

# Water Resources Study Update

Dr. Jon Bartholic, Director

Institute of Water Research at Michigan State University

Zach Curtis, Ph.D. candidate

Graduate Assistant, Civil and Environmental Engineering

# Study Background - Growth

- Ottawa County is one of the fastest growing counties in Michigan:

## Ten Fastest Growing Counties in Michigan (2014-2015)

Ranked by Percent Change in Population (2014-2015)

| County                | Census Population |           |                   | Population Change<br>2010 - 2015 | Percent Change<br>2010 - 2015 | Population Change<br>2014 - 2015 | Percent Change<br>2014 - 2015 |
|-----------------------|-------------------|-----------|-------------------|----------------------------------|-------------------------------|----------------------------------|-------------------------------|
|                       | Actual<br>2010    | Estimates |                   |                                  |                               |                                  |                               |
|                       |                   | 2014      | 2015 <sup>1</sup> |                                  |                               |                                  |                               |
| Ottawa County         | 263,801           | 276,598   | 279,955           | 16,154                           | 6.12%                         | 3,357                            | 1.21%                         |
| Kent County           | 602,622           | 630,225   | 636,369           | 33,747                           | 5.60%                         | 6,144                            | 0.97%                         |
| Grand Traverse County | 86,986            | 90,796    | 91,636            | 4,650                            | 5.35%                         | 840                              | 0.93%                         |
| Livingston County     | 180,967           | 185,703   | 187,316           | 6,349                            | 3.51%                         | 1,613                            | 0.87%                         |
| Allegan County        | 111,408           | 113,743   | 114,625           | 3,217                            | 2.89%                         | 882                              | 0.78%                         |
| Lake County           | 11,539            | 11,345    | 11,424            | -115                             | -1.00%                        | 79                               | 0.70%                         |
| Ingham County         | 280,895           | 284,263   | 286,085           | 5,190                            | 1.85%                         | 1,822                            | 0.64%                         |
| Kalamazoo County      | 250,331           | 258,908   | 260,263           | 9,932                            | 3.97%                         | 1,355                            | 0.52%                         |
| Washtenaw County      | 344,791           | 357,029   | 358,880           | 14,089                           | 4.09%                         | 1,851                            | 0.52%                         |
| Leelanau County       | 21,708            | 21,884    | 21,981            | 273                              | 1.26%                         | 97                               | 0.44%                         |
| Michigan              | 9,883,640         | 9,916,306 | 9,922,576         | 38,936                           | 0.39%                         | 6,270                            | 0.06%                         |

