

The New Groundwater Law - 2003 Wisconsin Act 310

DNR Bureau of Drinking
Water and Groundwater



Resource concern #1

Surface Water Impacts



**Big
Spring**

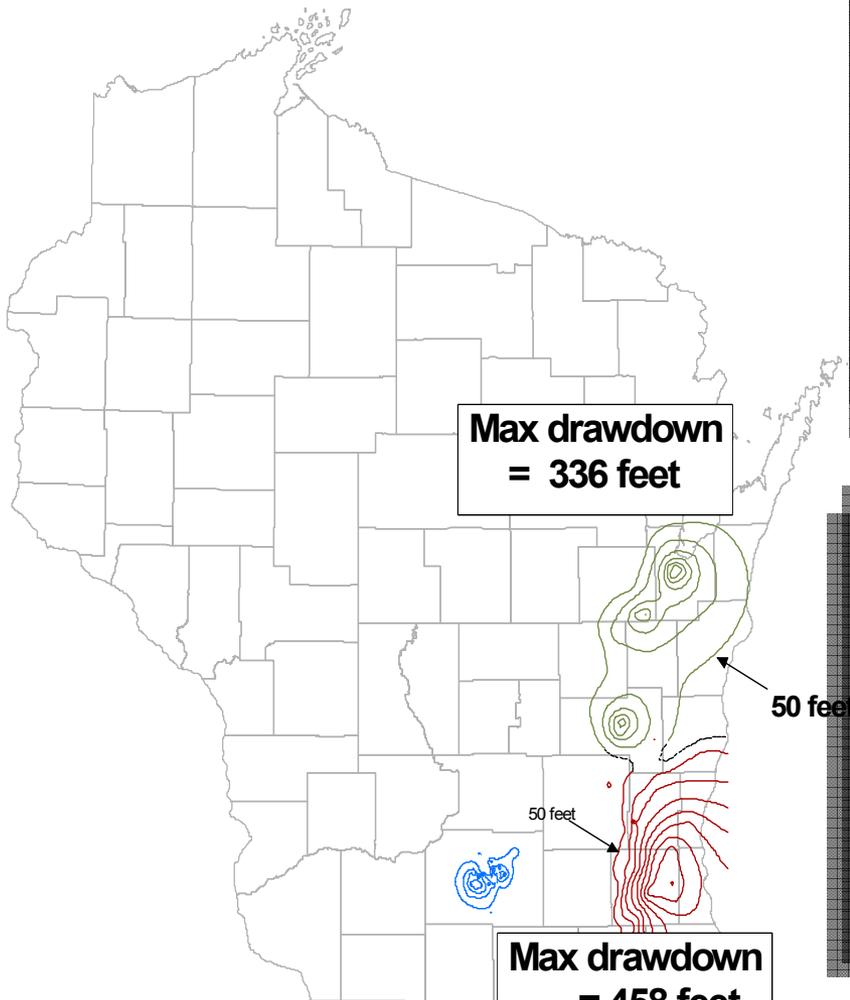


L. Plover

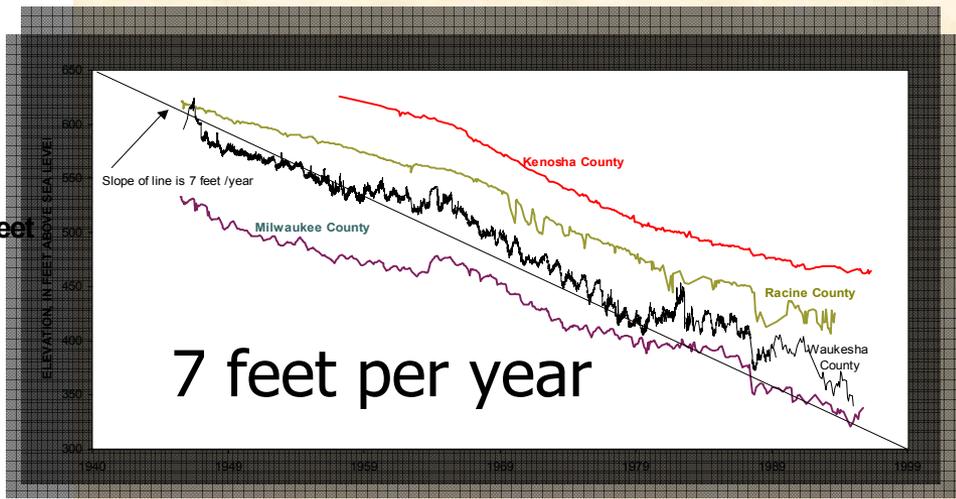
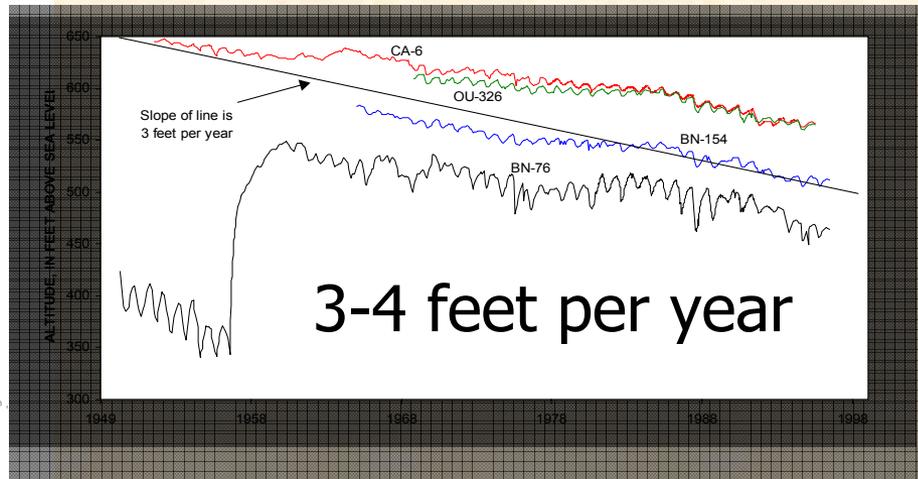
**Madison
springs**

Resource concern #2: Overpumping of Deep Sandstone Aquifer

Drawdown in the Sandstone Aquifer



Source: USGS & WGNHS



Groundwater management needs

- Ability to manage impacts of pumping on lakes, streams, wetlands
- Mechanism to address water management on regional level
- Information and data
- Funding mechanism

Current well regulation

- >800,000 private residential wells
- >11,000 high capacity wells
- 17,000 new wells drilled every year
- Private well construction must follow Well Code
- High capacity wells need approval
- Public water systems must undergo additional plan review

High capacity wells



- Can pump > 100,000 gpd (70 gpm) from single property
- Used for irrigation, livestock, manufacturing, beverages, and public water supply
- Existing approvals consider effects on public water supplies

