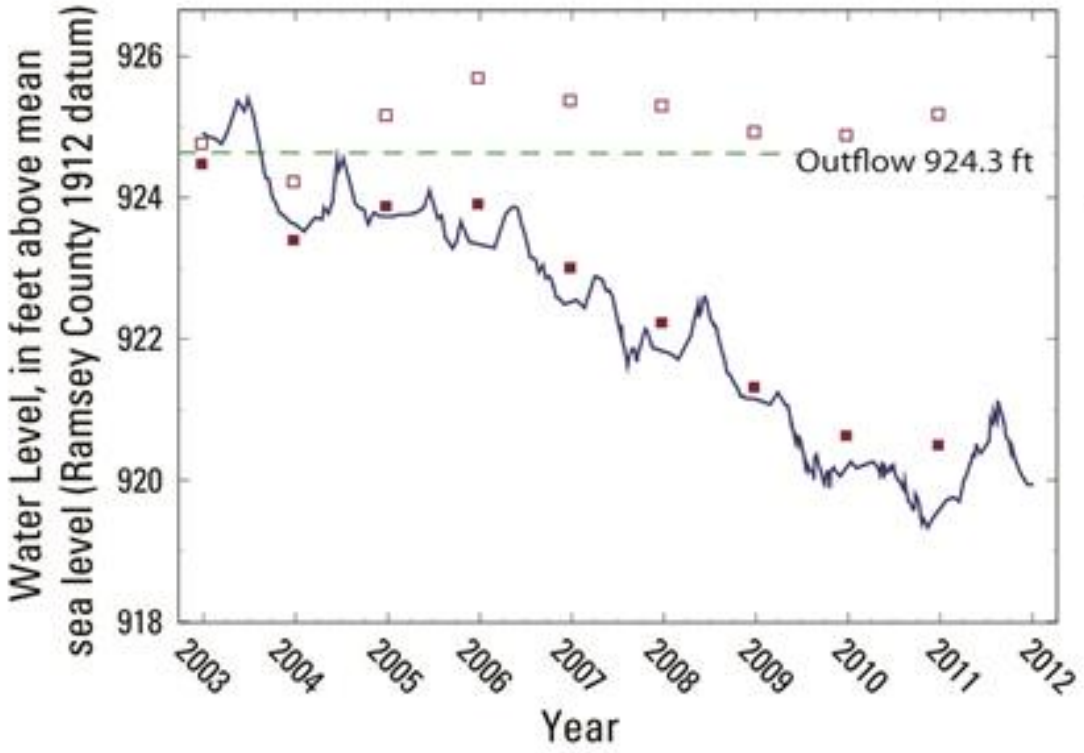


- **1912-1978: Groundwater pumping for augmentation**
- **1987-1991: Drought**
- **1991-1995: Recovery**
- **2003-2016: Water levels decrease rapidly**

THIS TIME IT'S DIFFERENT



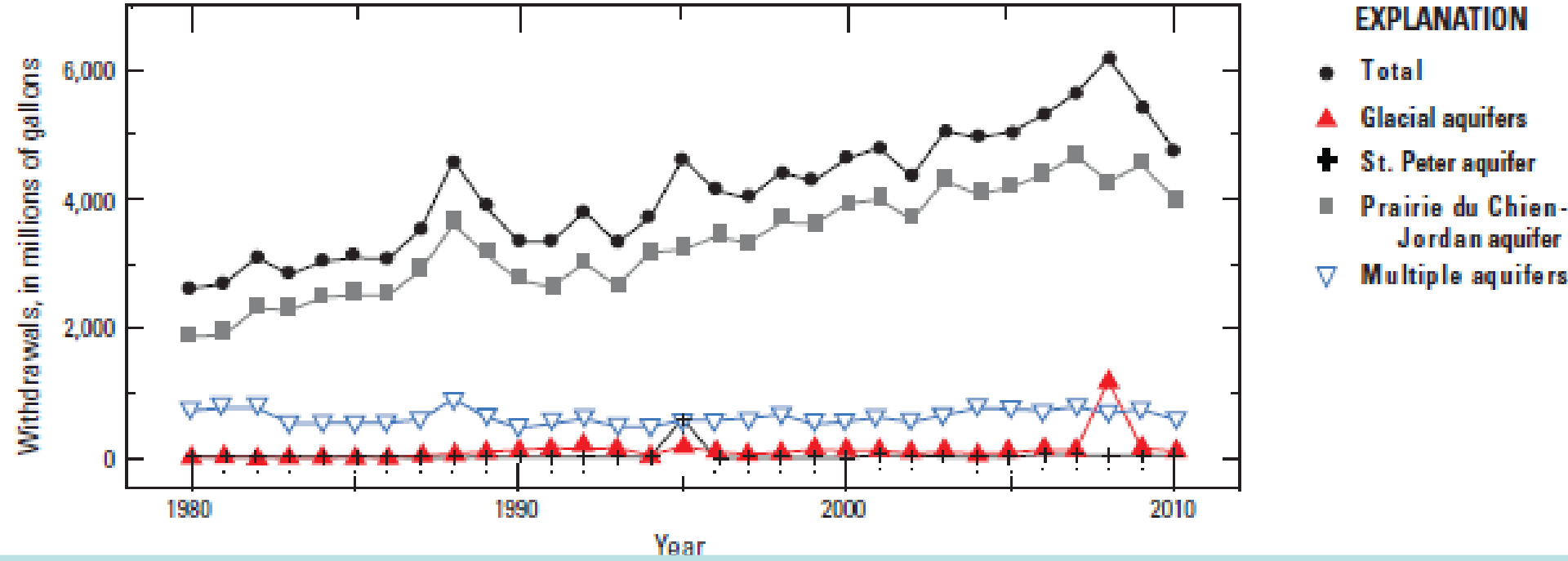
(C) Observed and mutliple linear regression model-predicted lake levels, 2003 - 2011.



EXPLANATION

- Observed Lake Level
- Predicted lake level on January 1 st of each year, 2003-2010, using reported annual high-capacity well pumpage from the Prairie du Chien-Jordan aquifer.
- Predicted lake level on January 1 st of each year, 2003 - 2010, using the average annual 1980 - 2002 high-capacity well pumpage from the Prairie du Chien-Jordan aquifer.

THE SUSPECT: INCREASED PUMPING FROM THE PRAIRIE DU CHIEN AQUIFER



HAD DNR ALLOWED TOO MUCH PUMPING VIA APPROPRIATIONS PERMITS?

WHITE BEAR LAKE

1998

LAKE-GROUND WATER INTERACTION STUDY

at White Bear Lake, Minnesota

WHITE BEAR LAKE

Minnesota
DNR Waters

USGS
science for a changing world

Prepared in cooperation with the White Bear Lake Conservation District, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, Minnesota Board of Water and Soil Resources, Twin Cities Metropolitan Council, and the Groundwater/Surface-Water Interaction Partners