# Study Background – Unique Geology

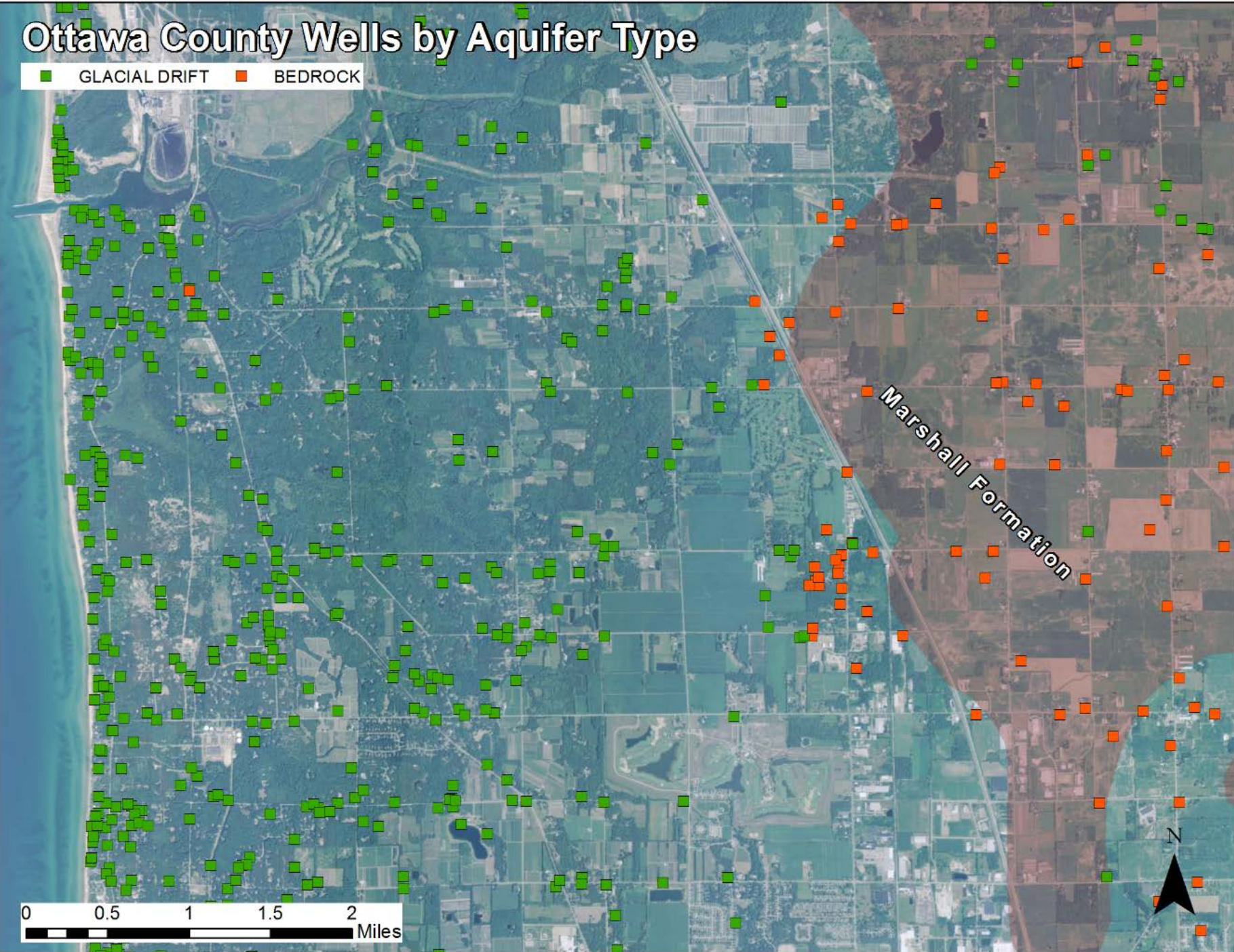
From the Nov. 2, 2016, Ottawa County Groundwater Task Force Meeting Minutes:

“Mr. Yellich explained that Ottawa County is in a unique geological area in Michigan. He questioned whether future development in Ottawa County will use the