Key aspects of legislation

- Requires notification of all new well construction and water use reporting
- Expands DNR authority to consider environmental impacts in issuing high cap approvals in certain situations
- Directs DNR to establish Groundwater Management Areas in 2 parts of state
- Creates Groundwater Advisory Committee to advise department and make recommendations for future legislation

Other key points

- Retains protection of public water utility wells
- Most areas of state and most well approvals will be “business as usual”
- Recognizes that all wells have impact on quantity
- Recognizes connection between surface and groundwater, quality and quantity
- Acknowledges need for further solutions, including legislation

Details of legislation

- Tracking well construction and water use
- Environmental review of some high cap wells
- Groundwater Management Areas
- Groundwater Advisory Committee

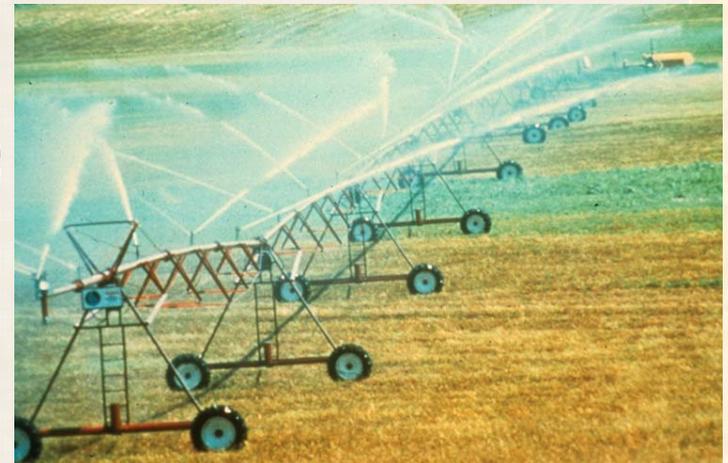
Tracking well construction...

- Requires notification of *all* new well construction (domestic and high capacity)
- Fees on *all* new wells -
\$50 for private well, \$500 for high cap
- Helps assure proper location and construction
- Increased inspections



...and water use

- *All* high capacity wells will report water use on an annual basis, including ones with existing approvals
- Improved knowledge will help better manage groundwater resources



Environmental reviews of high capacity wells

- Groundwater Protection Areas (GPAs)
 - within 1200 feet of ORW, ERW, and trout streams
- Consumptive uses (withdrawals that result in water loss of >95%)
- Significant impacts on high flow springs (>1 cubic foot per second)

Environmental reviews



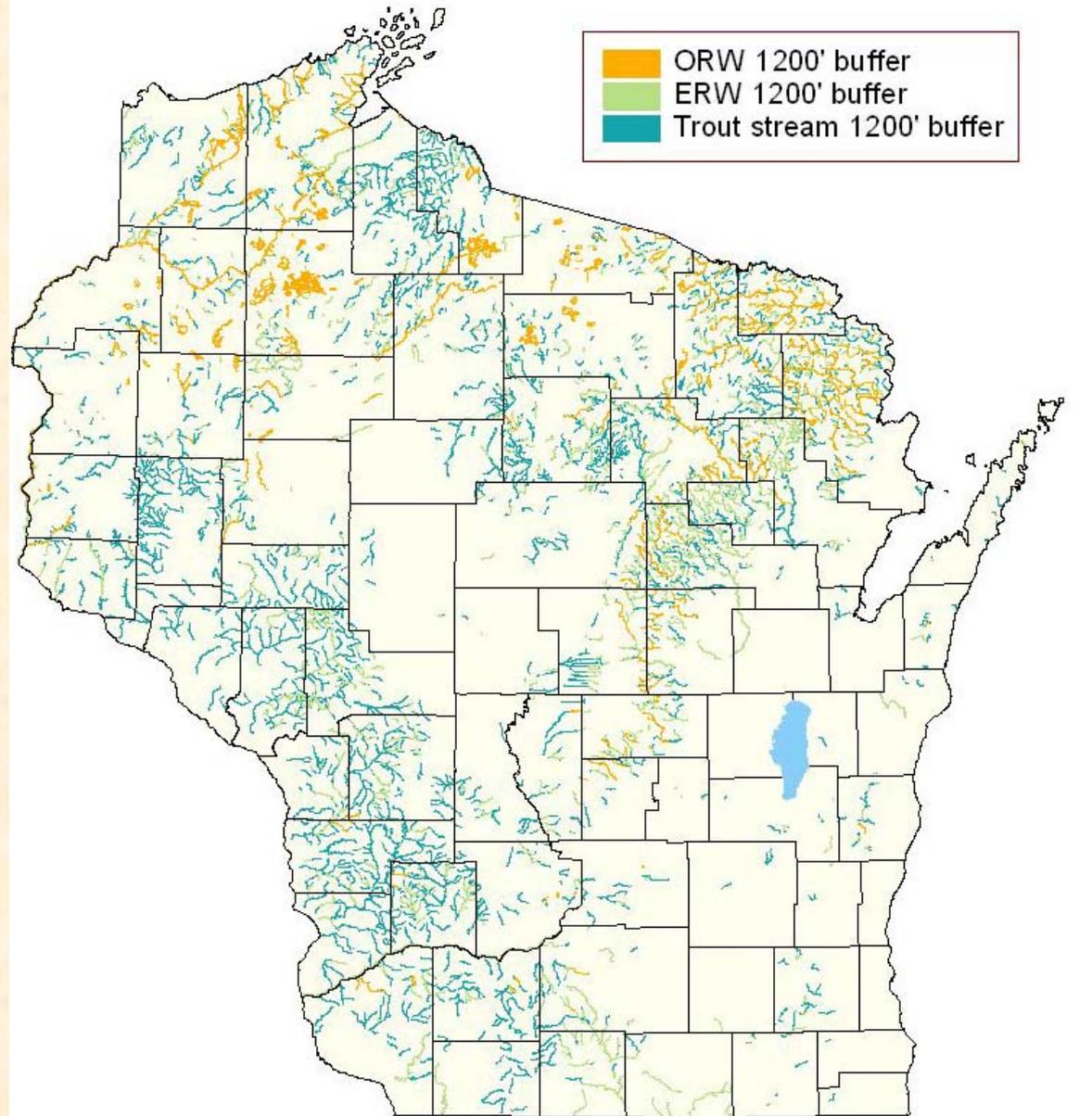
- If a proposed well meets any of these conditions, an environmental analysis may be needed
- Balance test for public water supply wells