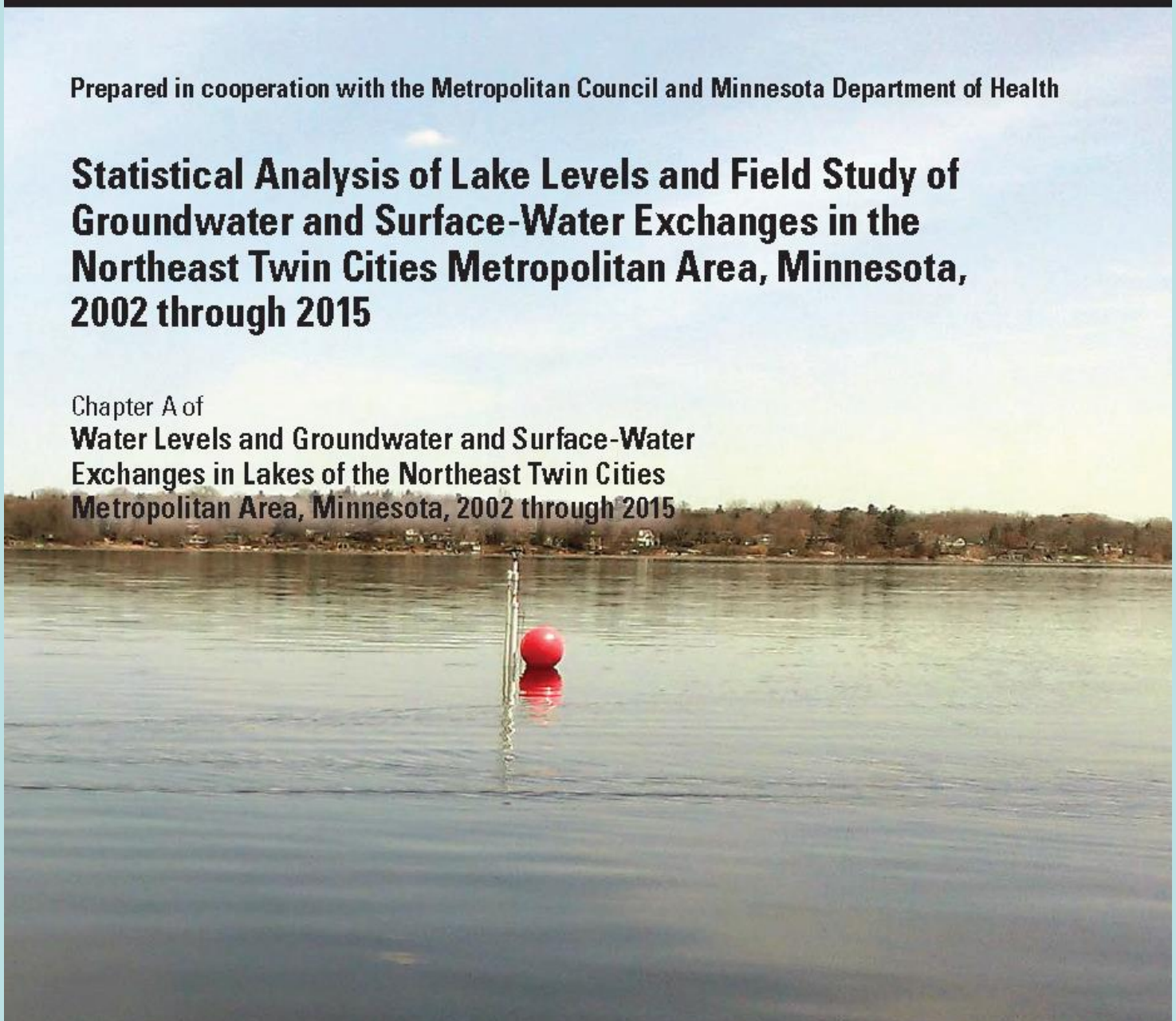
Groundwater and Surface-Water Interactions near White Bear Lake, Minnesota, through 2011

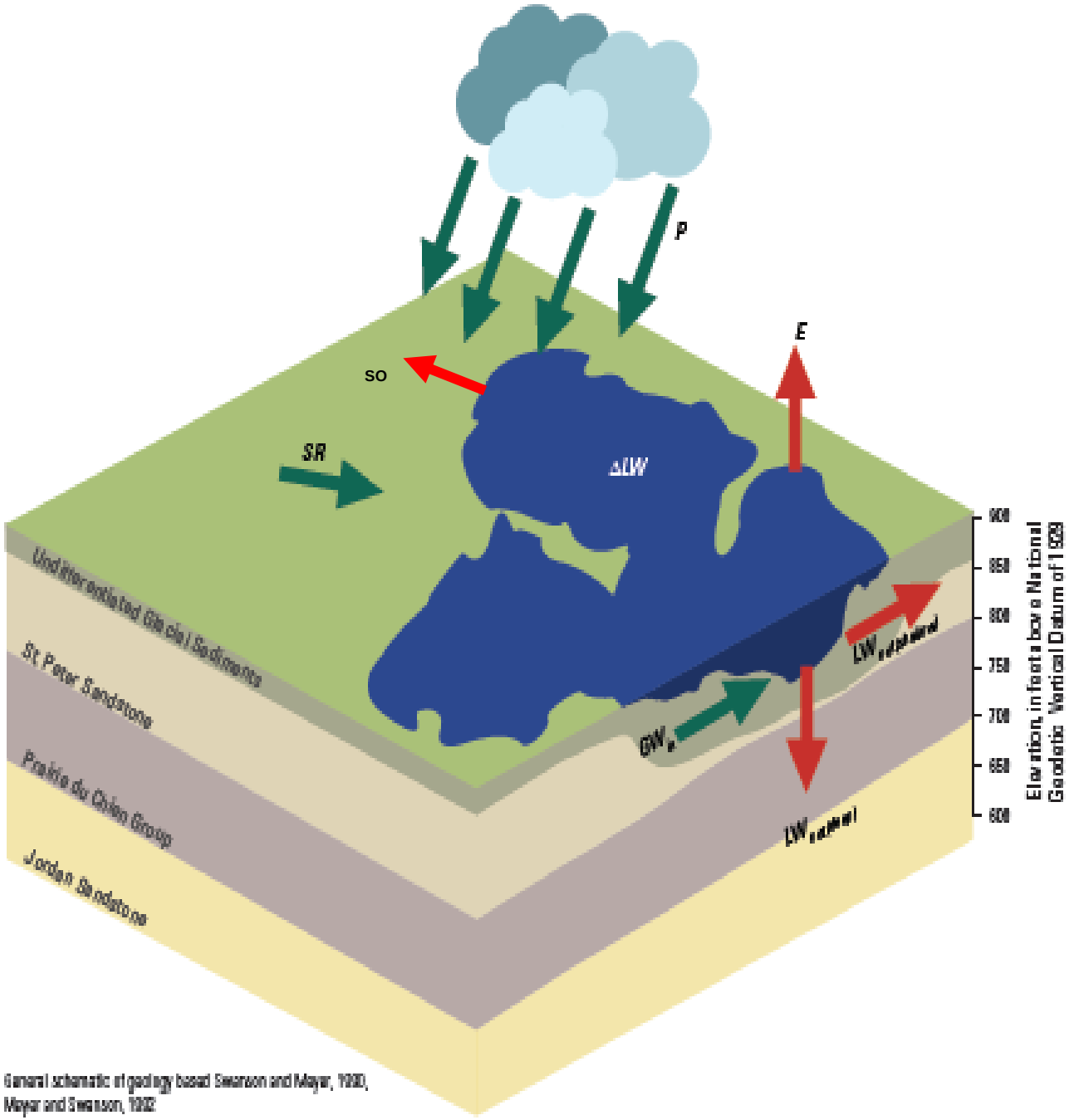
USGS
science for a changing world

Prepared in cooperation with the Metropolitan Council and Minnesota Department of Health

