The Michigan Geological Survey

MICHIGAN AGGREGATE ASSOCIATION
2019 ANNUAL MEETING

Geology – Water
Knowledge of both are needed
Stop kicking the geology can down the road!

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February 7, 2019
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Travel promotions for Michigan
Water is Michigan - 1950's to present

Most important Michigan Resource?

Water!

Where does water reside?

- **Lakes and streams**
- **Sands and gravels**

Are sands and gravels important?

What do we know about the subsurface sands and gravels?

Almost NOTHING!

Background on the Geological Survey!

Beginning in the late 70's and for 30 plus years, with minimal funding the MGS minimized or discontinued making those notable resource investments in geological survey functions i.e. mapping, collaborative research and studies, data resources, etc.

The Michigan Geological Survey (MGS)

- **Michigan Statute PA 167, October 2011, assigned the state functions of the Geological Survey to WMU Geological and Environmental Sciences, a Division with a defined role.**
- **<u>Transferred with No Funding!!</u>**

Michigan Geological Survey

Statutory Responsibilities: Enabling 2011 Act PA 167

- **"continue to make a thorough geological survey of the state…**
- **include a determination of the succession and arrangement, thickness and position of all strata and rocks…**
- **investigation of all deposits of brines, coal, marl, clay, gypsum, lime, petroleum, natural gas, metals and metallic ores, building stone, marble…and all other productions or features…"**
- **"provide for the collection and conservation of cores, samples, and specimens for the illustration of every division of the geology and mineralogy of the state…."**

Michigan Geological Survey Mission Statement

MGS Mission Statement:

- ***The mission of the Michigan Geological Survey (MGS) is to facilitate basic and applied geological research to promote the best use of Michigan's geological resources for their social and economic benefits while protecting associated resource values and the environment.***
  - **RE- introducing these functions will begin to restore the social and economic benefits to enhance the education and employment opportunities for Michigan residents while preserving the environment.**

MGS – Summary of budgets & projects

Since 2011, only two tranches of State funds

MGS- 2016 - $500K Natural Resource funding

- **Completed eleven (11) projects and demo programs.**

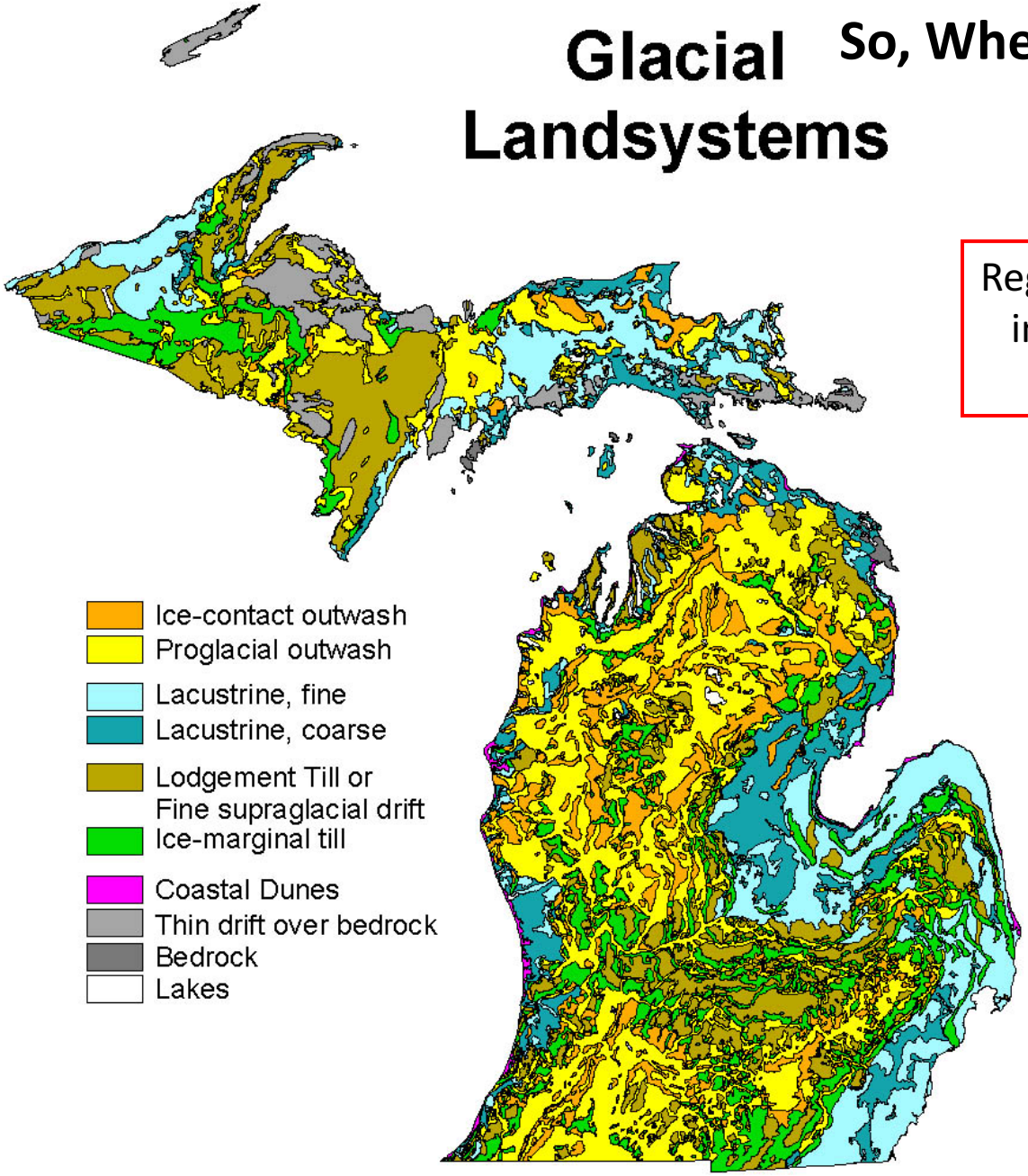
MGS – 2019 - $500K Funding for PFAS and groundwater resource mapping