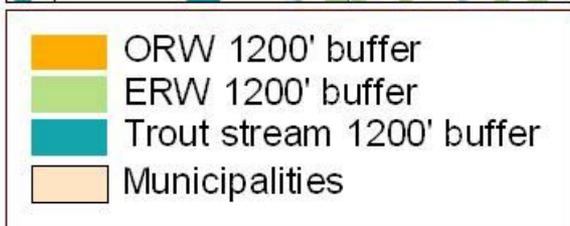
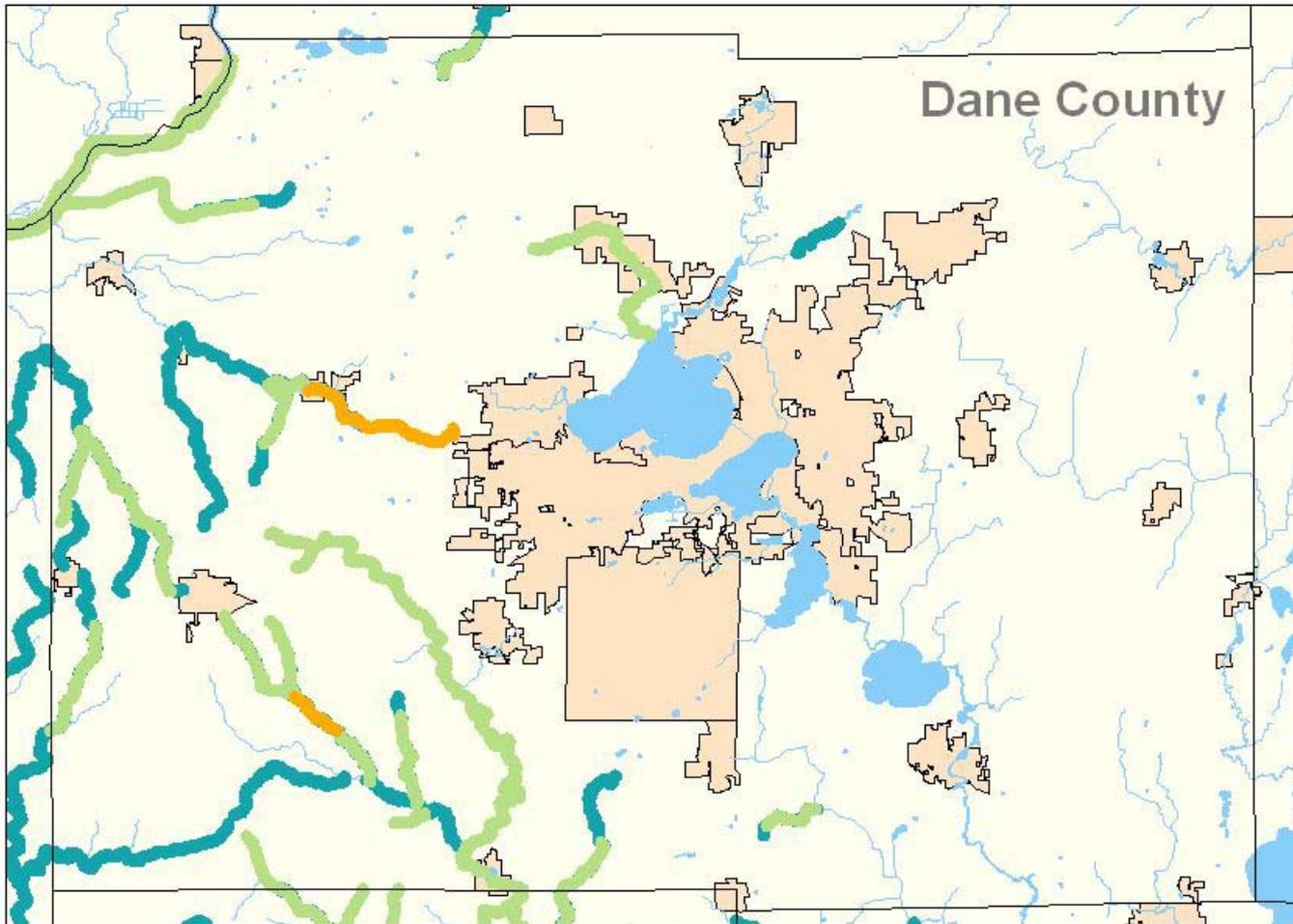
GPAs:

ORW =
Outstanding
Resource Water

ERW =
Exceptional
Resource Water

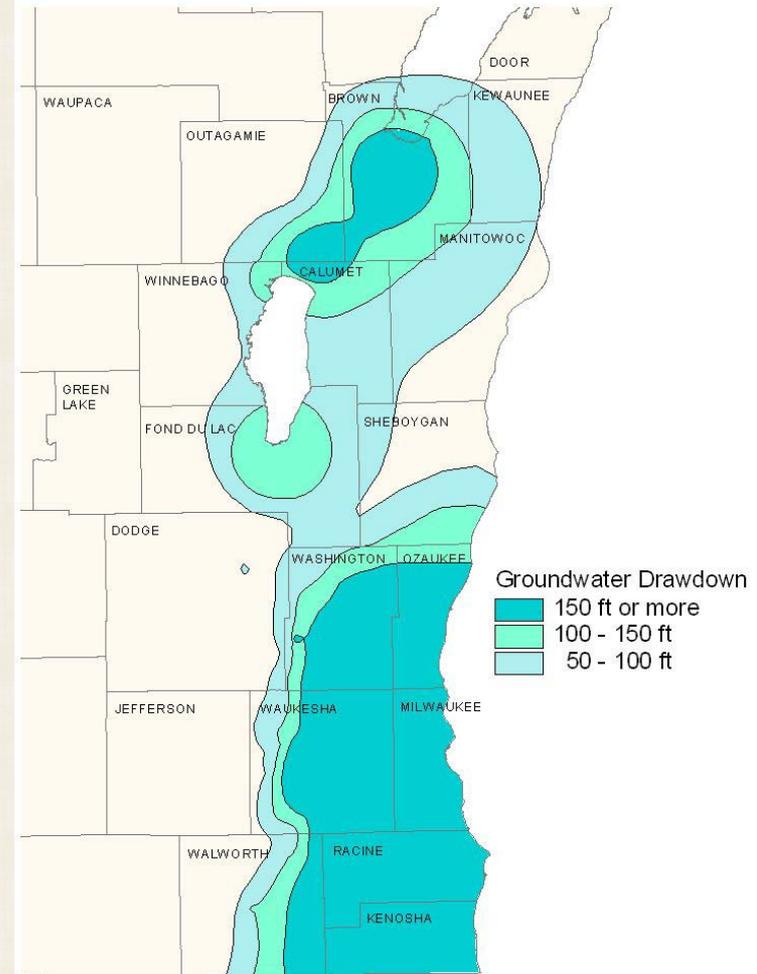
Trout Streams
include Class I,
II, and III