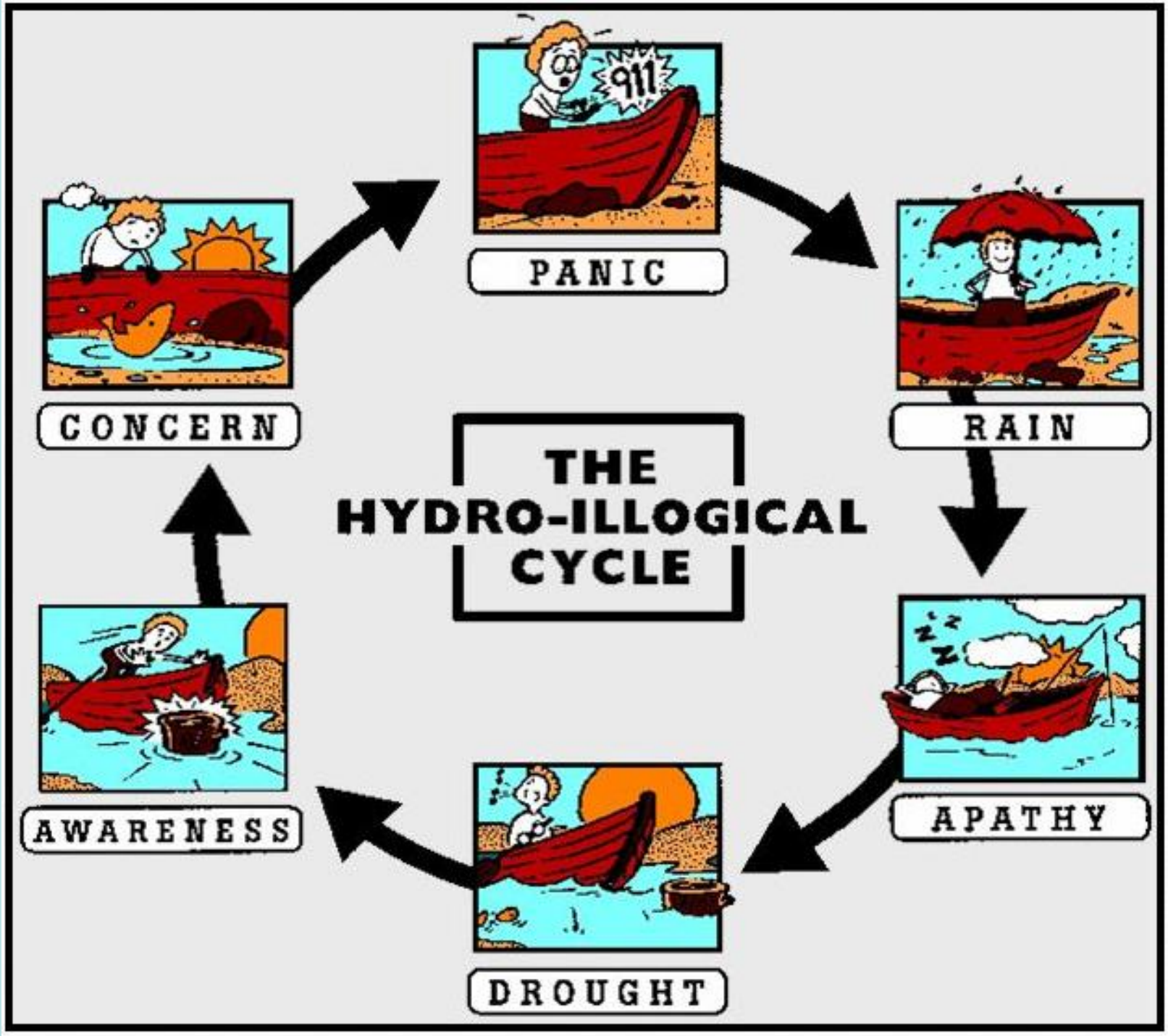
Statistical Analysis of Lake Levels and Field Study of Groundwater and Surface-Water Exchanges in the Northeast Twin Cities Metropolitan Area, Minnesota, 2002 through 2015

Chapter A of
Water Levels and Groundwater and Surface-Water Exchanges in Lakes of the Northeast Twin Cities Metropolitan Area, Minnesota, 2002 through 2015





General schematic of geology based Swanson and Meyer, 1990, Meyer and Swanson, 1992


911
PANIC
RAIN
APATHY
DROUGHT
AWARENESS
CONCERN
THE HYDRO-ILLOGICAL CYCLE

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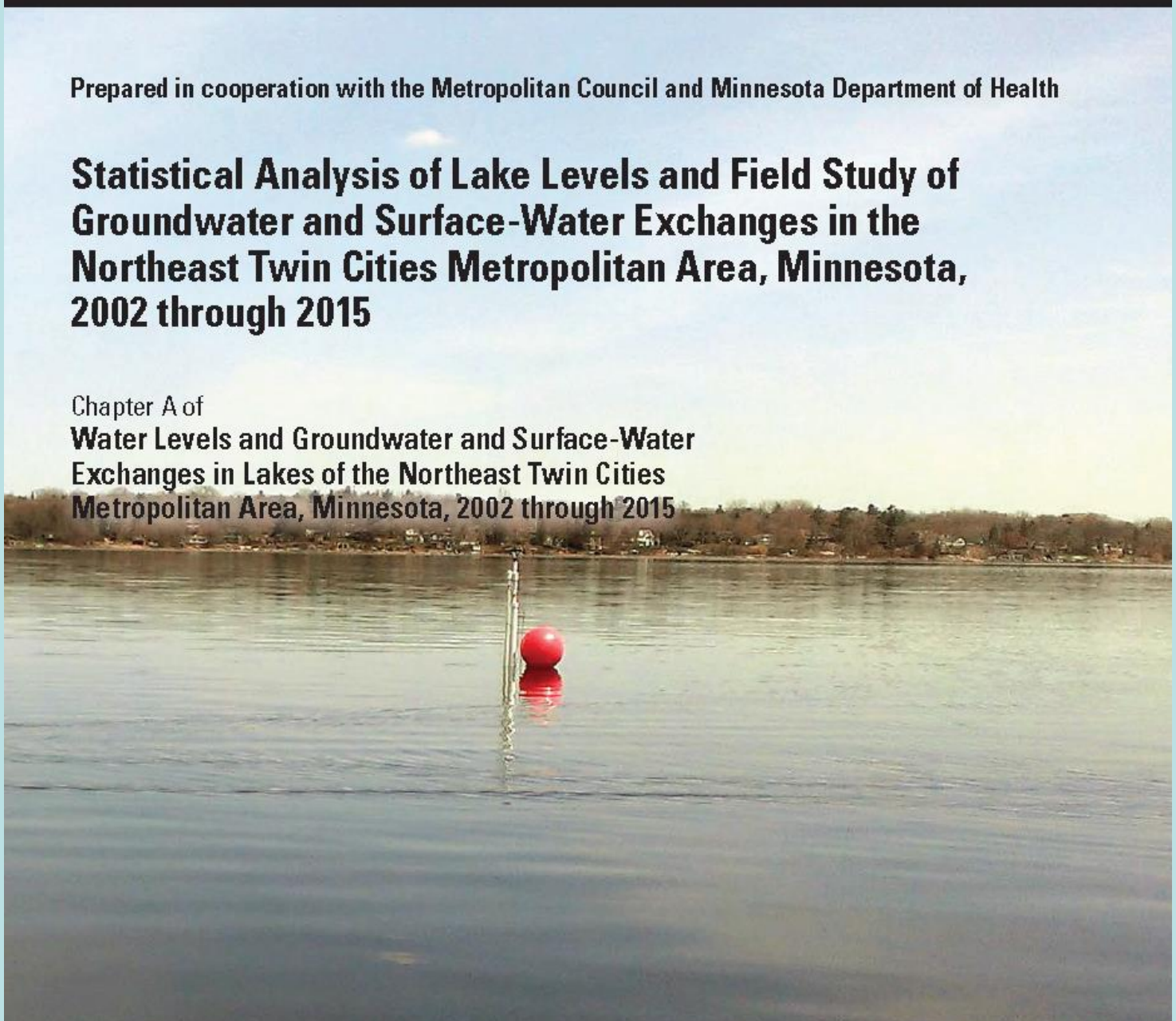
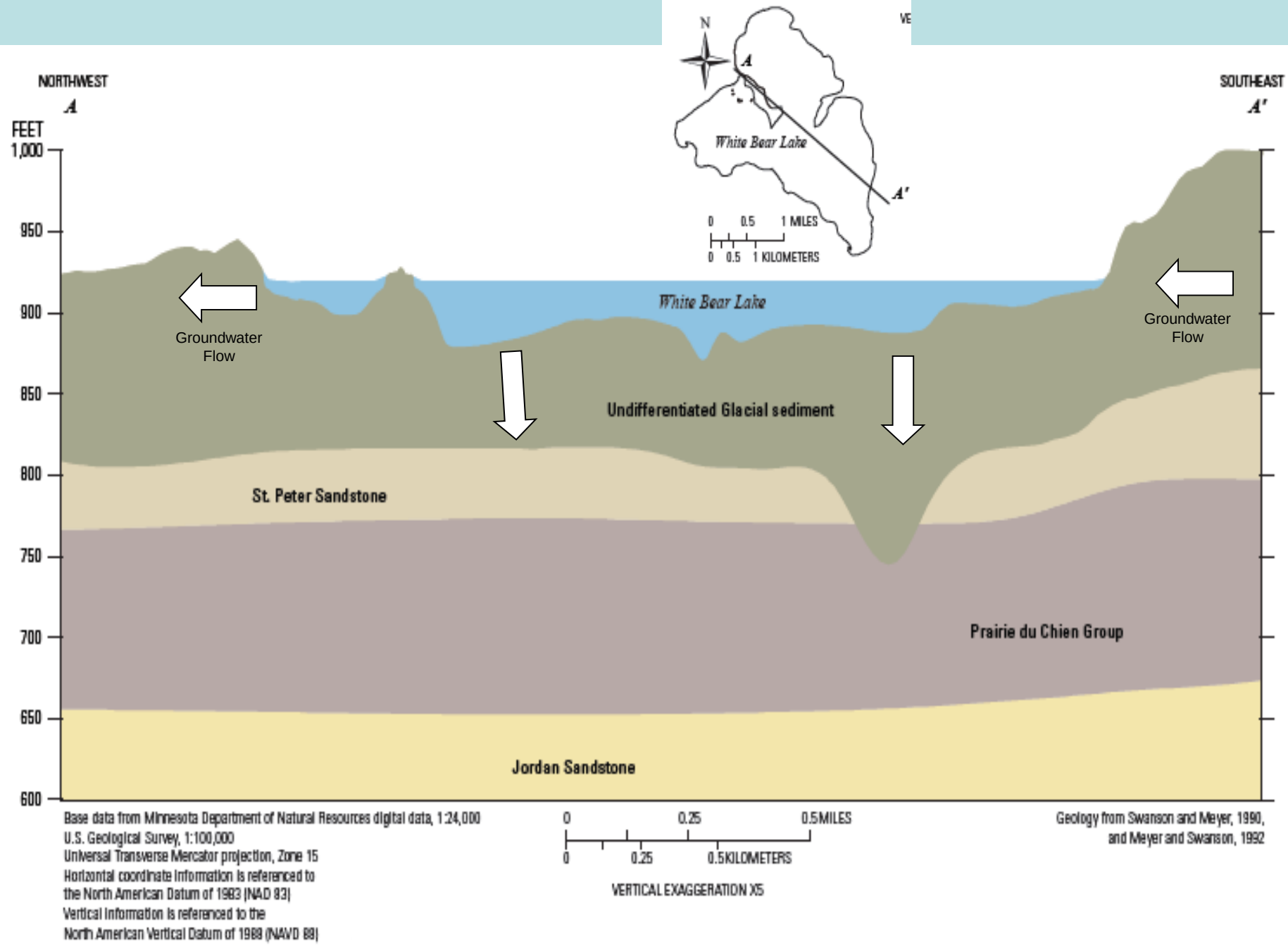