- **Identify priority areas of geologic need to gather subsurface data and to initiate mapping.**

<u>MGS requires annual funding to hire permanent staff.</u>

Glacial Landsystems

So, Where do we begin?



Regulatory, consulting and Mi WWAT interpretations and decisions are made using this map.

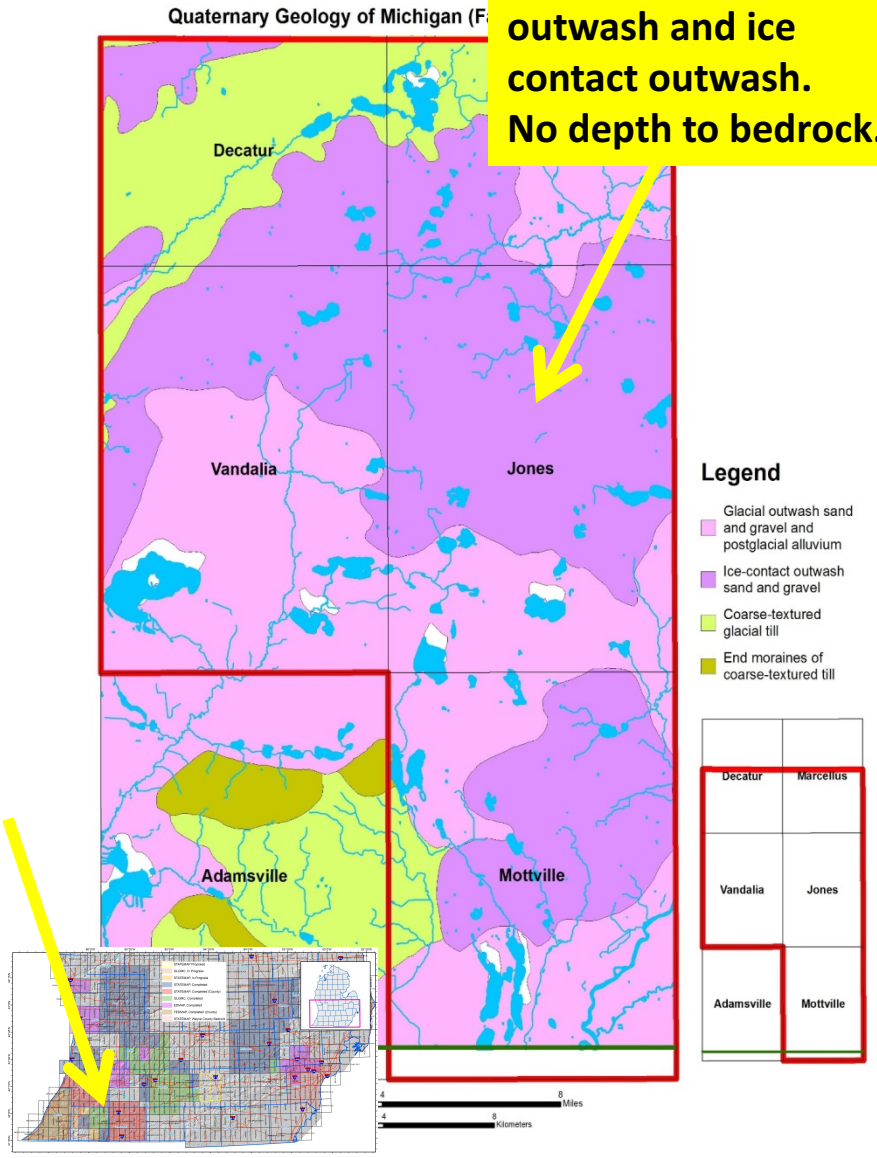
- **This surficial geology is based on 1915 data, with minimal changes in 1955, and 1982. This is ONLY a surficial geology map.**
- **No subsurface validation.**