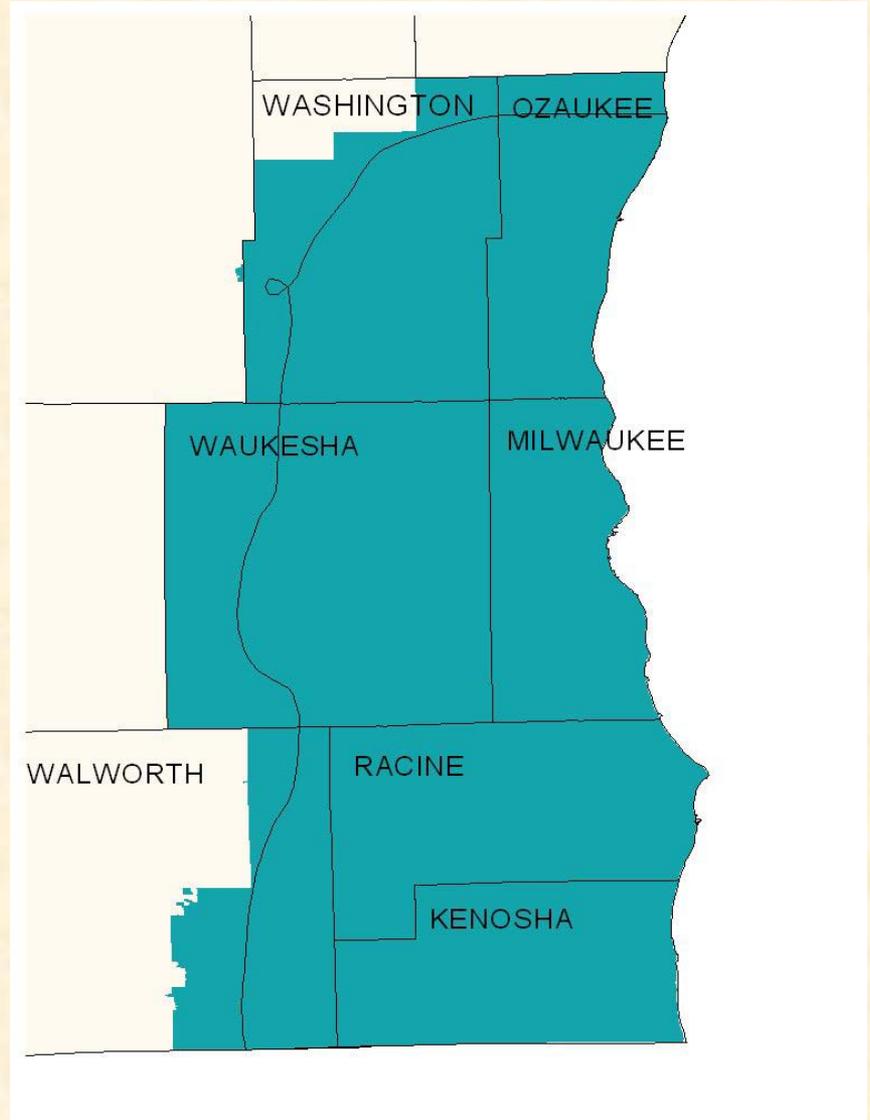
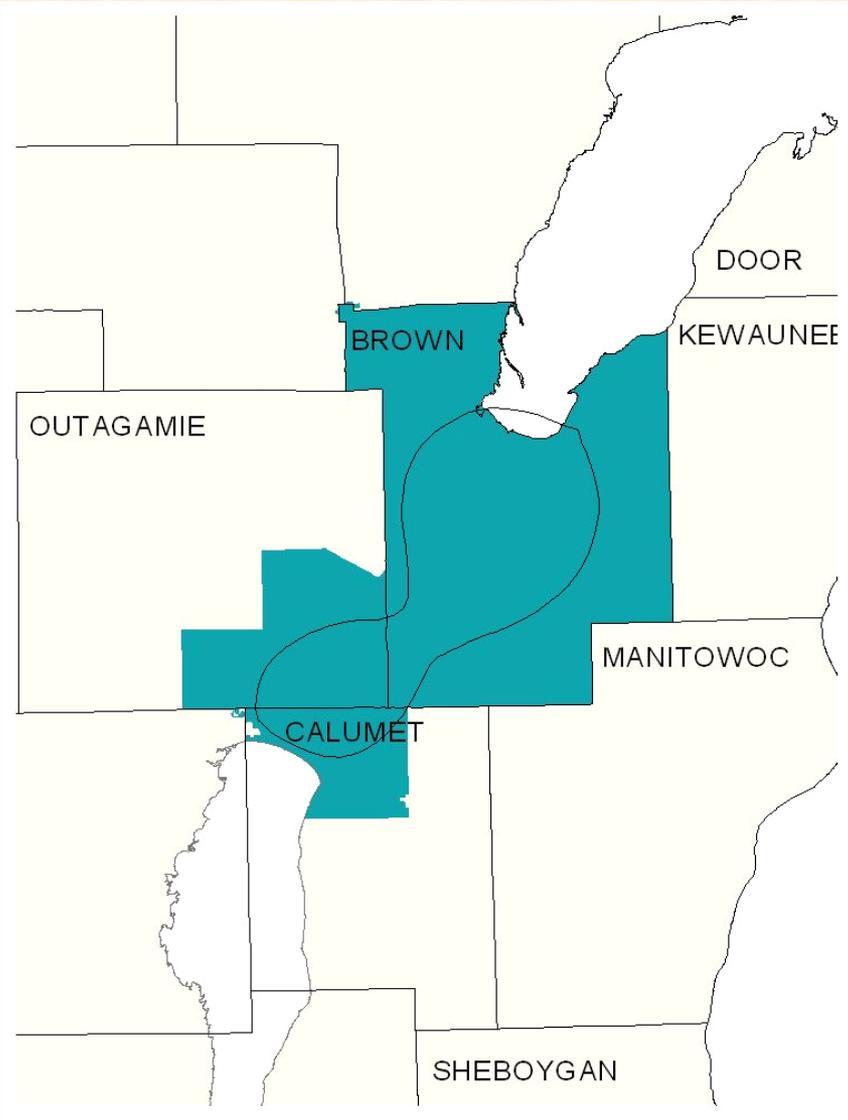


Groundwater Management Areas

- Centered on Waukesha and Brown County
- Areas of significant drawdowns and over-pumping
- Water quality problems (arsenic, radium, salinity)
- Need for a coordinated management strategy



Possible look of GMAs



Groundwater Advisory Committee

- 14 members
- Appointed by Governor and Legislature
- Must represent municipal, industrial, agricultural, and environmental interests
- Staffed by DNR



