

# **Groundwater and wells in agricultural regions of Bayfield County**

**Report to the Large-scale  
Livestock Study Committee  
November 12, 2015**

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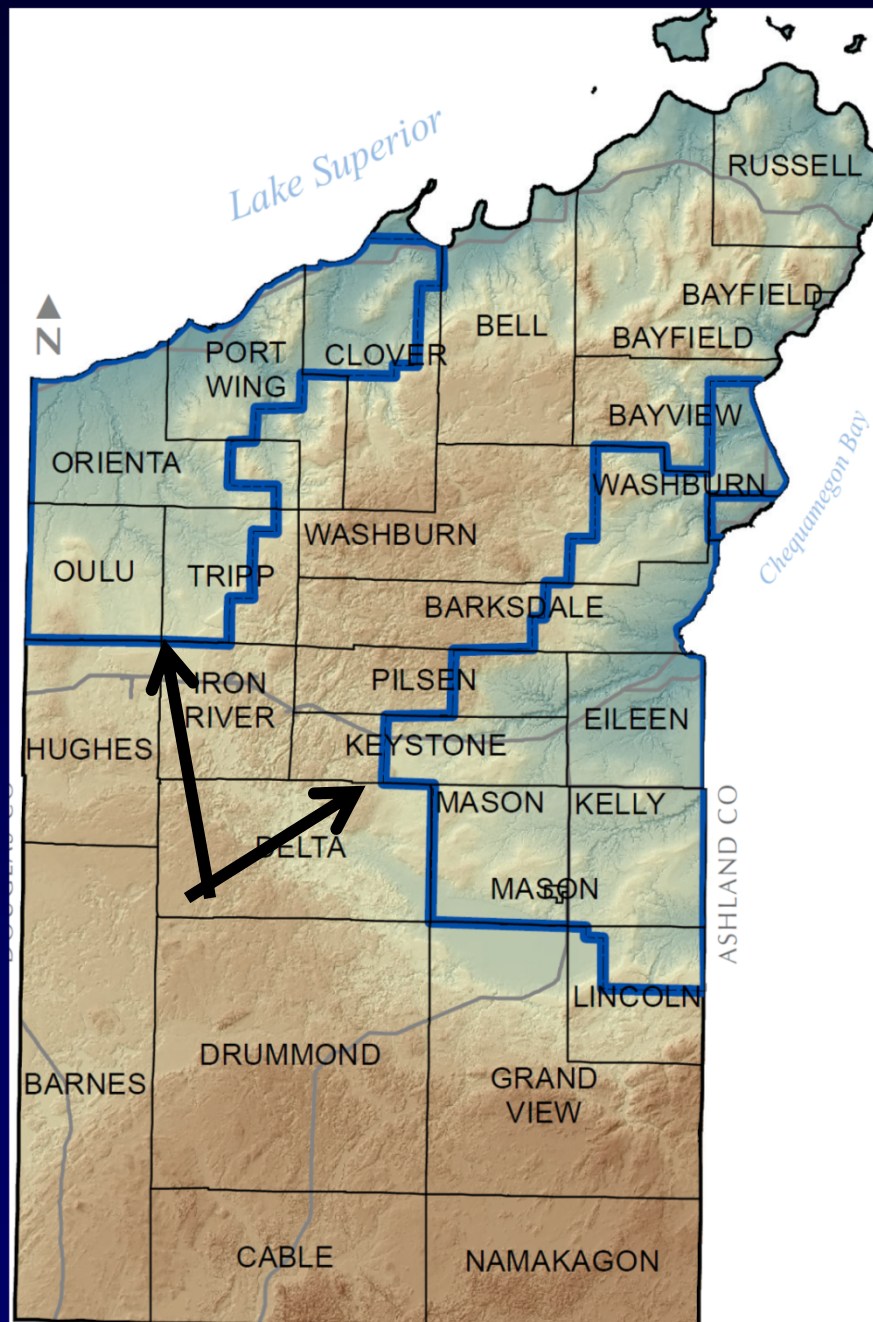