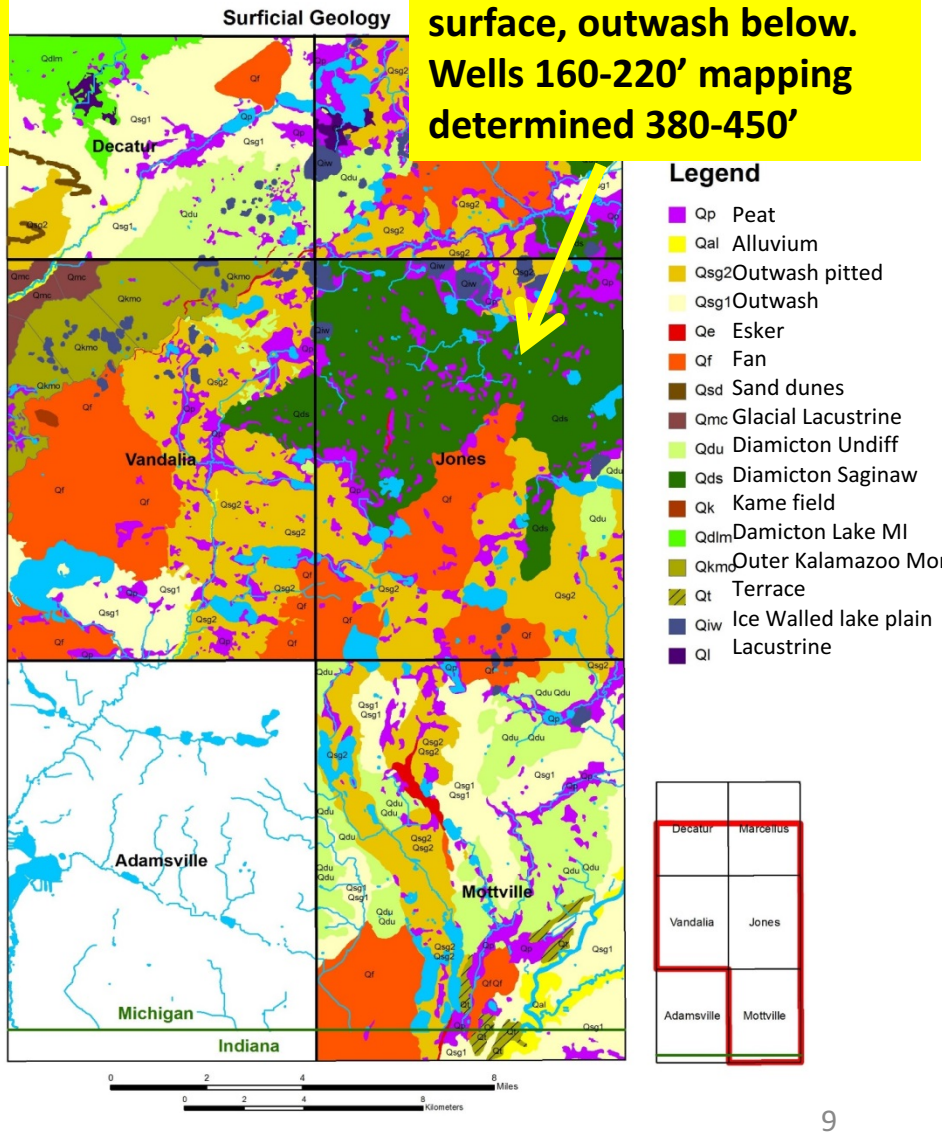
The role of the Survey is to provide updated mapping in priority areas.

Map comparison 1982 versus 2017

1982 interprets this as outwash and ice contact outwash. No depth to bedrock.