Marshall or glacial aquifer as the main water resource.”

John Yellich is the director of the Michigan Geological Survey at Western Michigan University.

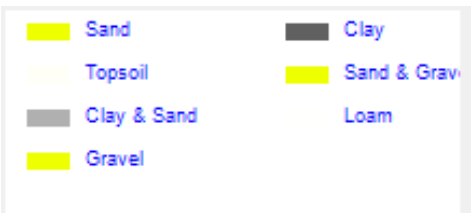
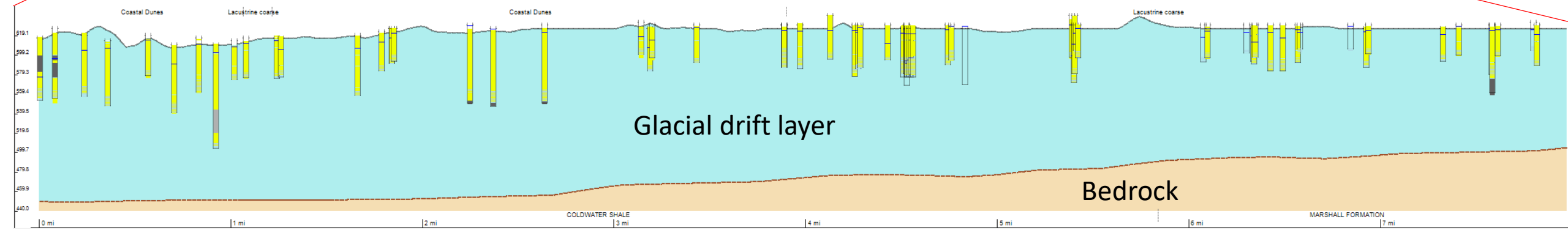
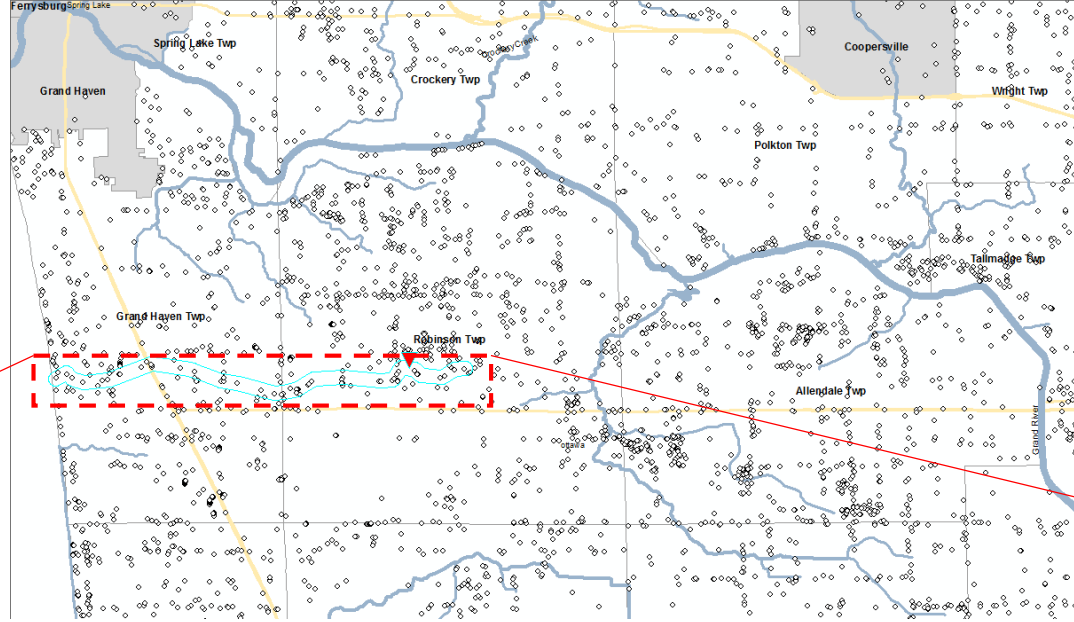
# Ottawa County Wells by Aquifer Type