**Wisconsin Geological &  
Natural History Survey**

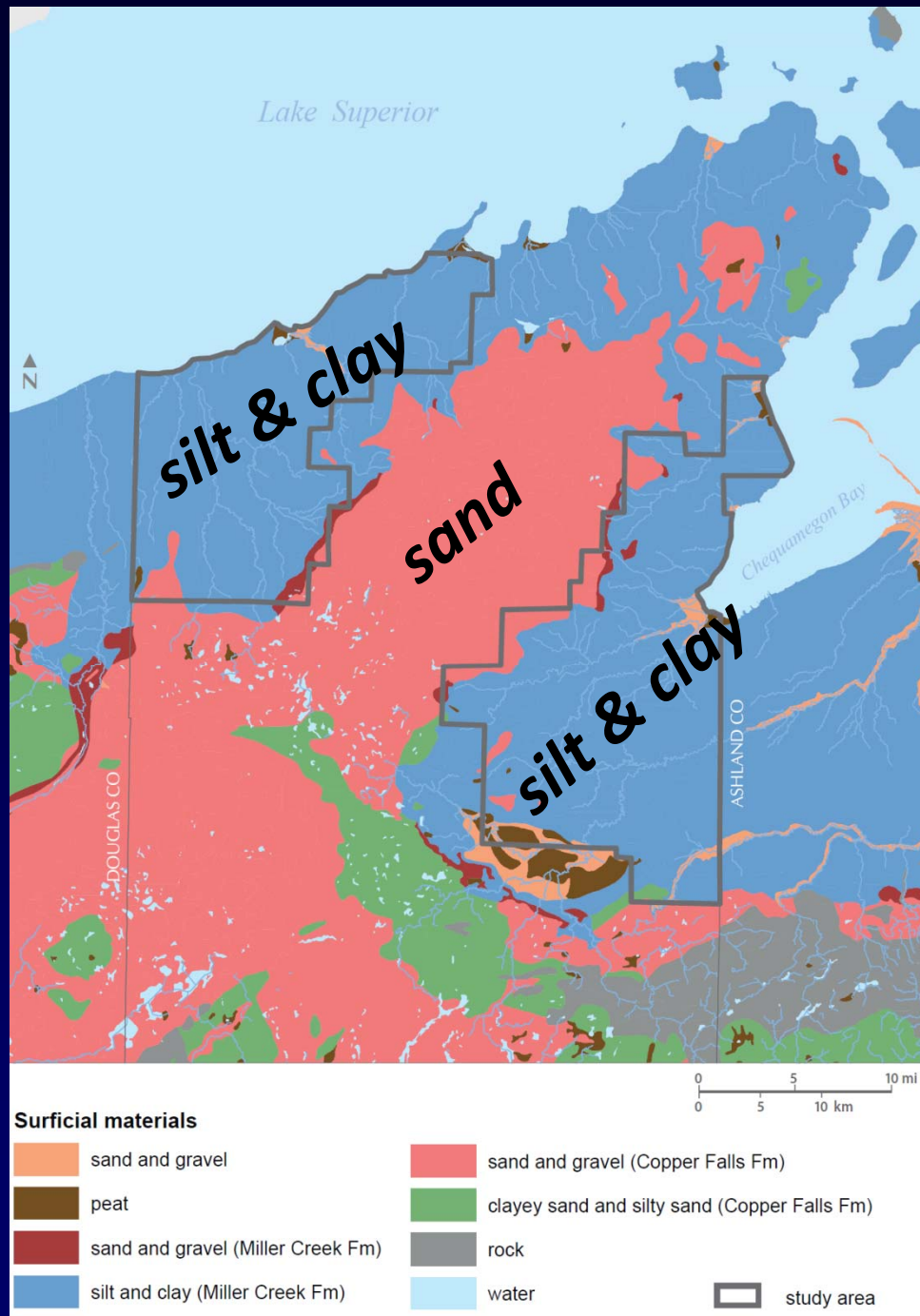
# Project purpose

Technical information to support local decisions about land use practices that potentially affect groundwater and wells