THE TRIAL

- Judge – Margaret Marrinan
- Legal clerk
- Witness stand
- Court recorder
- Lawyers for Plaintiff and Defendant
- Area for other lawyers
- Audience

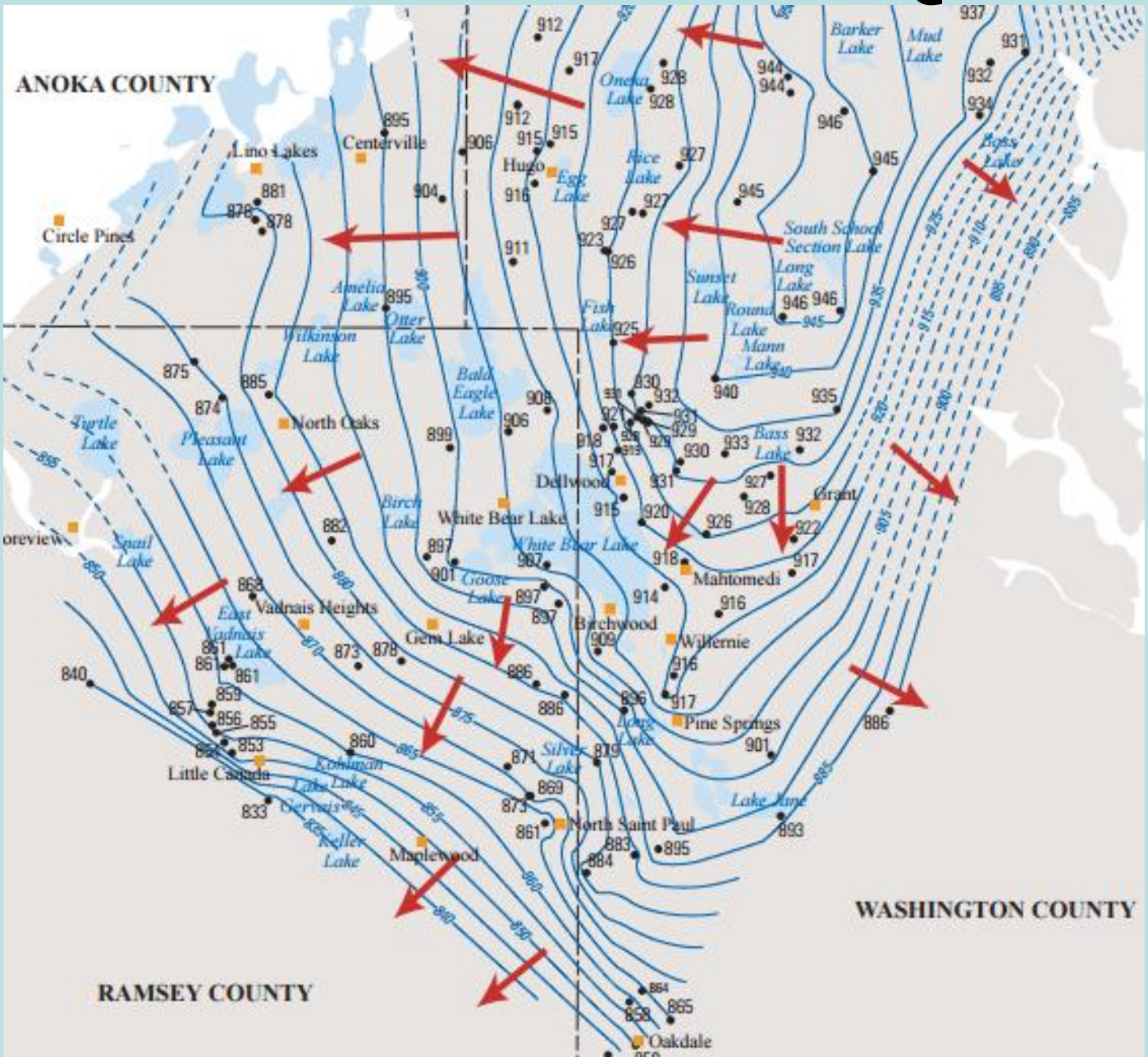
THE TESTIMONY



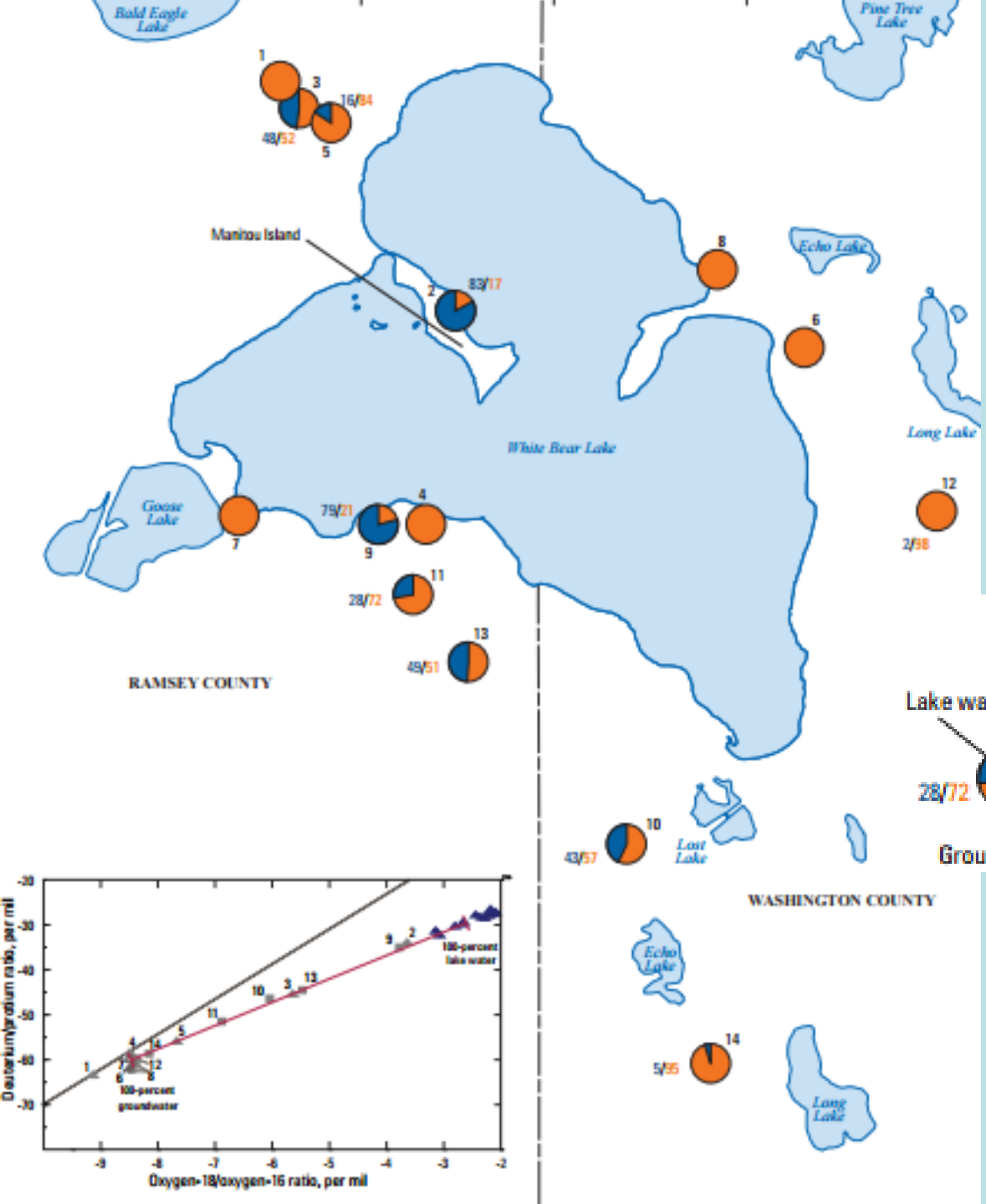
Base data from Minnesota Department of Natural Resources digital data, 1:24,000
U.S. Geological Survey, 1:100,000
Universal Transverse Mercator projection, Zone 15
Horizontal coordinate information is referenced to
the North American Datum of 1983 (NAD 83)
Vertical information is referenced to the
North American Vertical Datum of 1988 (NAVD 88)