■ GLACIAL DRIFT ■ BEDROCK



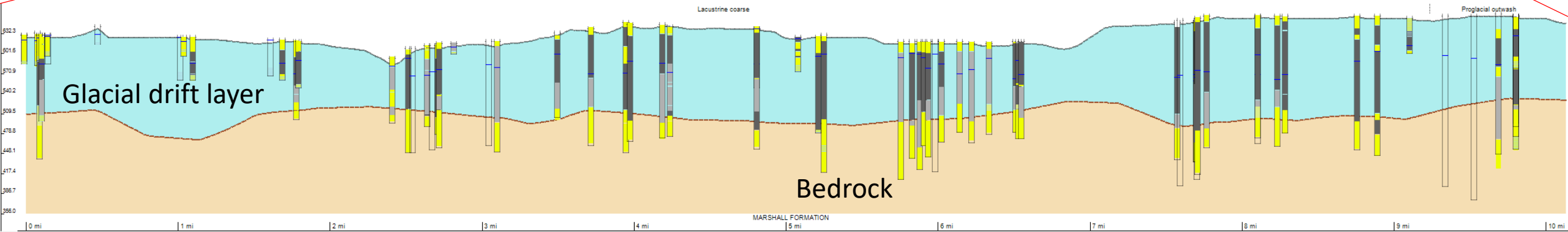
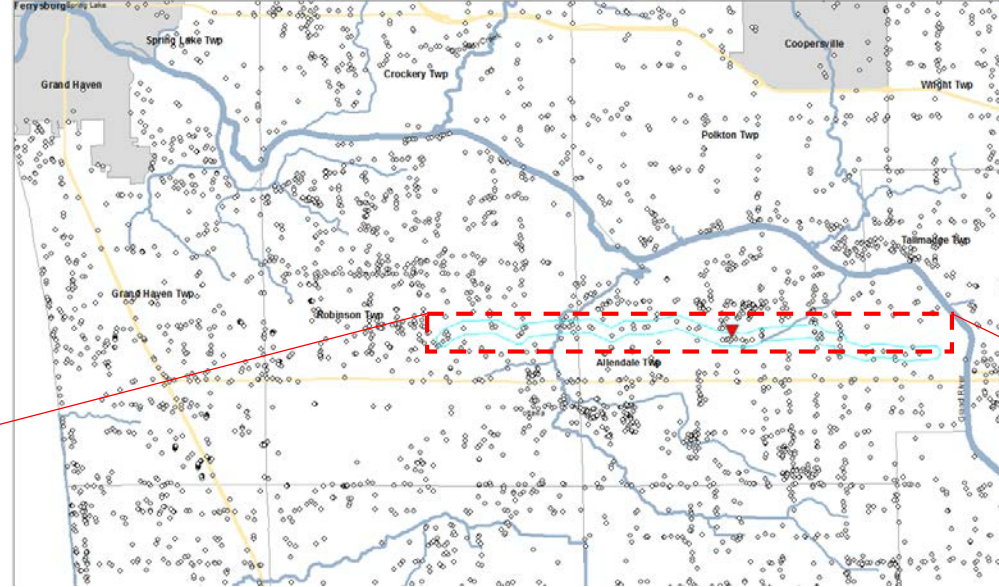
# Cross-section, central east-Ottawa County