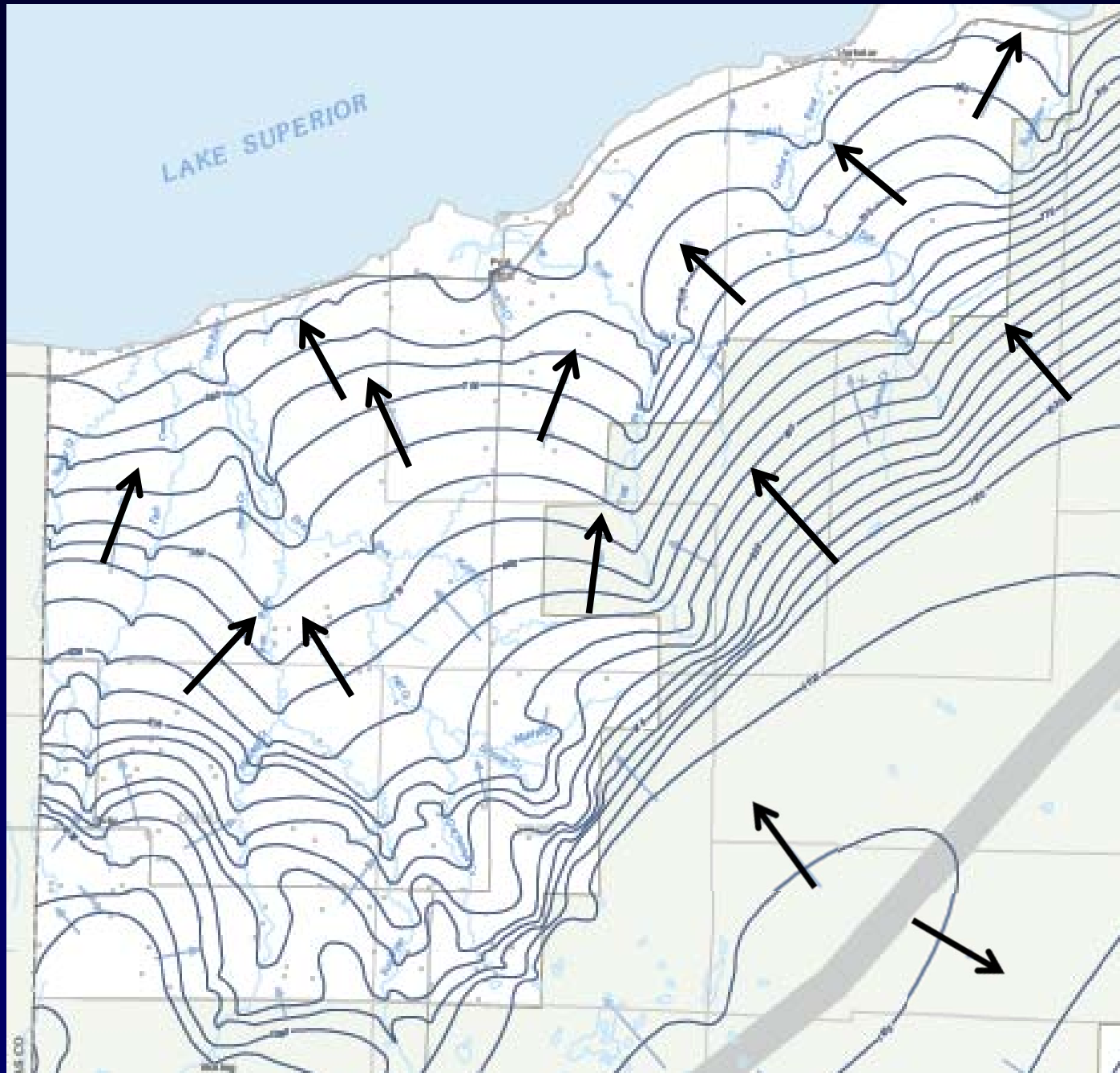
- Compile data and existing reports
- Interpret and illustrate the hydrogeologic setting
- Develop a water table map
- Provide report and GIS data sets



The study area includes Bayfield County's two agricultural regions, outlined in blue on this map.