2017 Diamicton/till at the surface, outwash below. Wells 160-220’ mapping determined 380-450’





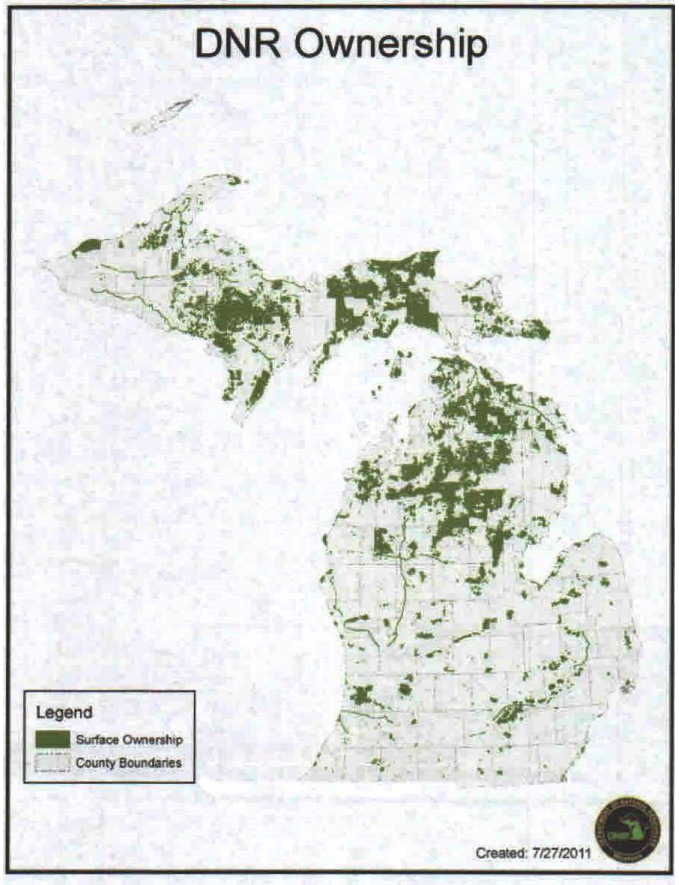
Michigan must INVEST IN science

Summary of State land vs Open file validated mapping products

STATE LAND MANAGEMENT -Minimal open file public geologic data

~4.6 MILLION ACRES

All acquisitions should have geologic data before purchase (NRTF).



Michigan Geological Survey - 21st

What geological work has been done for more than 30 years?

1985 Superfund and clean up of chemical and petroleum releases (30 plus years of Michigan 213 and 201 sites).

- **Most sites have drill holes logged by a geologist/geological engineer**
- **More than 30,000 sites**
  - **None of the geologic data has been compiled to standard D-base and most is still paper files. Individuals have compiled for their projects.**
- **Did Michigan commit any funding to geologic data?**
  - **Did they contribute a DIME?**

Michigan Geological Survey - 21st Cont.

What geological work has been done for more than 30 years?

- 2001 – Great Lakes compact and development of Water Withdrawal Assessment tool (MIWATT).
  - Subsurface data is derived from well drillers logs, the only database (DB) having any data on subsurface material.
  - Drillers were never trained in geologic terms or sample logging methods.
  - This is the data used to develop the Water Withdrawal Assessment Tool (MIWATT).
  - The data is used to support Michigan's compliance with the Great Lakes Compact.
  - All adjoining Great Lakes states at least validate the location of the drill hole DB.
  - YES OR NO to the following three questions.
- Does anyone know if there is an open data file with validated locations for the ~ 600,000+ wells?
- Where is the 2-4-D, trichloro, PFAS going in the subsurface?
- Does Michigan have any database to collect geologic data?

Kicking the geology can down the road!

1970's - Michigan legislature did not maintain survey funding

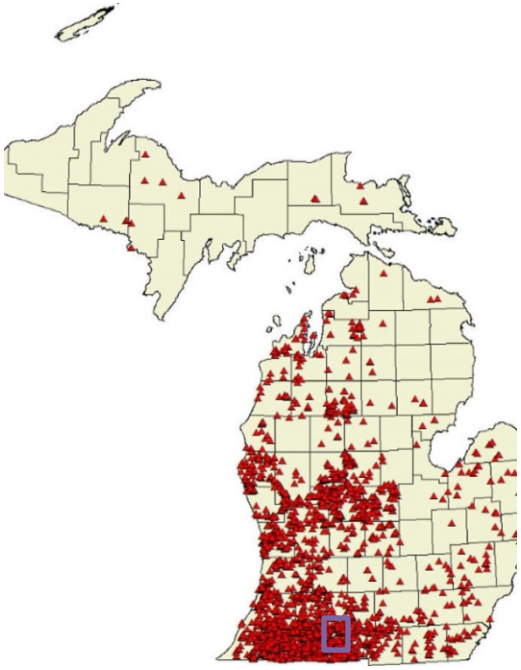
- Legislature determined consultants and staff can provide the geologic data.
  - State could then compile the data, but did they allocate dollars?
  - No urgency in doing subsurface or surface mapping.
- So where is the "geology can" now?
  - No funding for the state departments to compile the data.
  - "Use what we have", "no time, no money" has been the mantra for geologic data.
  - Data costs money to compile and maintain so there were no staff costs attached to data compilation. Everyone must compile it themselves.
- What did Michigan do to stimulate a greater understanding of the natural resources for the economy for the last 30 years?
  - NOTHING!
- Here are some examples of "kicking the geology can down the road"!!!