Actual well lithology shown

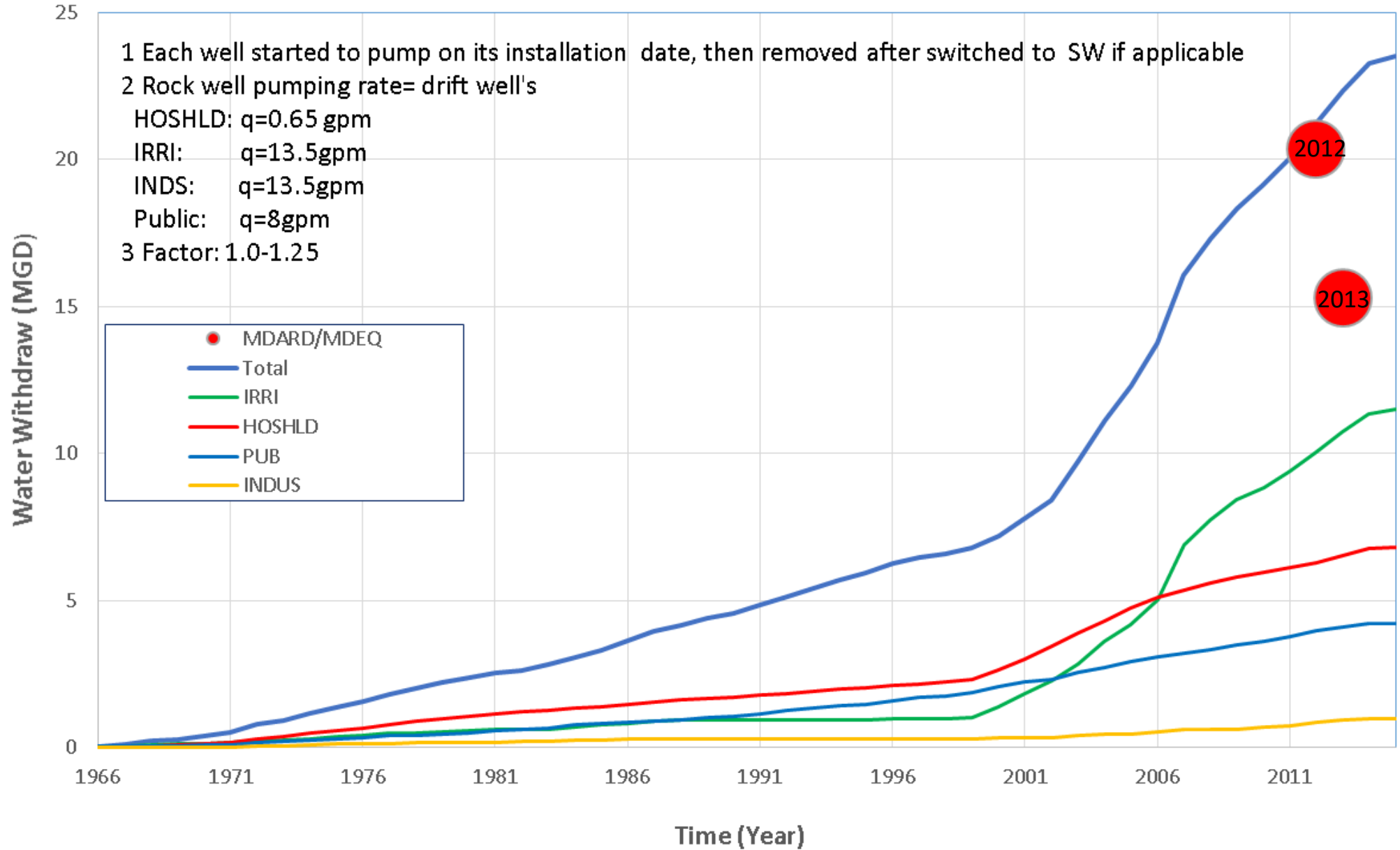


# Cross-section, central Ottawa County

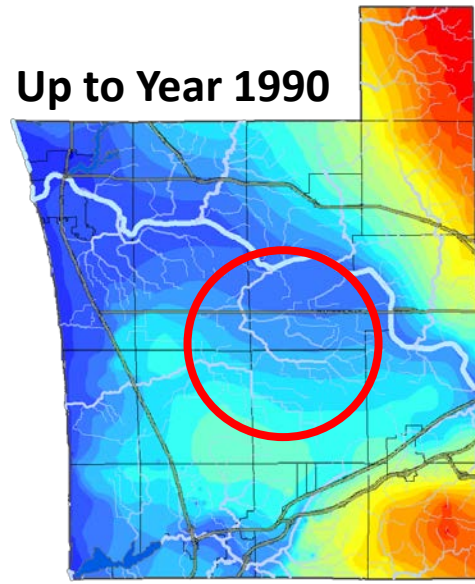
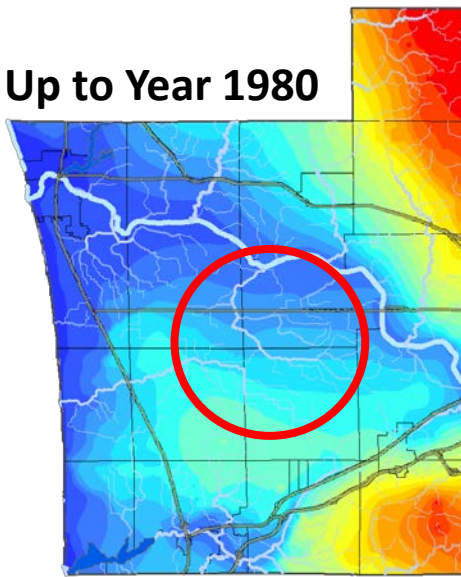
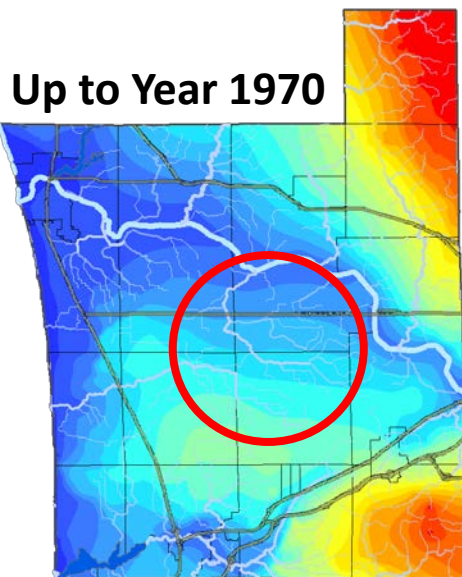