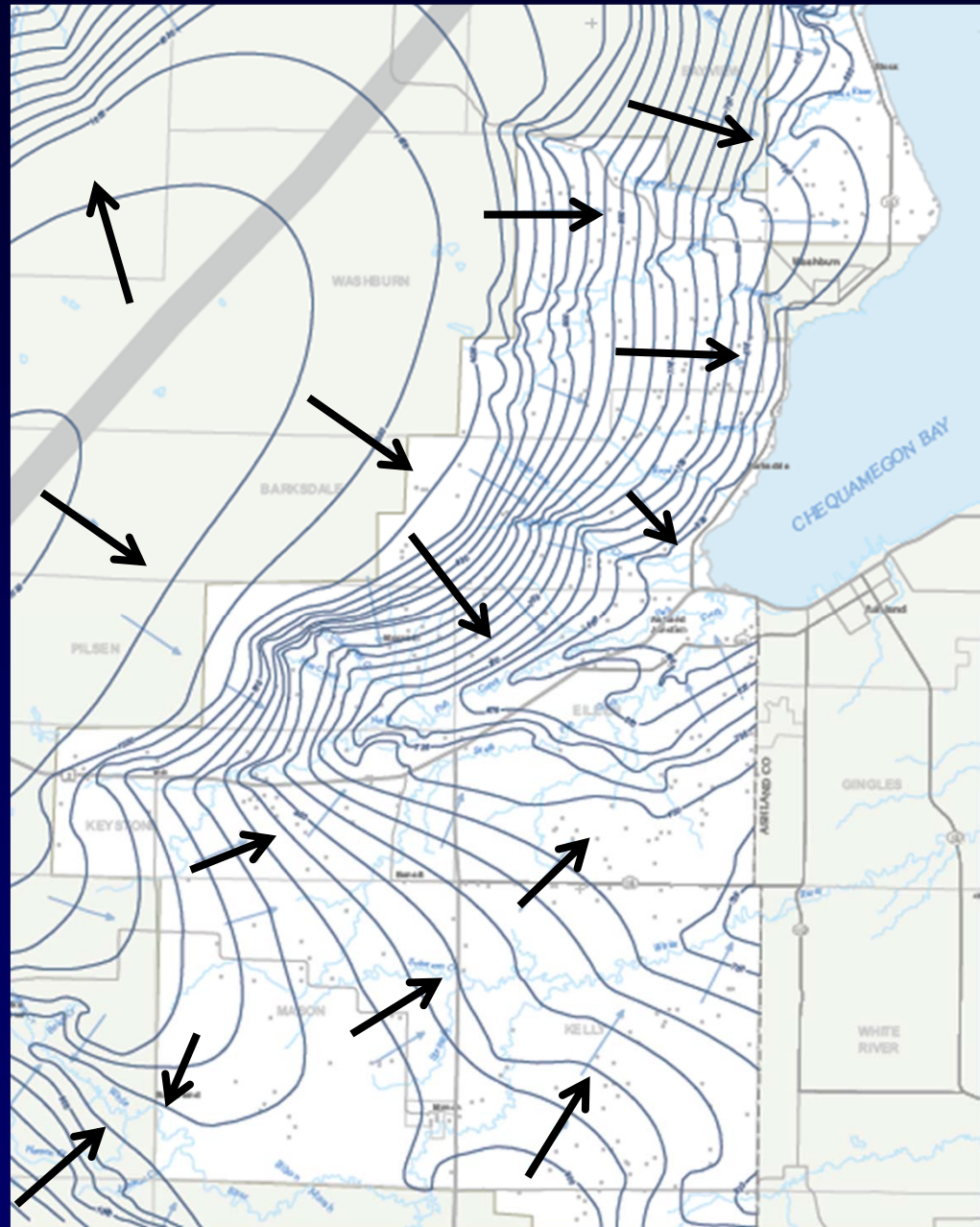
Geologic sediment in agricultural regions is primarily silt and clay (shown in blue on this map). This results in more runoff of rainfall compared to upland areas, which have very sandy sediment (shown in pink and red).



The water table map shows the groundwater flow direction, generally towards Lake Superior



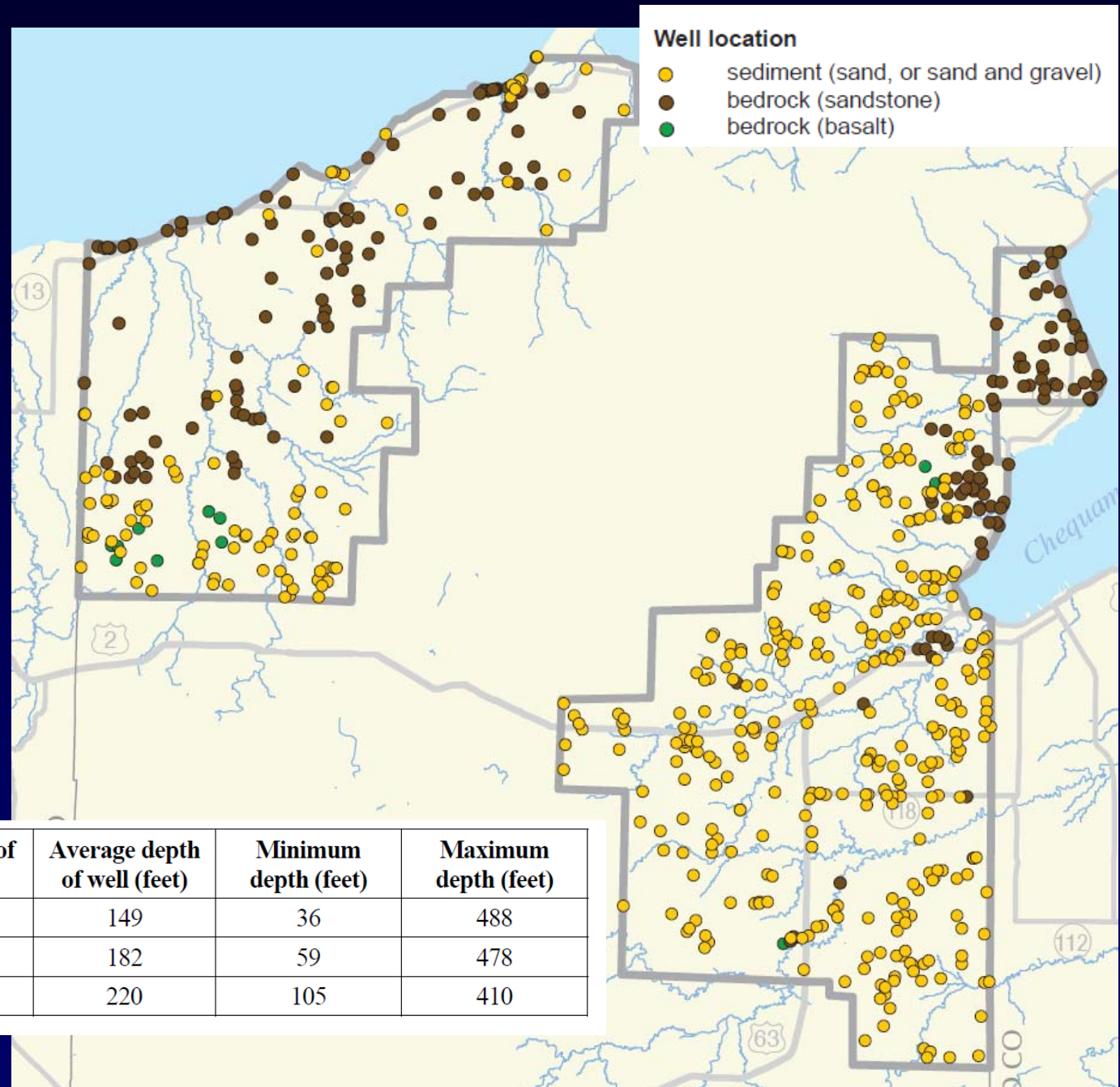
The water table map is used to identify wells and streams that are downgradient of agricultural fields and waste storage areas