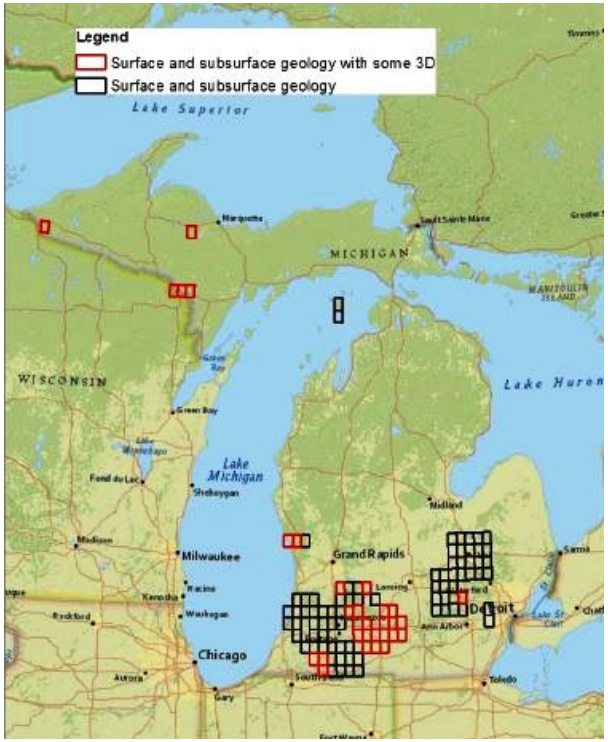
MI WWAT Applications vs detailed GEOLOGIC Map Products

Approximately 60% of the LP groundwater comes from glacial material

Mi WWAT Applications >70 GPM through 2016 for comparison

Beginning in ~2003 (Water Withdrawal Assessment Tool- well drillers logs, non-factual model)





This is the real summary of mapping of the detailed combined surface and subsurface by MGS, USGS or others for Lower Peninsula.

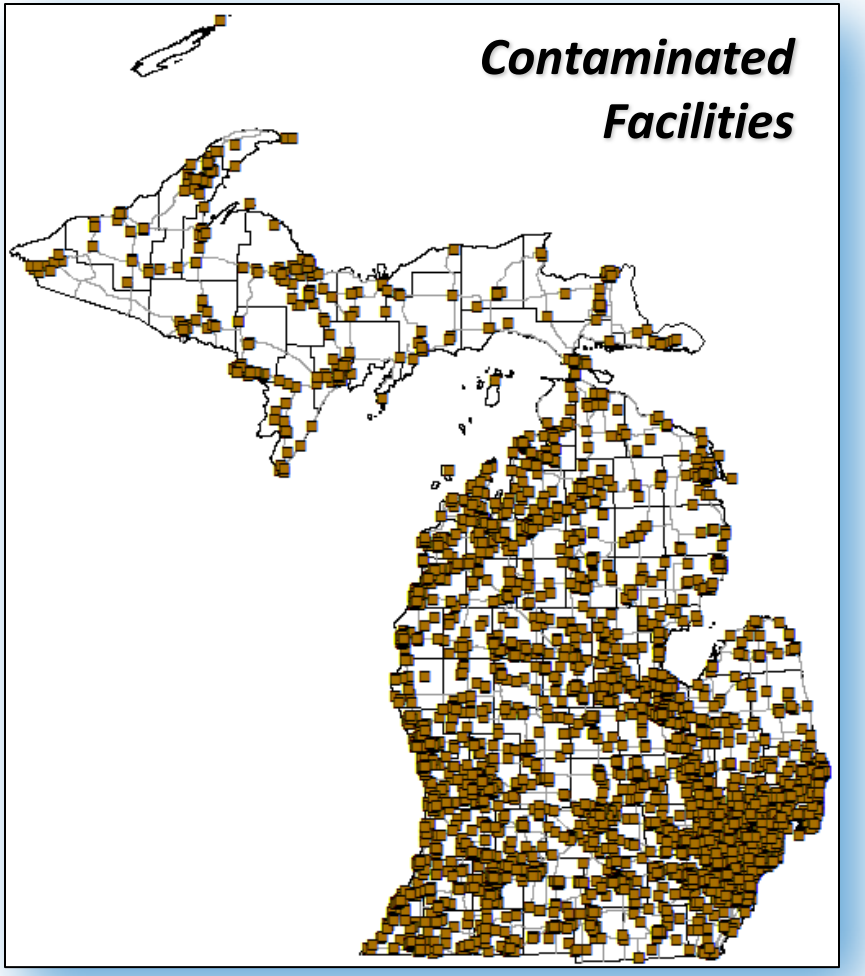
Less than 10 % Detailed MGS mapping.