Geology from Swanson and Meyer, 1990,
and Meyer and Swanson, 1992

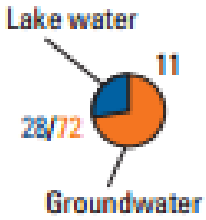
PRAIRIE DU CHIEN AQUIFER



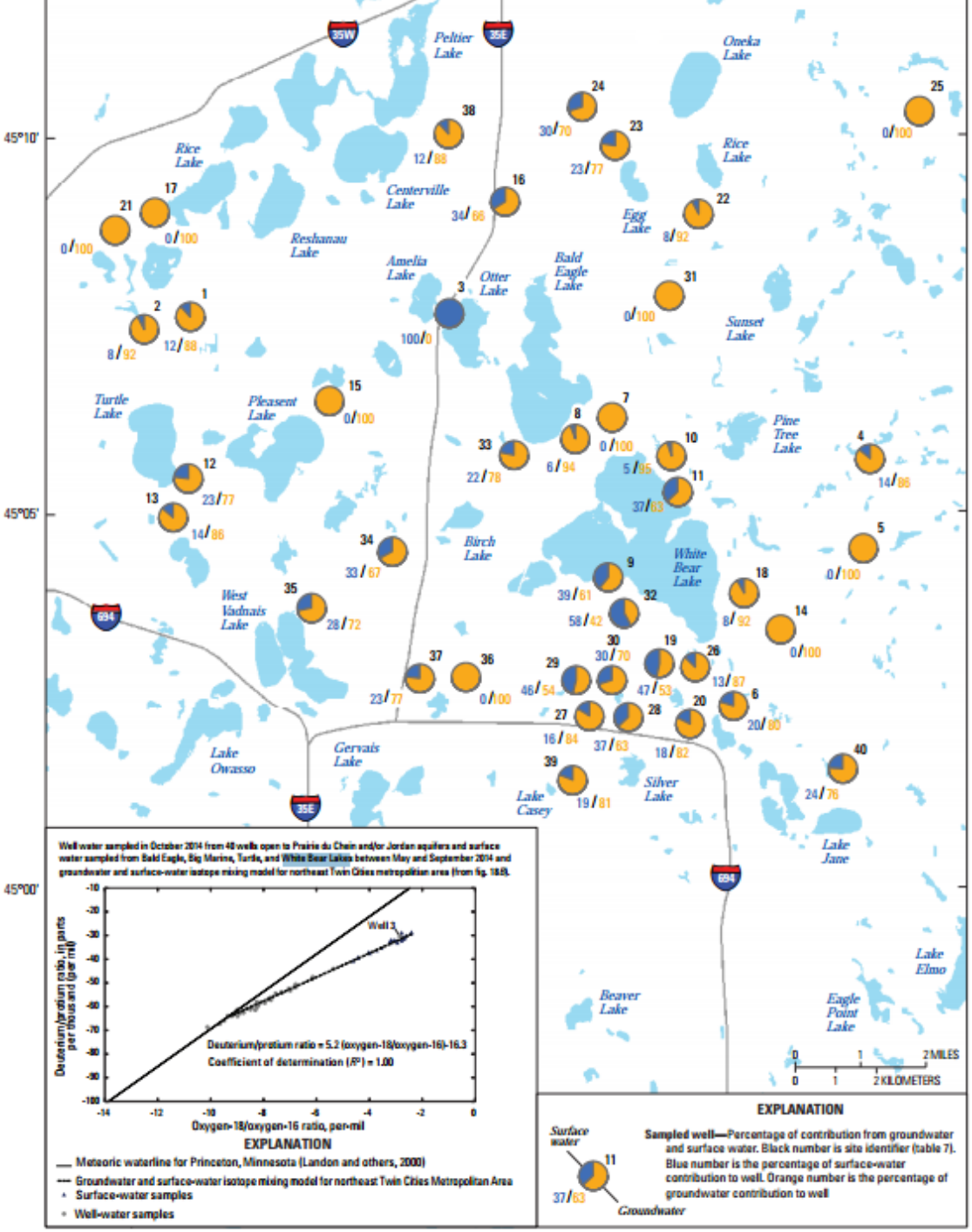
STABLE ISOTOPE ANALYSIS



EXPLANATION

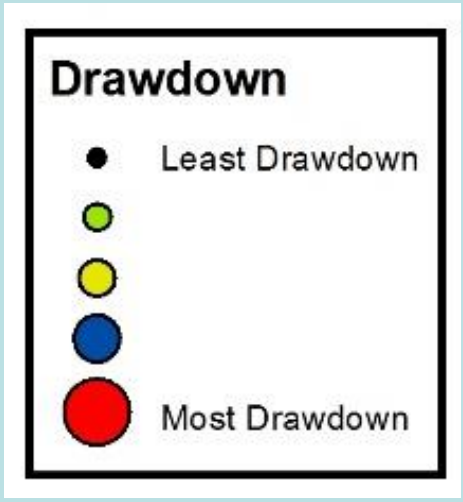


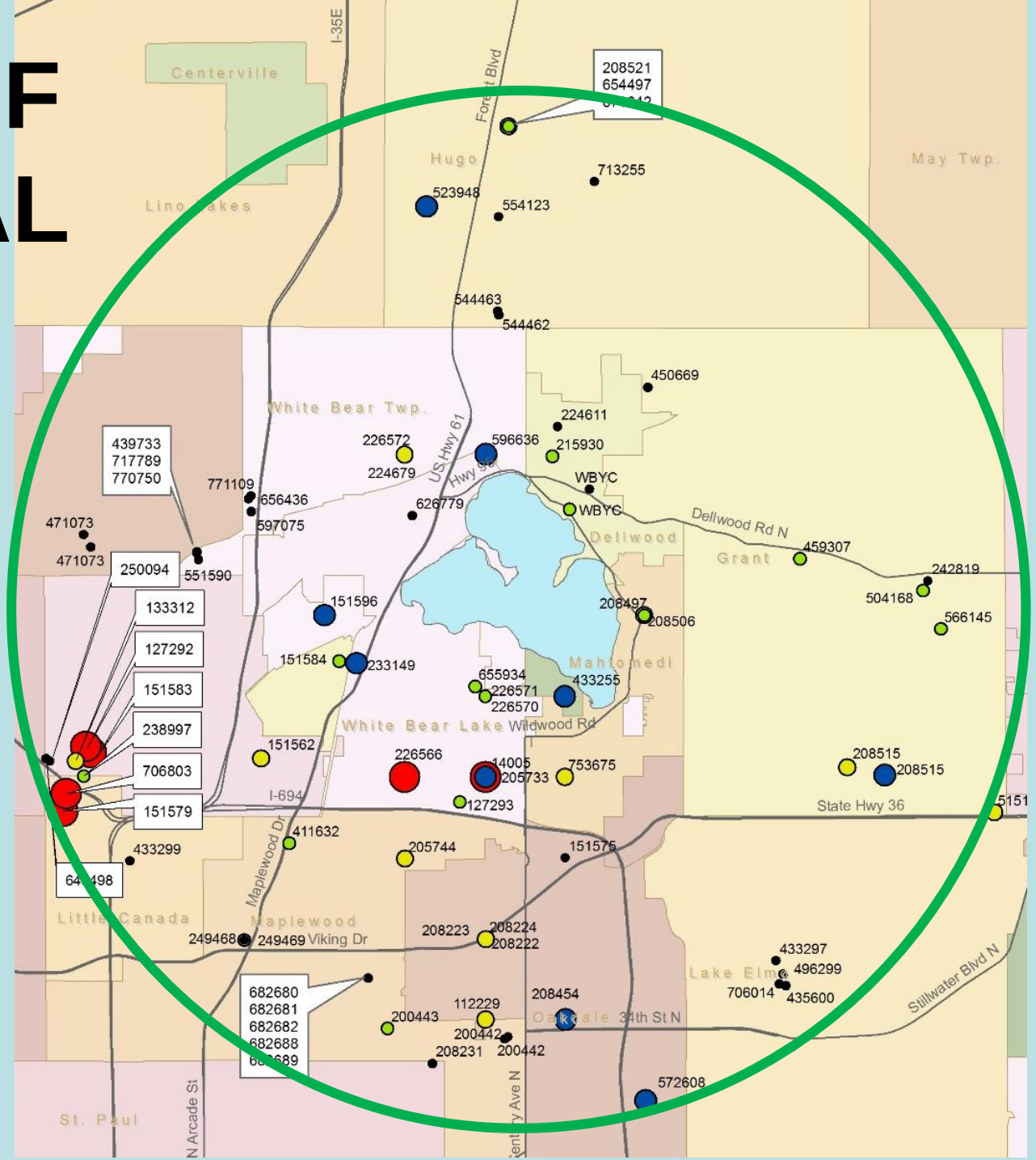