Actual well lithology shown



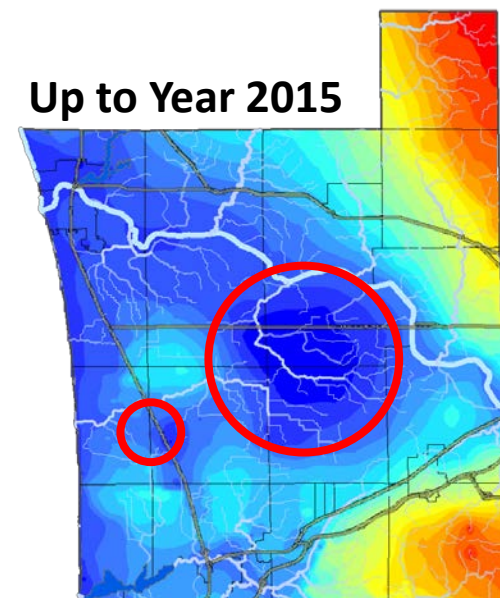
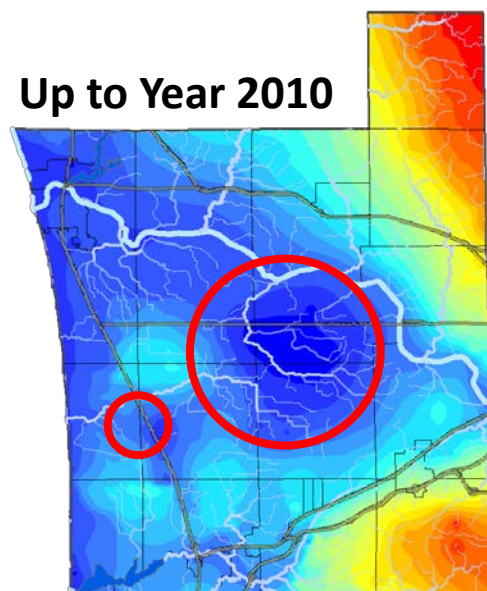
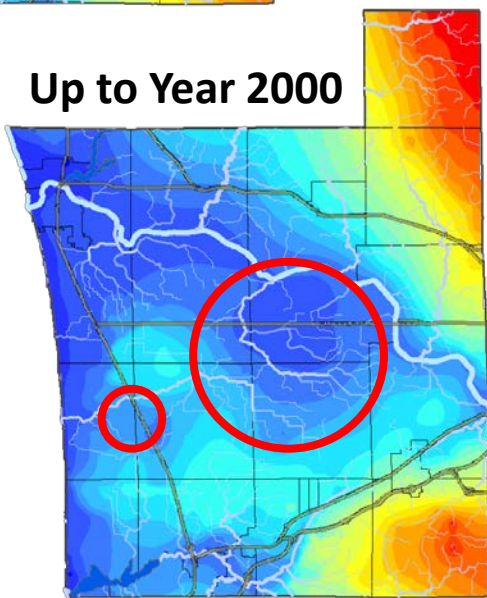
# (Final) Calibrated Water Use in Ottawa County