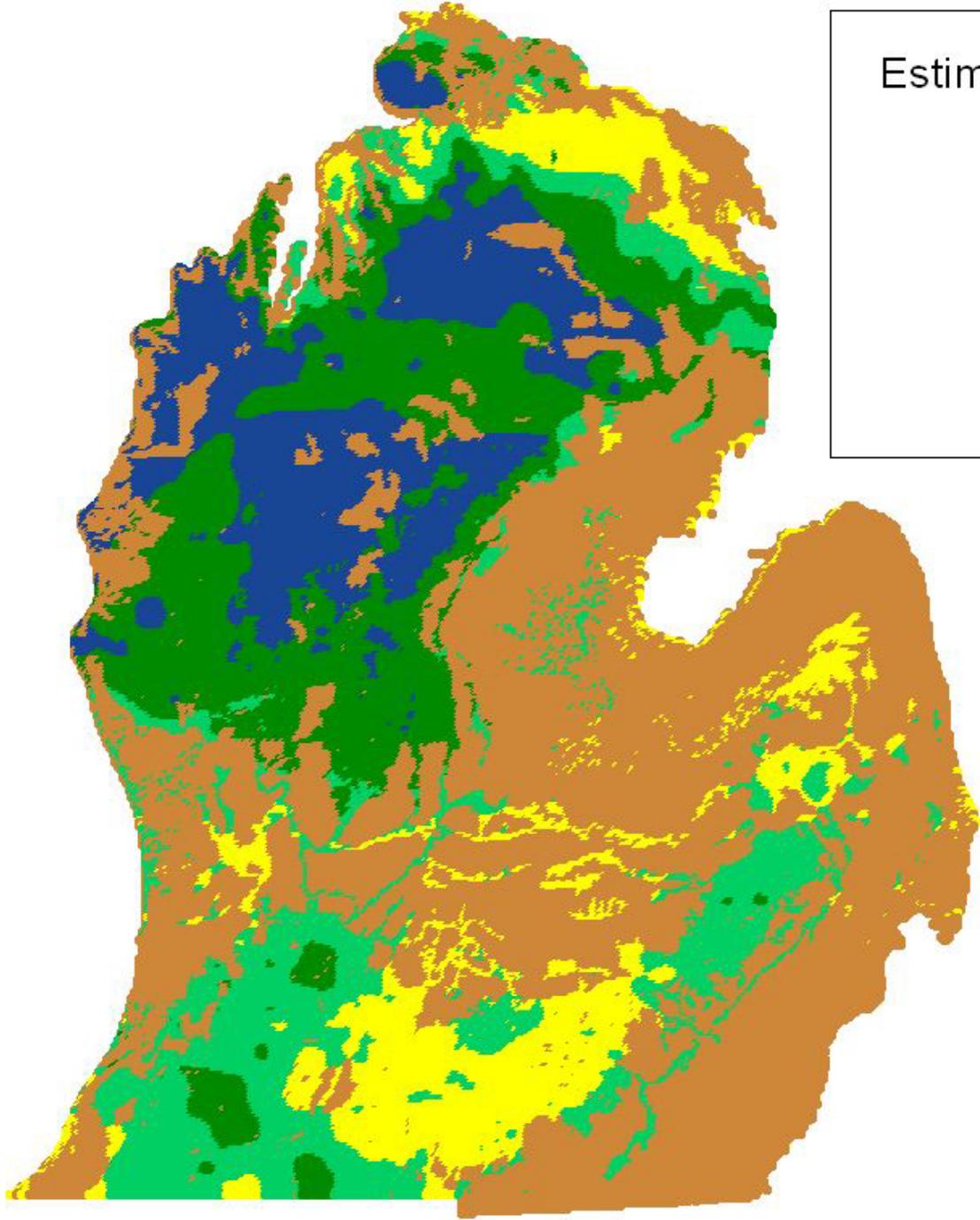
Groundwater Advisory Committee

- Two broad tasks
 - Recommendations for management within Groundwater Management Areas (GMAs)
 - Evaluation of new high capacity well regulations
- Reports due to legislature by end of 2007
- Recommendations could include future legislation

Estimated Transmissivity, ft²/day

Rasadrift2.shp

- 0 - 1244
- 1244 - 4322
- 4322 - 9210
- 9210 - 15560
- 15560 - 33920



Overview

- August 2003, Michigan Legislature passed Public Acts 148 and 177
- PA 148 requires that a ground-water inventory and map be generated for the State by August 2005
- PA 177 sets up procedure to address ground-water-withdrawal conflicts in the State
- USGS entered cooperative agreement with Michigan Department of Environmental Quality and Michigan State University to meet PA 148
- The work for PA 148 project will provide science support to MDEQ in meeting PA 177 requirements

Public Act 148 – Ground-water Inventory and Map

- (1)
 - (a) Location and water yielding capabilities of aquifers in the state.
 - (b) Aquifer recharge rates in the state, if available to the department.
 - (c) Static water levels of groundwater in the state (+ MSU)
 - (d) Base flow of rivers and streams in the state.
 - (e) Conflict areas in the state.
 - (f) Surface waters, including designated trout lakes and streams, and groundwater dependent natural resources, that are identified on the natural features inventory.
 - (g) The location and pumping capacity of all of the following:
 - (i) Industrial or processing facilities registered under section 32705 that withdraw groundwater.
 - (ii) Irrigation facilities registered under section 32705 that withdraw groundwater.
 - (iii) Public water supply systems that have the capacity to withdraw over 100,000 gallons of groundwater per day average in any consecutive 30-day period.
 - (h) Aggregate agricultural water use and consumptive use, by township.
- (2) The department shall make the statewide groundwater inventory and map available to the general public. -> [ArcIMS site hosted by MSU/MDEQ](#)

Scientific Challenges

- How to define aquifers Statewide – especially for glacial deposits
- How to combine information from variety of sources at different spatial scales
- How to express uncertainty
- How to express water yielding capability
 - Typical observed yield
 - Maximum potential yield
 - Ecological or water-balance constraints
 - Yield based on drawdown constraints:
 - What is the maximum pumping rate such that the drawdown is less than X feet at a distance Y feet from the pumping well after 90 days of pumping?
- How to map Statewide baseflow,
 - develop relationships for ungaged basins,
 - extend estimates to determine recharge,
 - provide uncertainty estimates