Sampled well—Percentage of contribution from groundwater and surface water. Black number is site identifier. Blue number is the percentage of lake water contribution to well. Orange number is the percentage of groundwater contribution to well



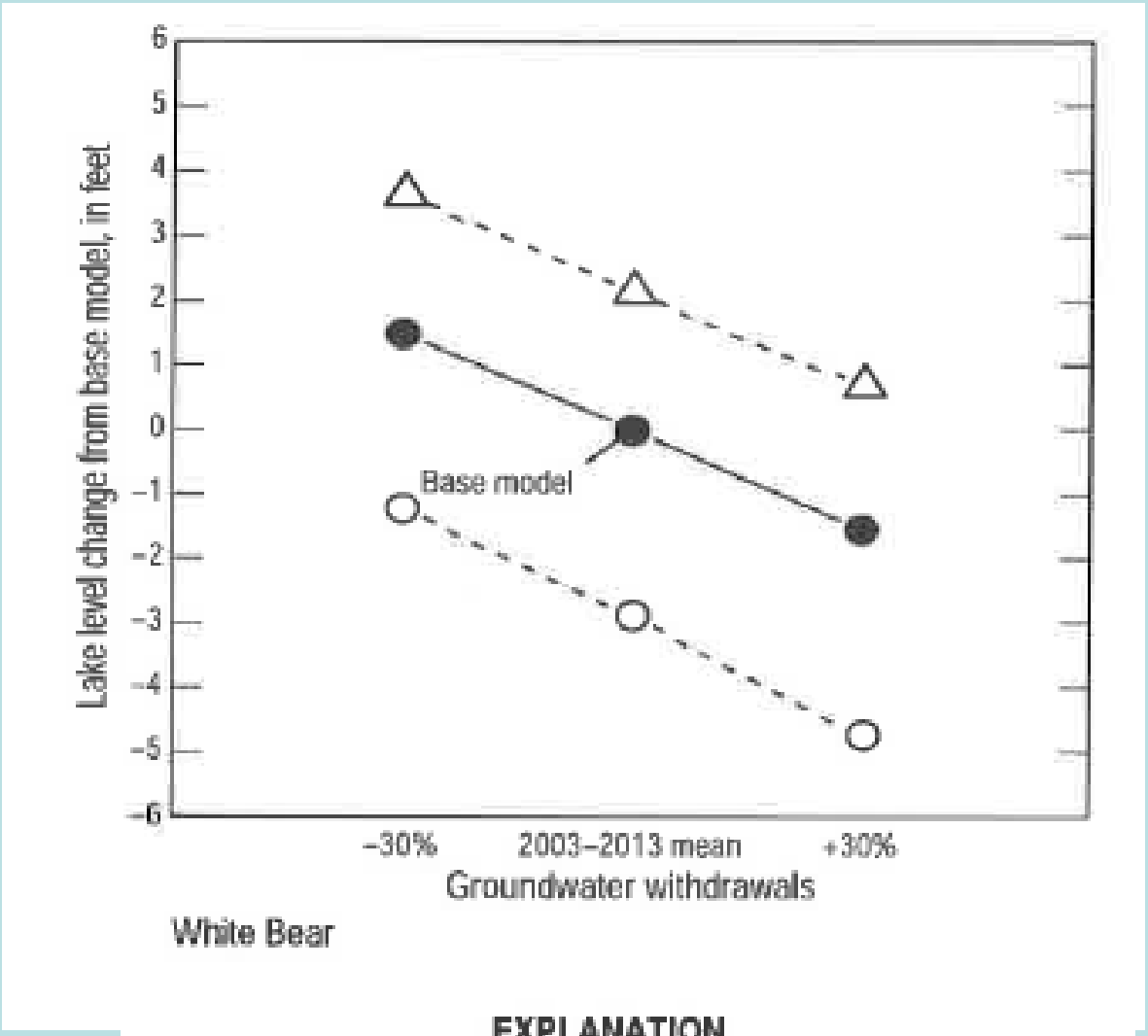
Base modified from Minnesota Department of Natural Resources digital data, 1:100,000