# KEY INSIGHT: Increased water use, lack of recharge from the surface, and low bedrock transmissivity combine to reduce Static Water Levels (SWLs) in central Ottawa County

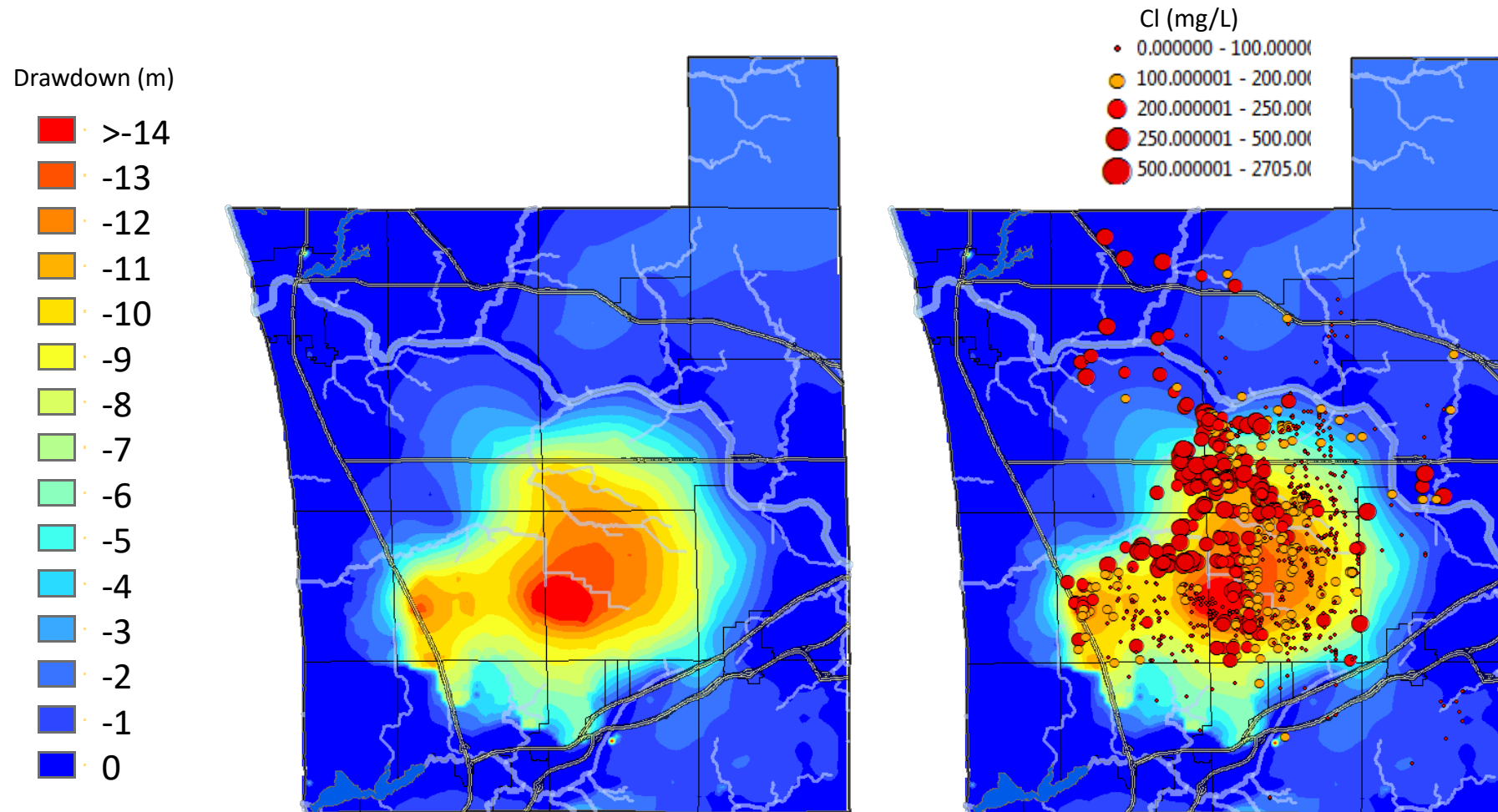


- Rock SWL (m)
- 165.1967163 - 174.8712686
  - 174.8712687 - 176.8961749
  - 176.896175 - 178.6960916
  - 178.6960917 - 180.7209979
  - 180.720998 - 182.7459042
  - 182.7459043 - 184.9958001
  - 184.9958002 - 187.4706855
  - 187.4706856 - 190.1705606
  - 190.1705607 - 192.8704356
  - 192.8704357 - 195.5703107
  - 195.5703108 - 197.8202066
  - 197.8202067 - 200.2950921
  - 200.2950922 - 202.7699775
  - 202.7699776 - 205.244863
  - 205.2448631 - 207.7197485
  - 207.7197486 - 209.9696443
  - 209.9696444 - 212.2195402
  - 212.2195403 - 214.4694361
  - 214.4694362 - 216.719332
  - 216.7193321 - 219.1942175
  - 219.1942176 - 222.3440717



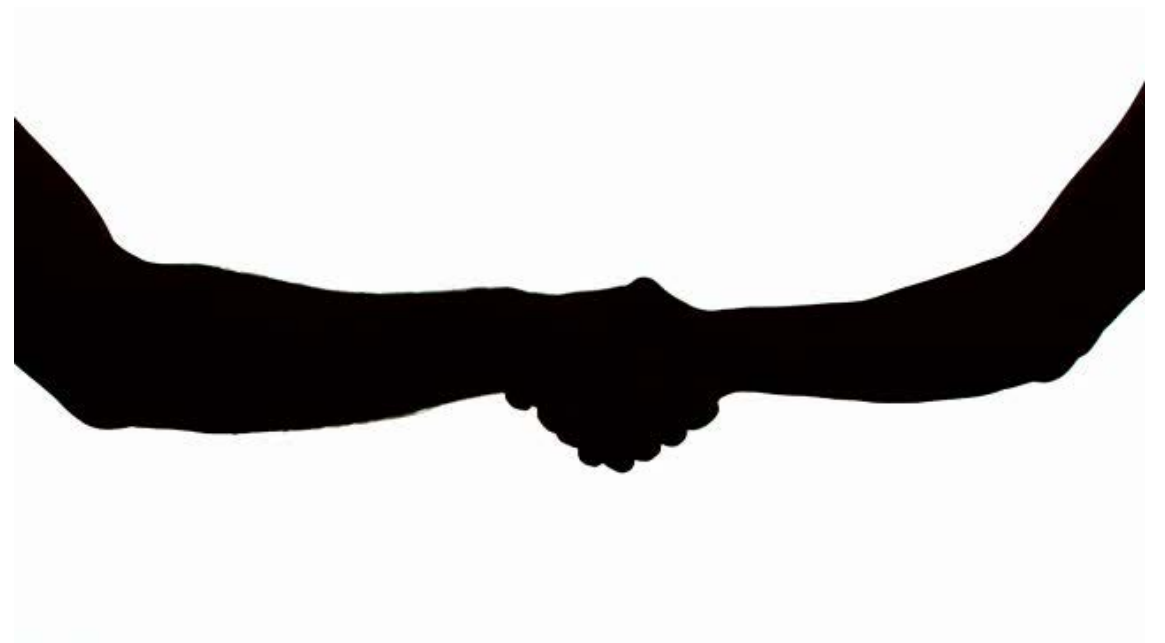


# Simulated Drawdown (1970 – 2015) with Chloride Point Data



# Excellent Cooperation

- Preliminary phase II study results have been presented to Ottawa County officials by researchers from the MSU Civil and Environmental Engineering
- Currently, local government officials are working to develop future development scenarios that will then be used in model simulations.