USGS
Monitoring

RASA
Studies

Ground-Water Inventory and Map

WellLogic
Lithology

Local
Studies



Aquifer
Tests

Hydrogeology
Mapping
Geostatistics
Geographic Database

Geologic
Maps



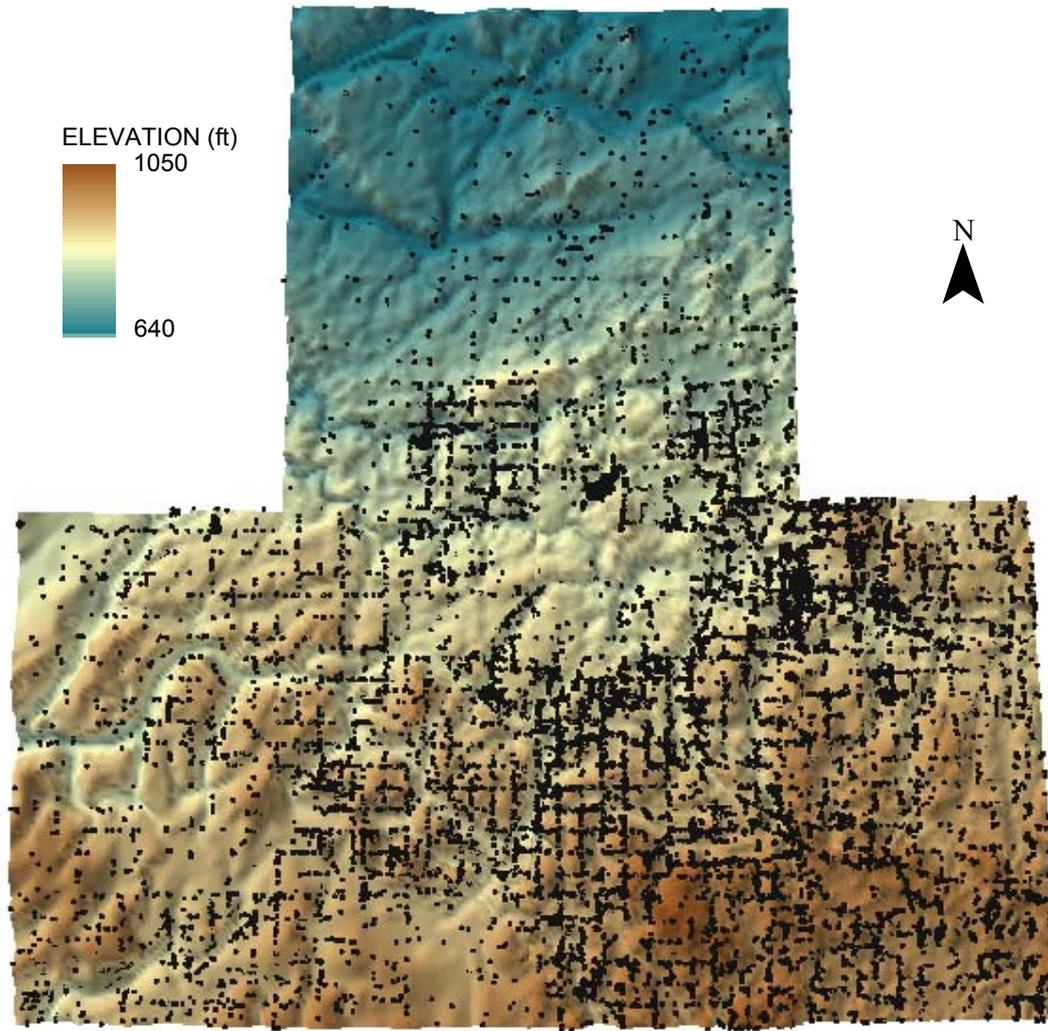
Mapping Aquifers and Static Water Levels

Pilot Areas

- Two areas selected to test methods
- Tri-County: Bedrock
- Kalamazoo: Glacial
- Report to State in June regarding approach for Statewide map based on pilot evaluation

Pilot Summary

- Bedrock – RASA model combined with aquifer test results from State and RASA databases appears reasonable
- Monroe County study in southeast
- Need to rely on older studies and State aquifer test database for Upper Peninsula



30-meter DEM for Clinton, Eaton, and Ingham Counties. Points show the location of wells completed in rock.

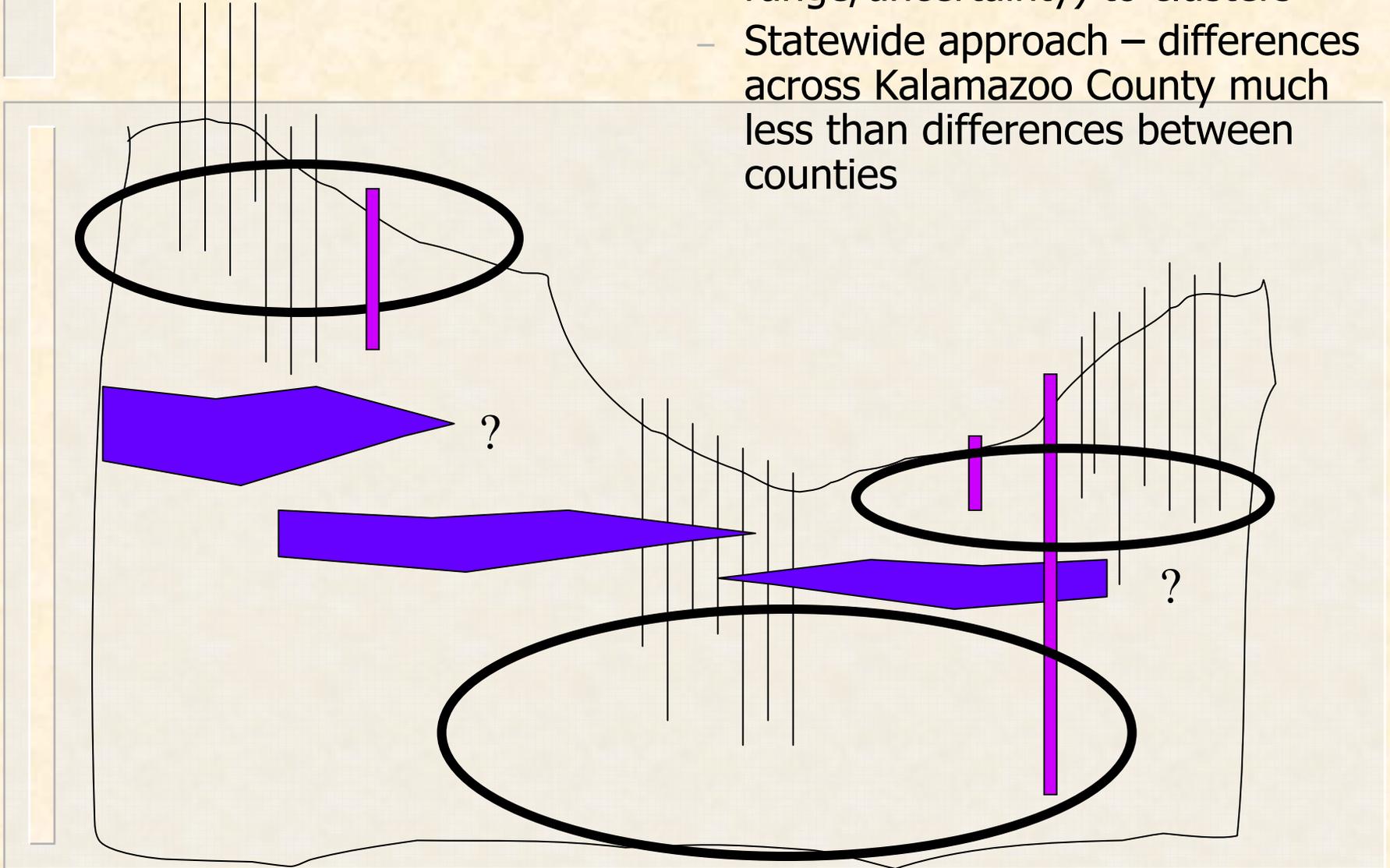


Pilot Summary

- Glacial – direct use of point information from WelLogic database did not work well
 - Effective properties based on lithologies
 - Projecting K onto lithologies using aquifer tests
 - Establishing layering, etc.