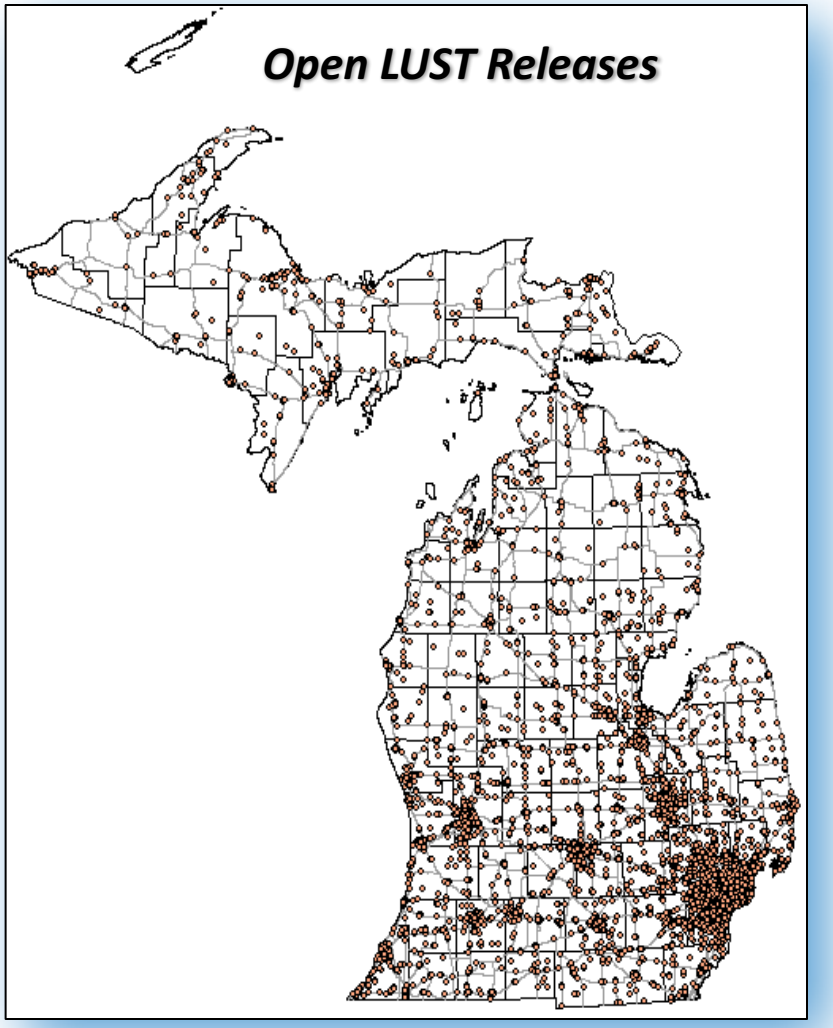
*** Quads (~56 Sq Mi)**

- Black - Surface only with validation of borings
- **Red - surface + some subsurface drilling / geology 3D**