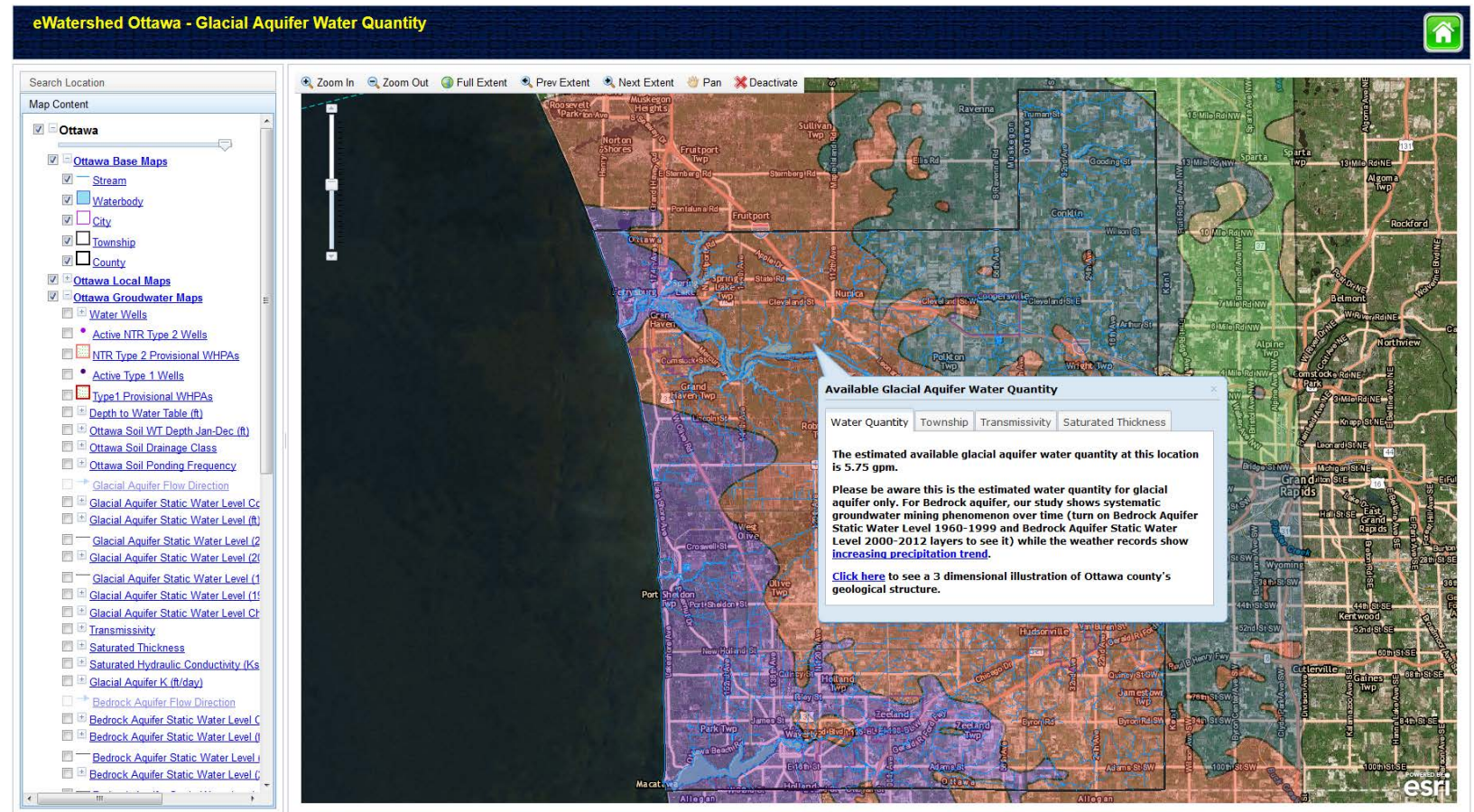
# Deserved Recognition

- University researchers would like to say “Thank You!” to government officials and local stakeholders who have been involved with the project during the last several years.



# Facilitating Future Decision Making

The IWR is currently developing an online system that will enable users to identify whether groundwater is a preferable source of water for the county.



# Summary

- Ottawa County is quickly developing.
- The bedrock aquifer has increasing chloride levels in parts of the county, rendering it difficult to use.
- A status quo approach will only lead to a continuation of the problem in the long-term. Water resource planning needs to begin now.