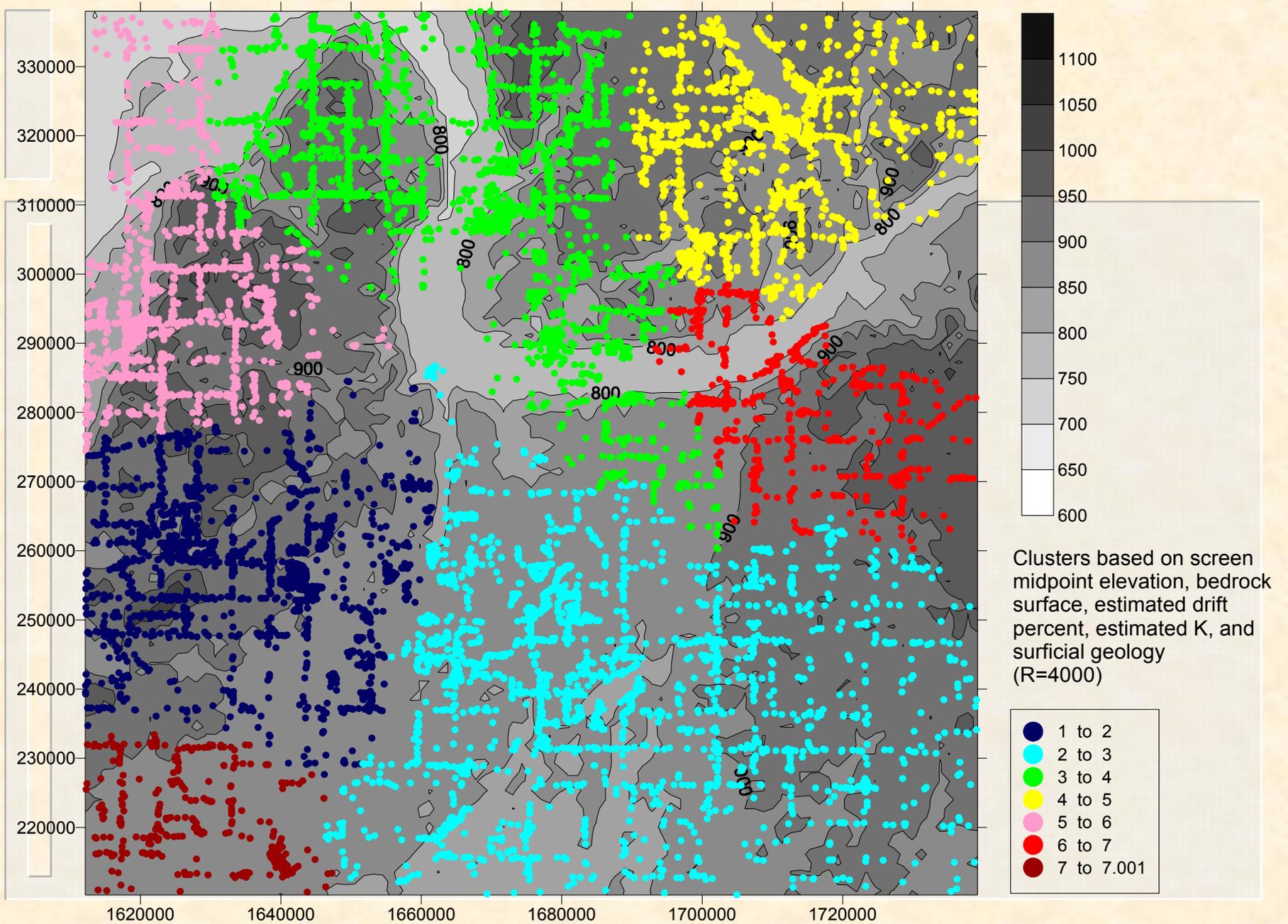
Current Efforts

- Cluster wells and assign aquifer properties (with range/uncertainty) to clusters
- Statewide approach – differences across Kalamazoo County much less than differences between counties



Clustering WelLogic Logs

- Can we identify clusters of wells using statistics such that aquifer properties can be assigned by cluster?
- Cluster analysis of WelLogic wells using SAS software