Records from 660 wells were used in this study. The symbol color indicates which wells are completed in sand and gravel or bedrock.

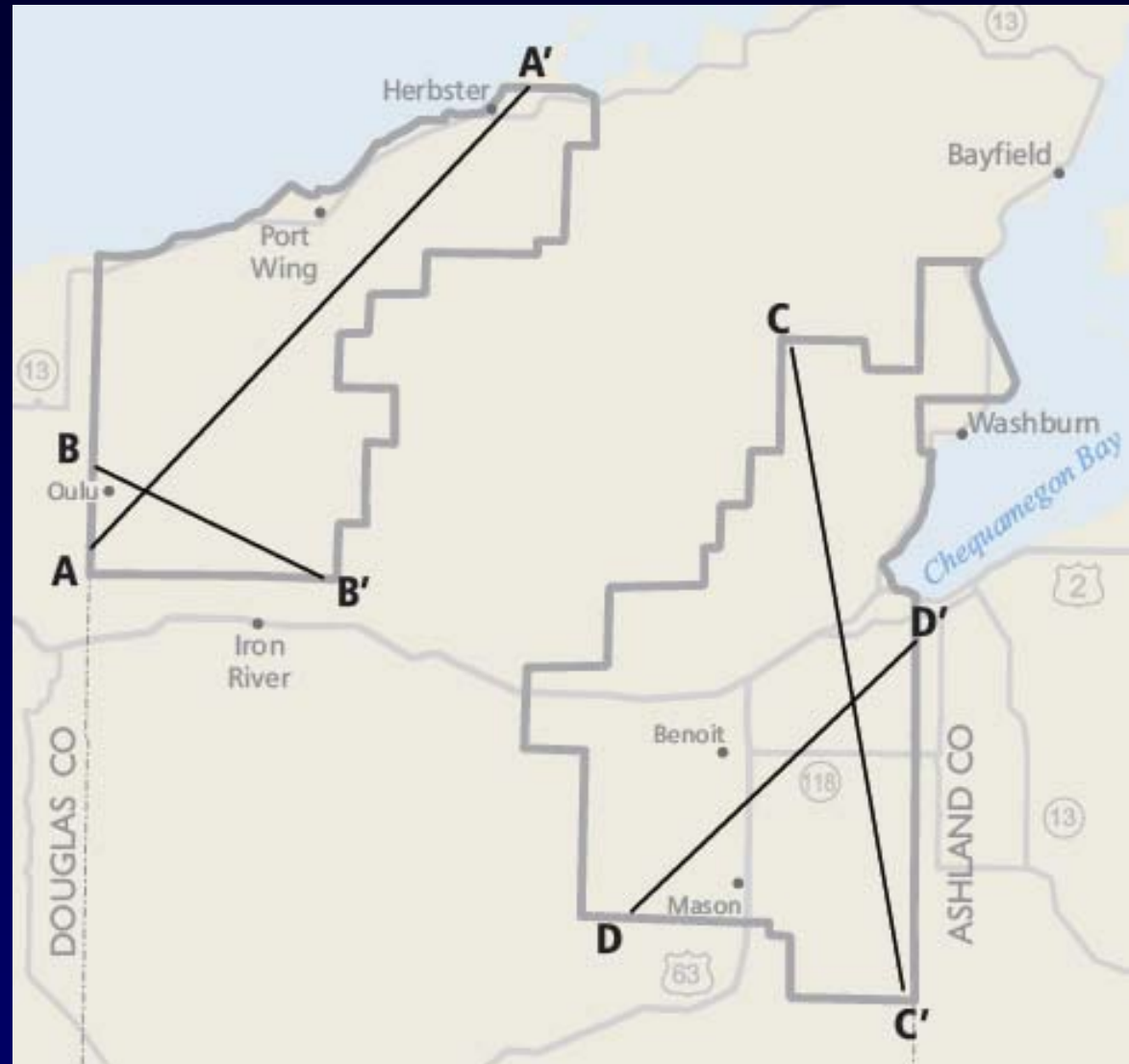
The table indicates the average, minimum, and maximum depth of wells.