Lets review more history!
Estimated 30,000 sites

Hazardous Substances Released to the Environment





1980's Pre – CERCLA to present

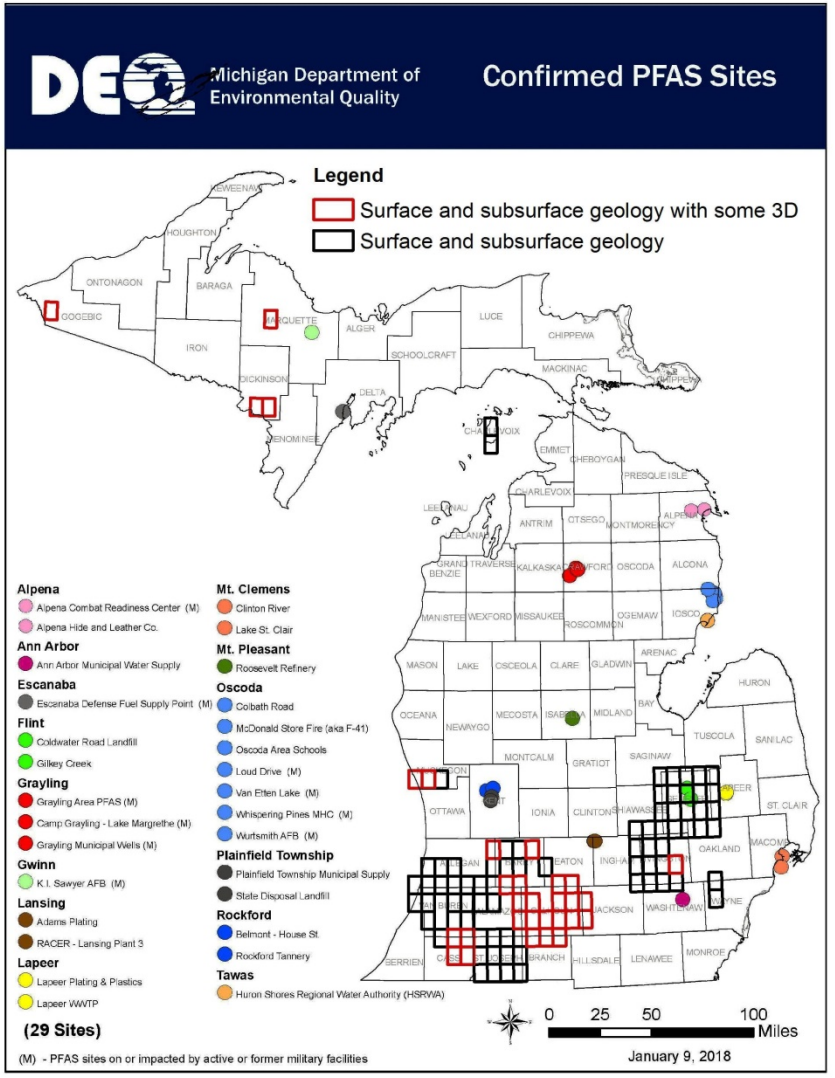
No data compilation

What is the new Michigan contaminant crisis?