EFFECT OF INDIVIDUAL WELLS

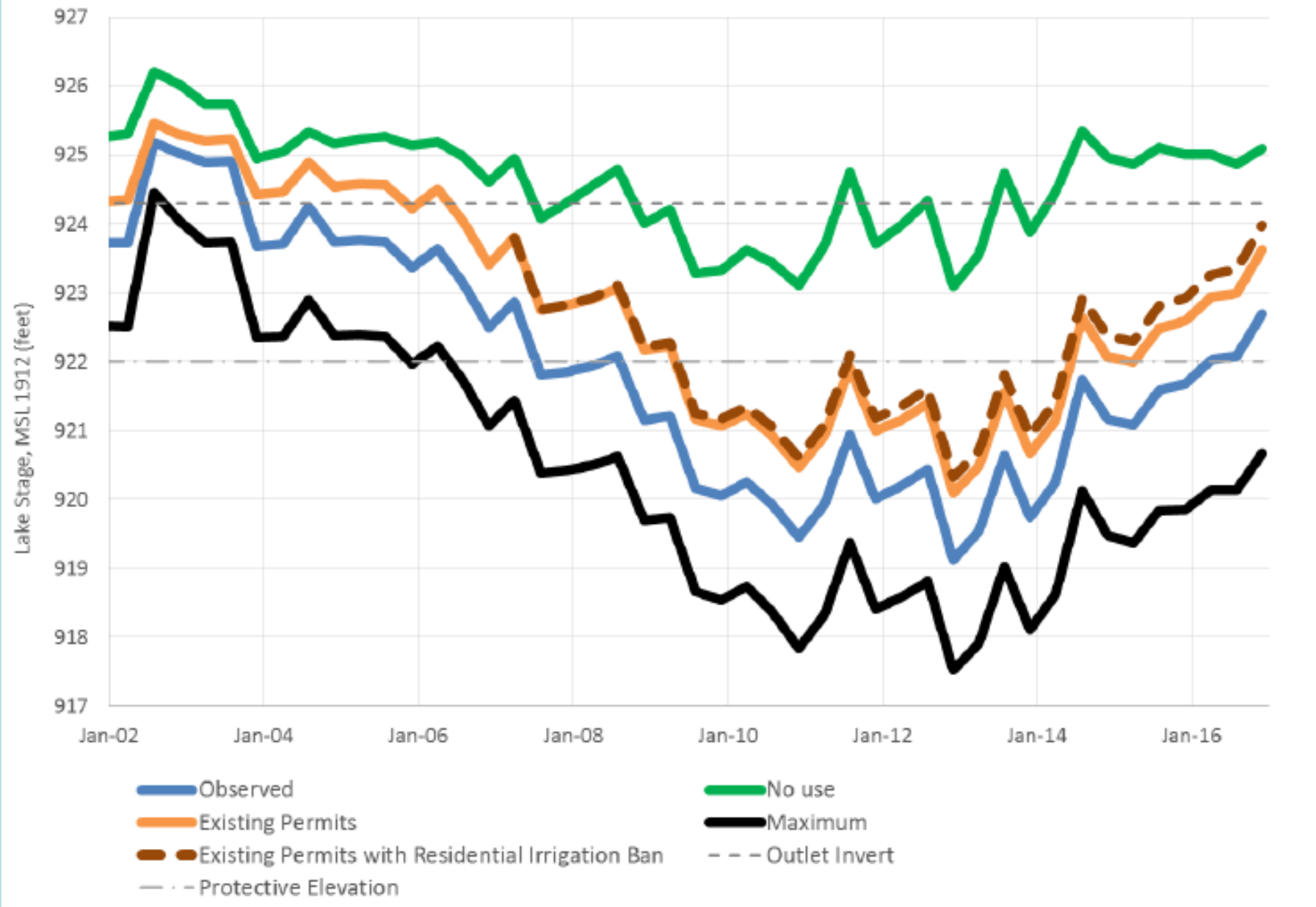




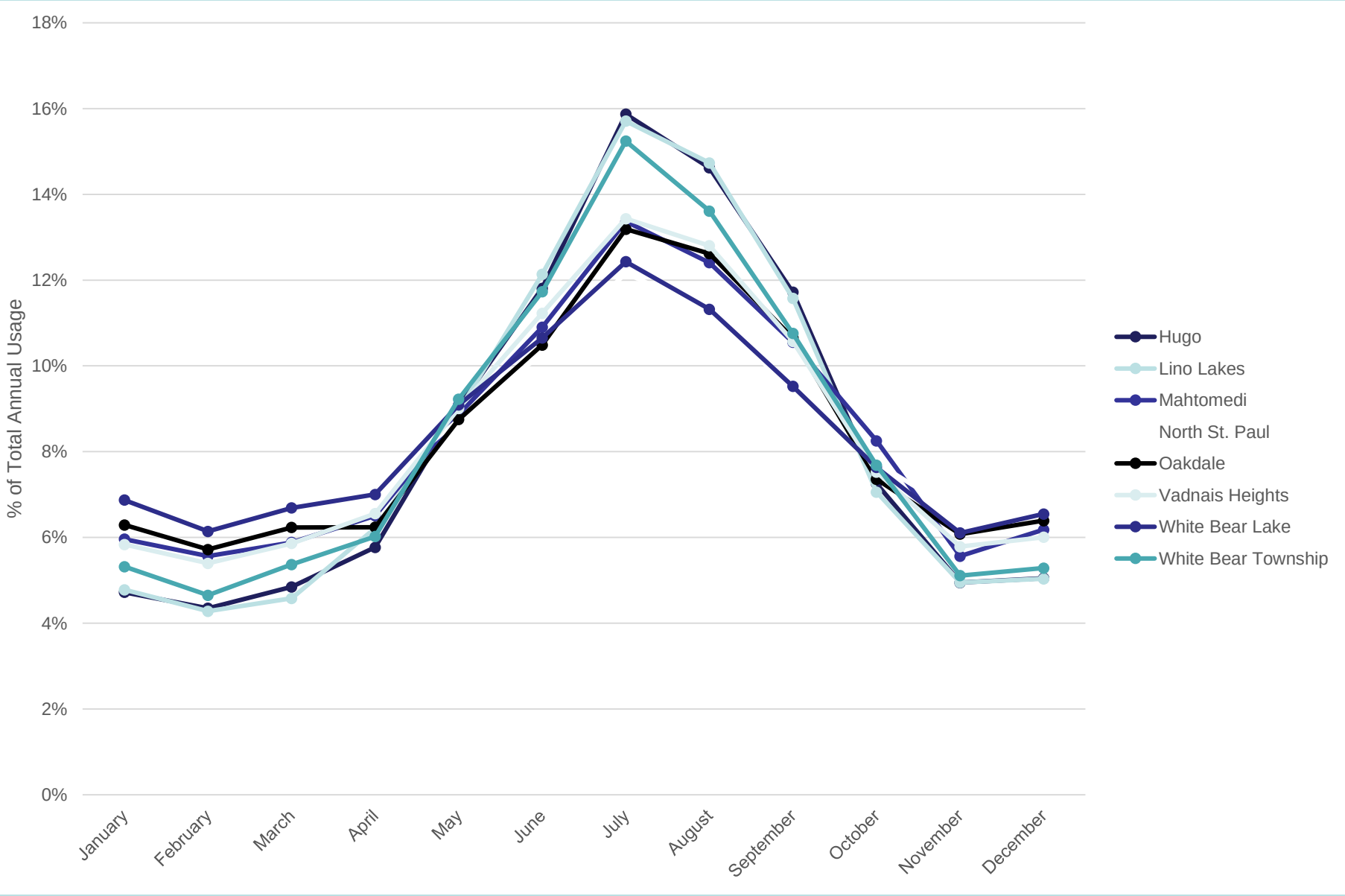
USGS MODEL RESULTS



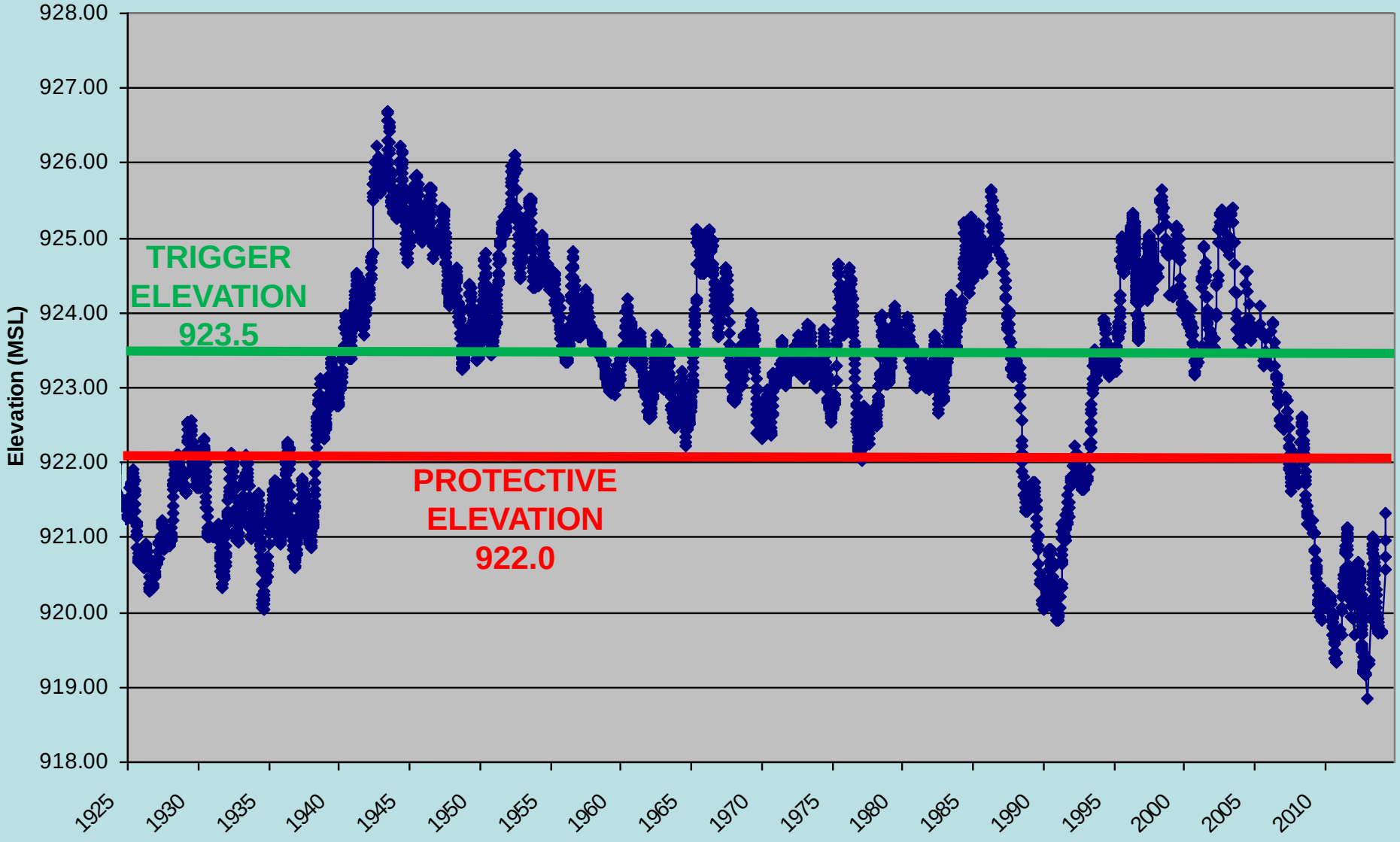
DNR MODEL RESULTS



GW PUMPING BY MONTH



WHITE BEAR LAKE ELEVATION 1925 - 2015



THE DECISION

- Groundwater pumping near WBL is unsustainable and is causing the drawdown of WBL
- No new or increased water appropriation permits within 5 miles of WBL
- DNR must develop a sustainable pumping plan and adjust appropriation permits
- 923.5 trigger elevation for a lawn watering ban


STAR TRIBUNE
SACK
PUT iT BACK.
WHITE BEAR LAKE
DNR
DNR

Possible Solutions

- Conservation (Cannot do it all!)
- Drill deeper wells
- Augmentation
- Mississippi River Water Source
  - Connect to St. Paul water system
  - Build new treatment plants for surface water
- Other?

Other water sources

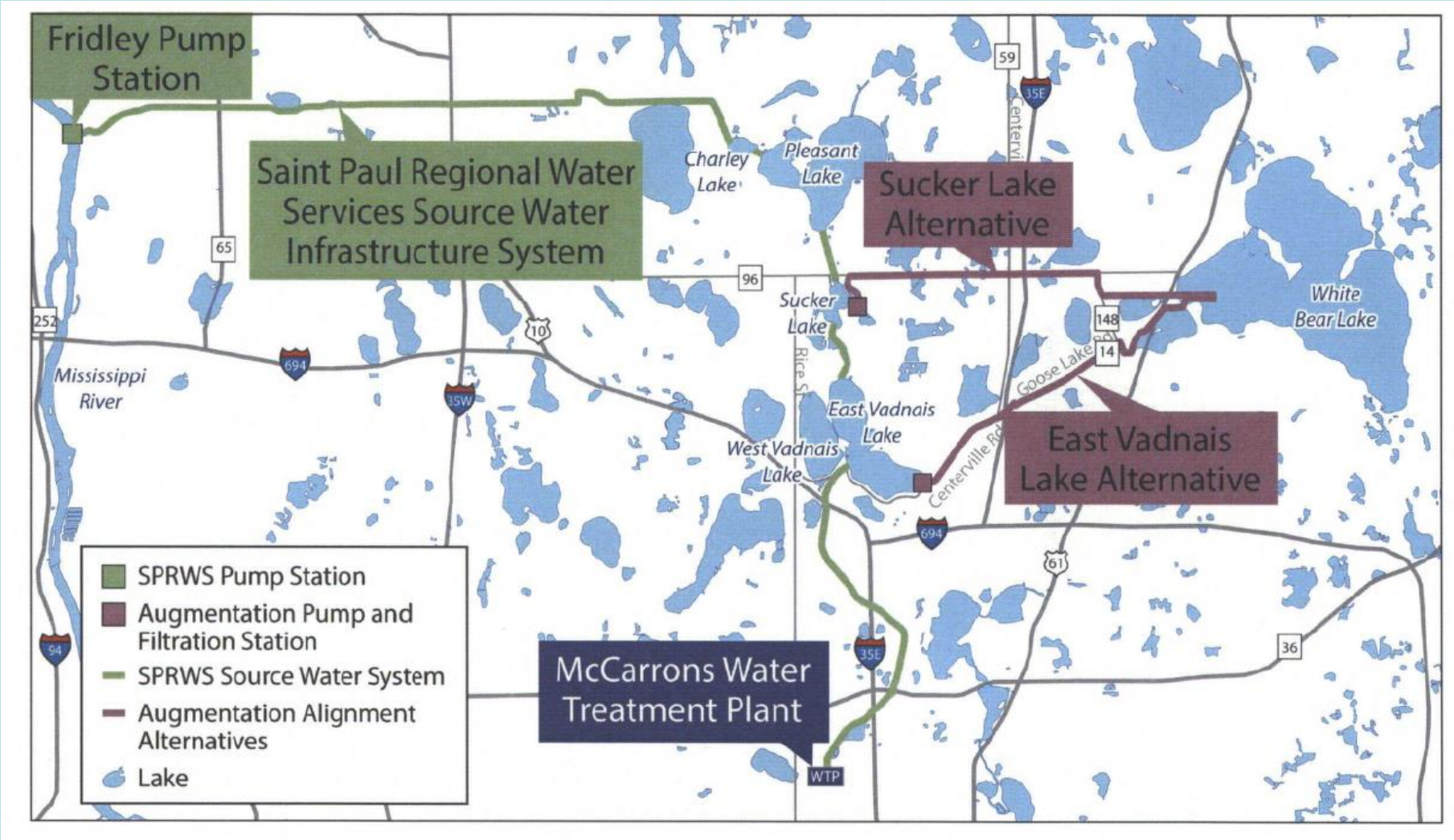
- Replace PdCJ wells for TC/W (deeper aquifer)
  - Tunnel City/Wonewoc aquifer. Replace high producing wells.
  - Figure 20 lists wells.
  - Exhibit 5 lists others using TC/W aquifer
- Surface Water – connect to SPRWS

DNR: 35-38% Conservation

NE Metro Municipal Water Use & Conservation Potential

SECTOR	CURRENT USE	POTENTIAL TO REDUCE USE*	INITIAL ESTIMATE OF CONSERVATION*
Residential Indoor	1,609	40%	965
Residential Outdoor	689	25-40%	517-413
Commercial/Institutional	558	39%	340
Industrial	159	39%	97
Other	152	10%	137
TOTAL	**3,167**	**35-38%**	**2,056-1,952**

DNR report on augmentation



TX341-09

Feasible Alternatives

- Amend permits requiring 30% less usage for about 5 miles around WBL
  - Irrigation ban (15%+ reduction)
  - Conservation (15%+ reduction)
- Augmentation to replace drained water used in wells
- No growth from Prairie du Chien Jordan
- Other water sources: aquifers or surface water
- Trigger for Protective Elevation – 923.5 feet
- Enforce GWMA
- Use the model to consider cumulative impacts. No permits if negative impact to WBL.