Completion material	Number of wells	Average depth of well (feet)	Minimum depth (feet)	Maximum depth (feet)
Sand, gravel	444	149	36	488
Sandstone (bedrock)	205	182	59	478
Basalt (bedrock)	11	220	105	410

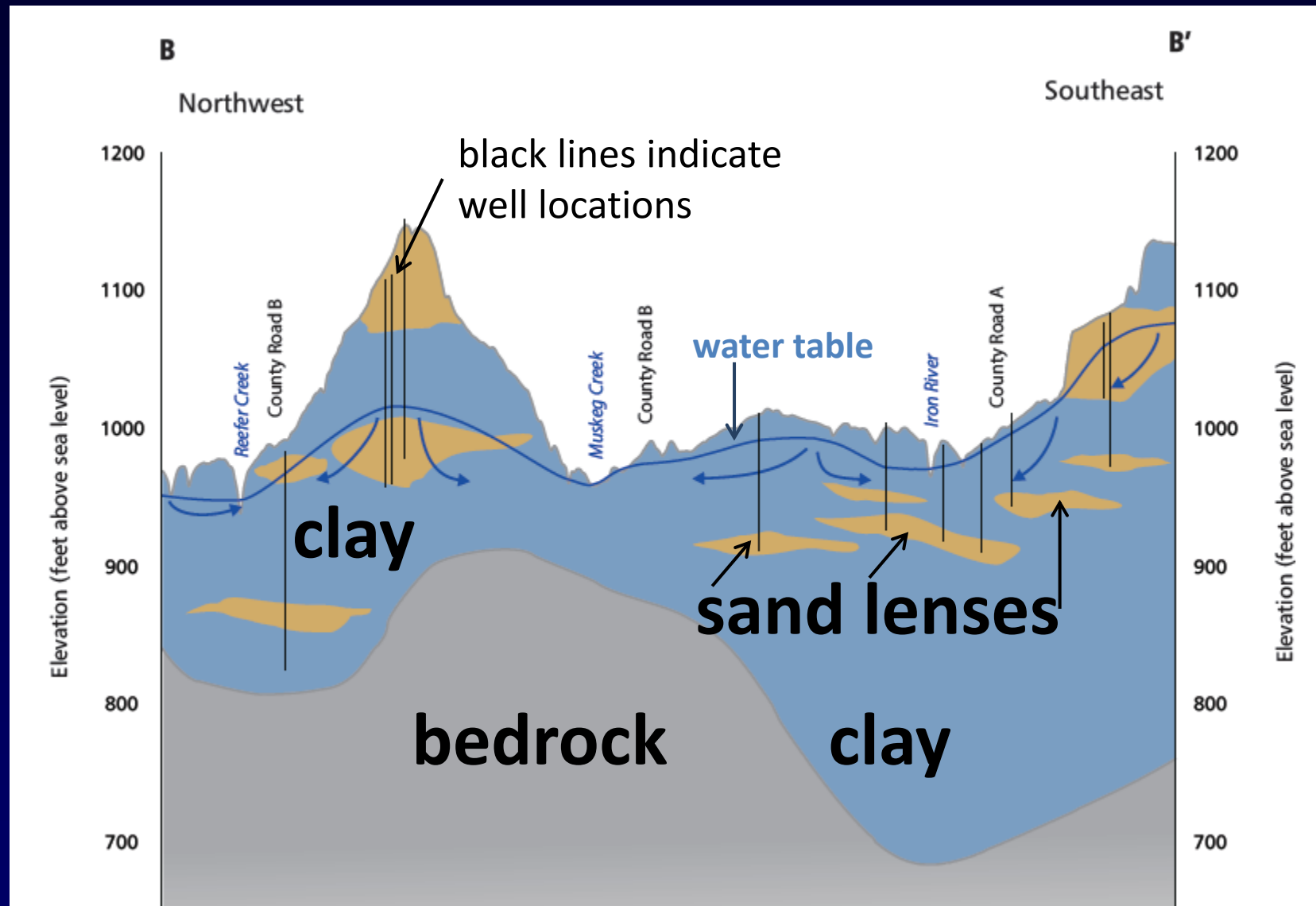


This map shows the locations of four geologic cross sections developed from well records.