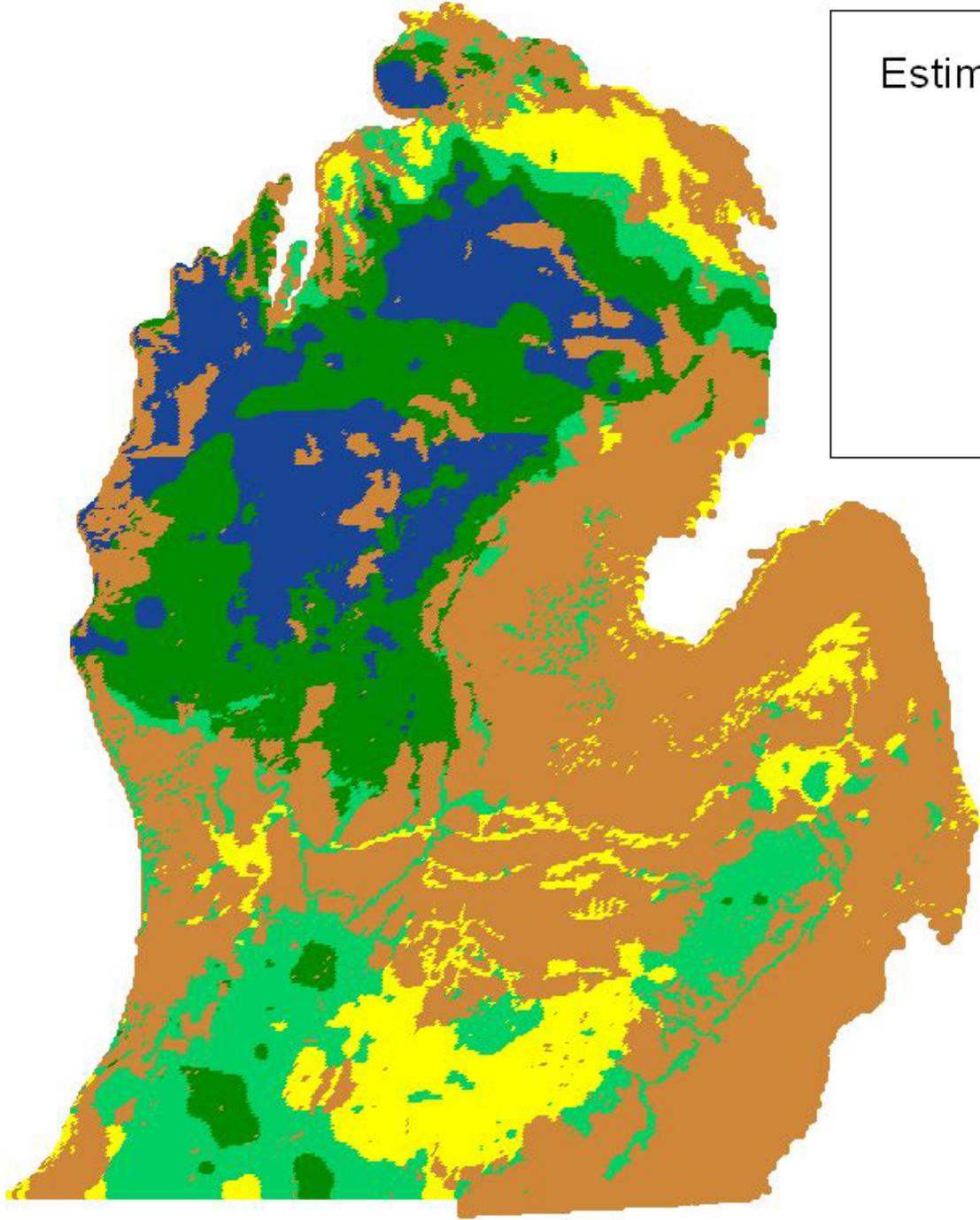
Statewide

- Provides starting point for future work
- Allows comparison of Kalamazoo County to other counties

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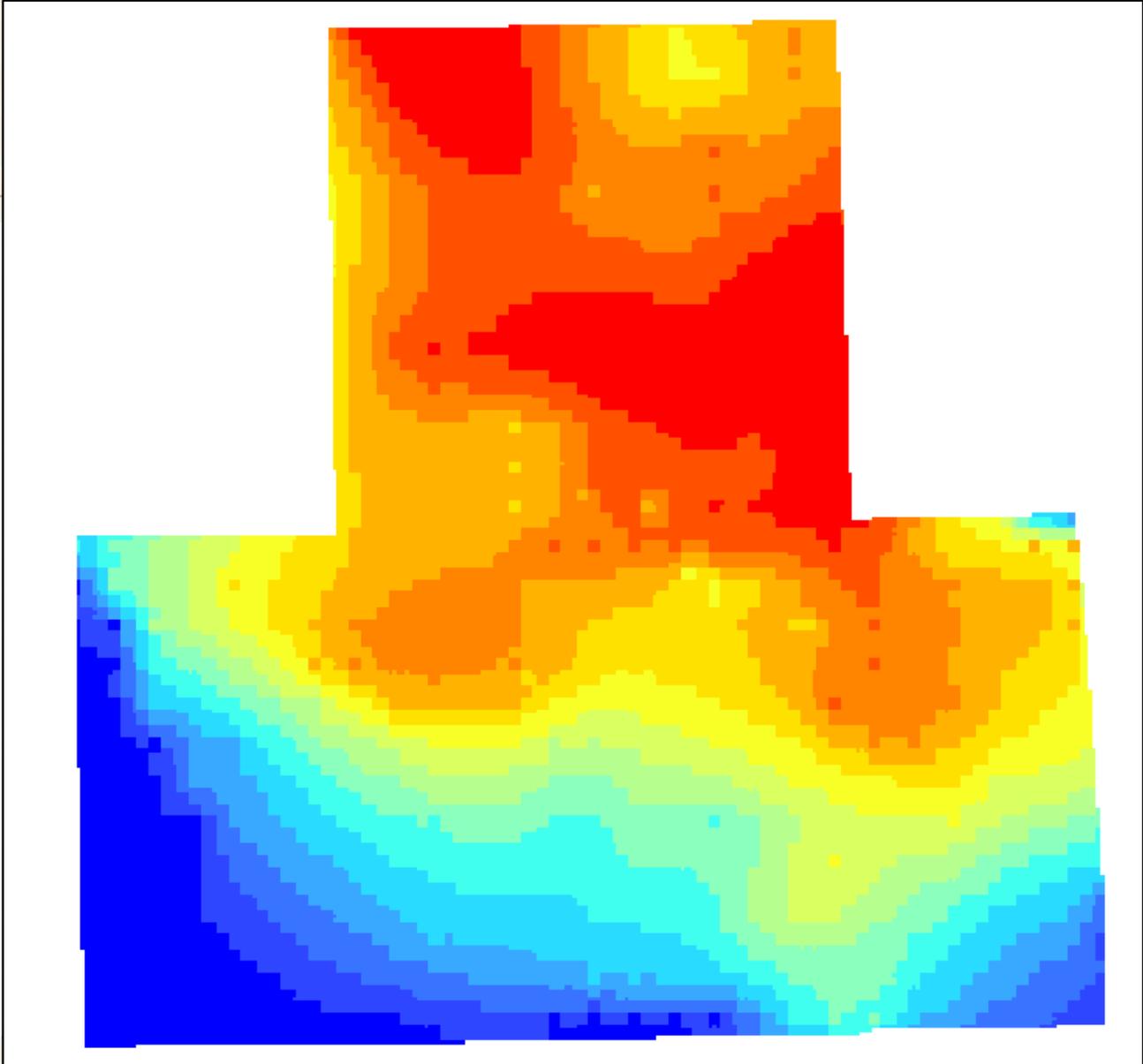


Static Water Levels

- Use reported water levels in WelLogic to generate potentiometric surface maps:
 - May be more relevant since these reflect where wells are screened
 - Can aquifers be identified from well logs using SWL? (Difference in water level elevation for nearby wells screened at different elevations)
 - Does well log information show temporal trends?
- Compare final map with water-table map from MSU – may highlight perched areas, etc.
- Use MSU water-table map as prior in Bayesian scheme to estimate water level in aquifer screened by wells in WelLogic



ArcIMS DEMO



Explanation

qmap_0.25
Discharge (gpm)

- 3 - 16
- 17 - 36
- 37 - 57
- 58 - 77
- 78 - 96
- 97 - 114
- 115 - 133
- 134 - 153
- 154 - 175
- 176 - 195
- 196 - 212
- 213 - 228
- 229 - 243
- 244 - 257
- 258 - 285

Discharge map that would result in 10 feet of drawdown 0.25 miles from pumping well after 90 days.