A geologic cross section shows the layering of sediment beneath the ground, as if you could slice the earth along the section line and look below, at the layers of sand, clay, and bedrock.





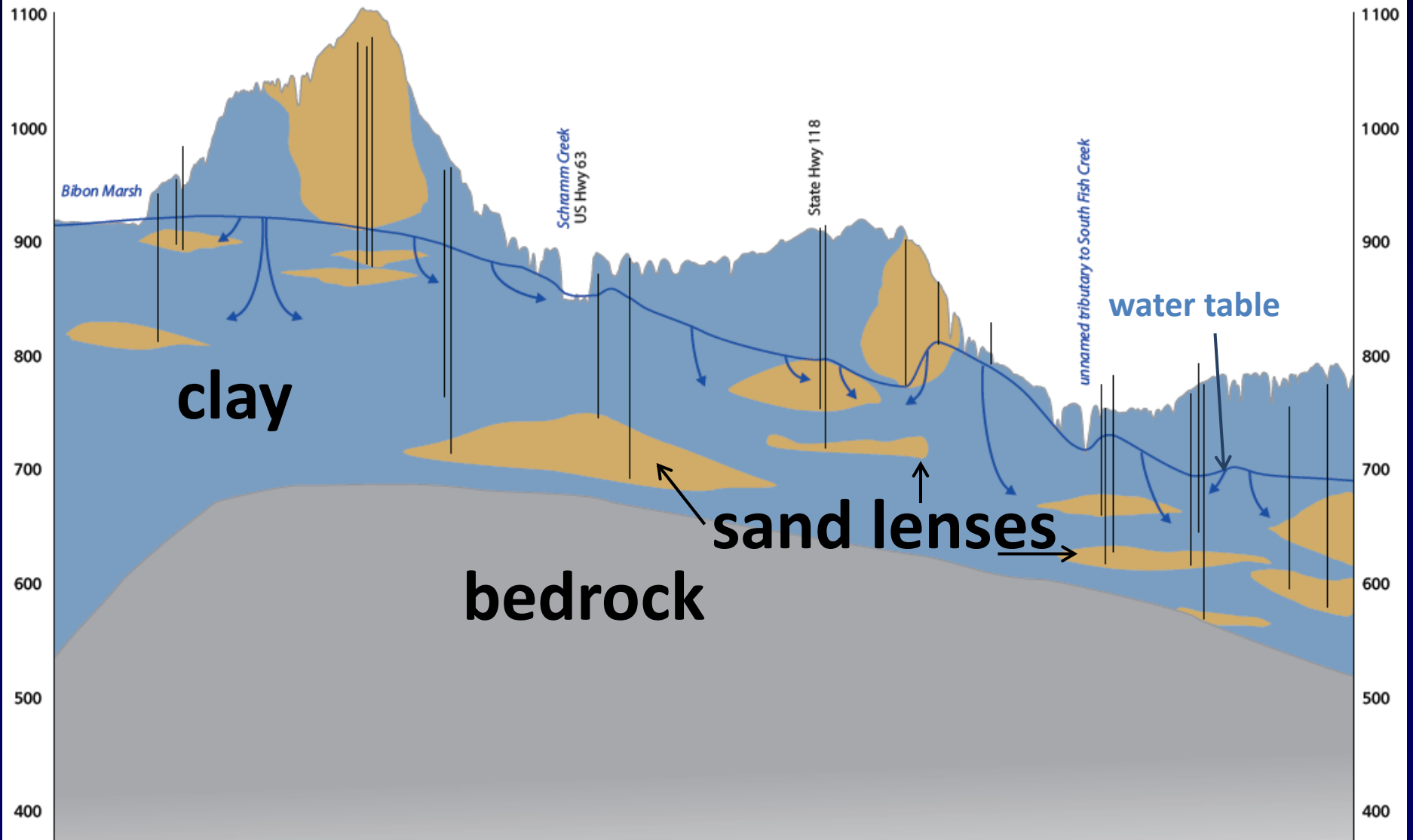


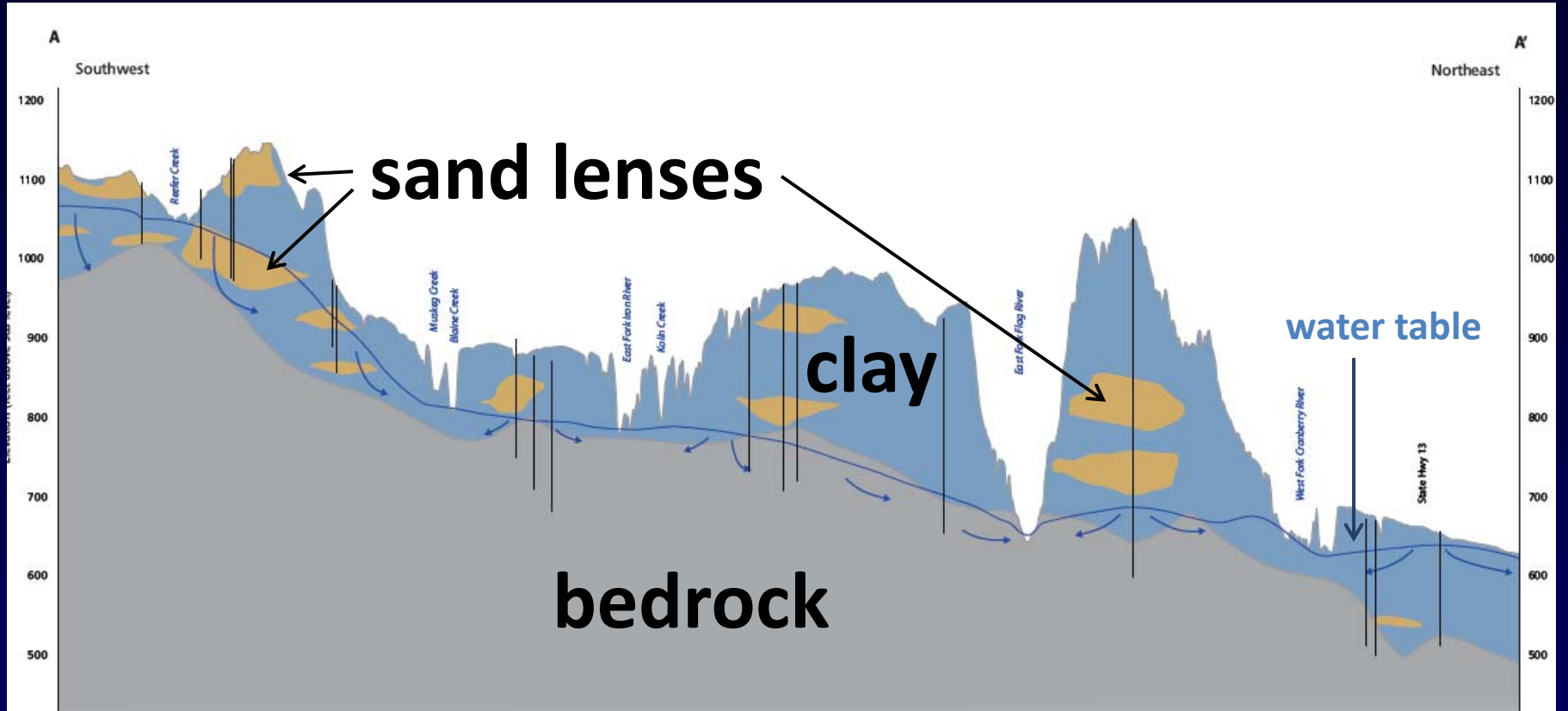
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Southwest

D'

Northeast





# Conclusions and Recommendations

- Geology in the agricultural regions supports runoff to streams and rivers with less groundwater recharge compared to the sandy upland areas
- Local officials, farmers, and residents can use the water table map to identify groundwater flow directions to and from areas of concern



# Recommendations, continued

- Local officials can provide advice on well construction to those seeking a building permit:
  - deep casings and wells are preferred
  - wells completed in sandstone with little overlying sediment are very vulnerable to contamination compared to wells completed beneath tens of feet of clay and silt

# Recommendations, continued

- Livestock operations should be required / encouraged to monitor groundwater downgradient (vertically and laterally) of waste storage areas and land spreading sites, over a long-term period (years)
- Local officials should encourage homeowners to sample their well water, in addition to the ~ 60 wells recently sampled, particularly the northwestern area
- Local officials may add existing wells to the 660 wells in the project database, recording well locations, depths and geology

## **Additional information**

County officials should consider investing in additional information about groundwater resources

- Add new wells and existing wells to the project database
- Develop a depth to bedrock map for the county
- Develop a groundwater susceptibility map for the county (groundwater recharge, depth to bedrock, depth to groundwater, sediment type)

**The full report is presented here:**

<http://wgnhs.uwex.edu/pubs/000934/>