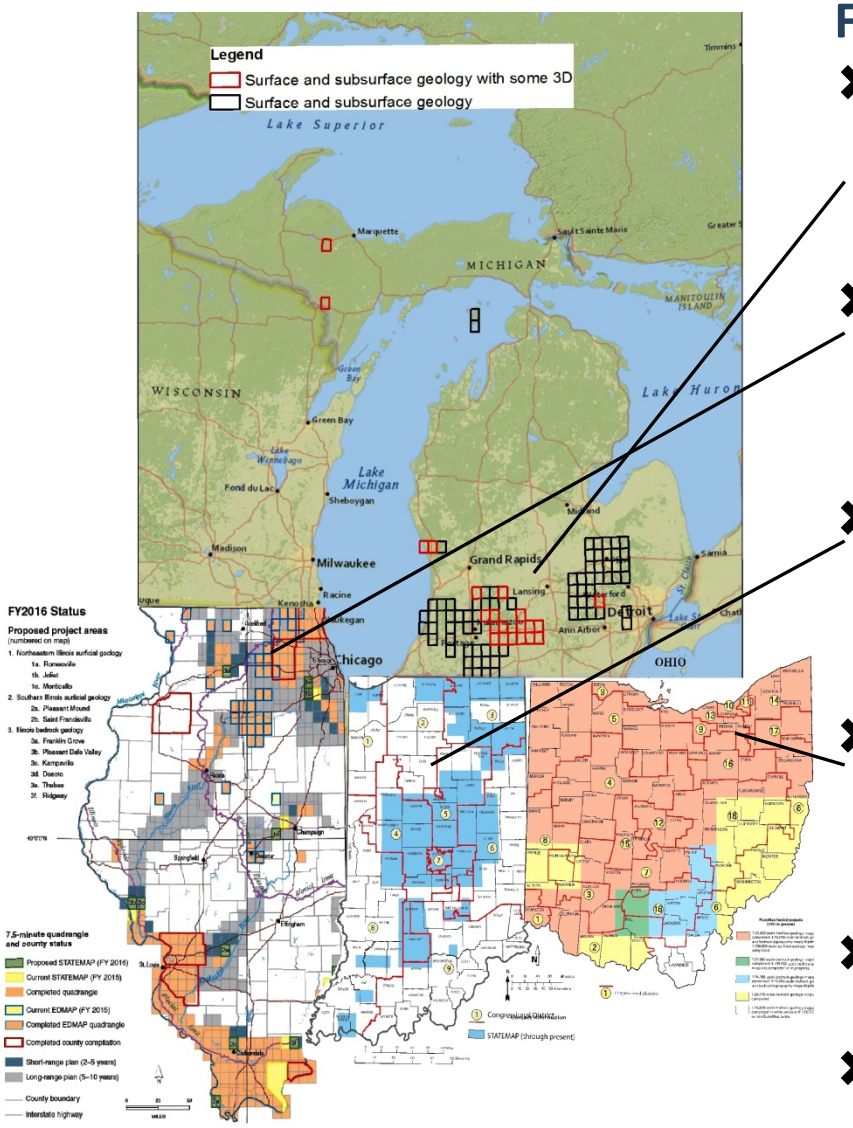
Michigan –

the Water Wonderland!

- Perfluorinated Alkyl Substances (PFAS).
- Multiple locations throughout Michigan and there may be more.
- Where Michigan has open file data on subsurface geology.
- What's wrong with this picture?



Mapping-Michigan versus adjoining states!



Federal matching dollars in the last 25 years

- ✖ **Michigan,** no dedicated funds in 24 years, not until 2014, $44,000 to support mapping in Cass County, < 10% mapped. ($1.751 M = $72.9 K/yr).
- ✖ **Illinois,** mapping in high impact and use areas, many priority areas for 3D mapping, ~ 30% mapped. ($4.987M=$207.8 K/yr).
- ✖ **Indiana,** mapping in high impact areas, some priority 3D mapping, ~ 40% mapped. ($4.276 M=$178.2 K/yr).
- ✖ **Ohio,** funding from energy and minerals, geo-hazards for mapping in addition to Fed funds ~ 80% mapped ($3.069 M=$127.9 K/yr).
- ✖ **Wisconsin,** mapping impact areas, $3.762 M = $156.7/year
- ✖ **Minnesota,** mapping impact areas, $2.834 M = $118.3/year.

All data from MGS mapping programs is OPEN FILES.

So how can geologic info be presented today?

Priority Driven Areas- Validated Research & Data

Combine new and proven technologies and methods

- 3D maps and reports are needed with validated information, in real time.
- Data in formats (e.g. ArcGIS) accessed by phones, tablets, laptops, actively showing multi layers of data…… in seconds, in the field.
- Secondary mapping products of surface and subsurface data include: Water tables, water bearing zones, surface drainage, aggregates, wetlands, recharge areas, deeper subsurface research and data, etc.
- Interactive electronic standard databases to capture existing and new data.
- 21st Users: Citizen scientists, city and county planners & developers, geologists, earth scientists, engineers, consultants, industry representatives, regulators.
- Where should you get your data, Wikipedia or the Geologic Survey?

How do we stop kicking the geologic can down the road?

So where do you see MGS going? A Poll!!

- 3D Geologic mapping in critical areas?
- Standardized and validated geologic data in any database?
- Database development for geologic downhole data?
- Training - guidance programs for all geologic data input, drillers and geologic professionals?
- Open file data on MGS website or State site?
- Should MGS sit on Governors' panels on water issues?
- Collaborate with USGS mapping and geophysical programs?
- Should geologists develop water table and bedrock maps?
- Anything else?

Michigan Geological Survey

Summary as of May 1, 2015

MICHIGAN GEOLOGICAL SURVEY (MGS) - STATE DATA SUMMARY

WITH DATA LOCATION NOTED

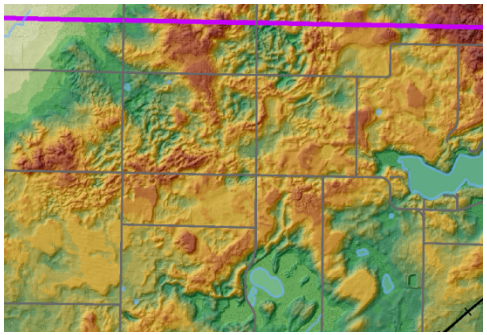
County	Number of RRD site entries in Environmental Mapper	RRD Files	Oil and Gas (OOGM) permitted boreholes	Wellogic water wells	Number of O&G Wireline log files -MGRRE	Shallow bedrock cored wells at MGRRE-WMU	Drill cuttings sets MGRRE
Alcona	108		934	3,300	755	0	73
Alger	56		0	2,286	4	0	1
Allegan	1,642		3,473	11,927	654	0	892
Alpena	321		1,469	2,877	1,367	2	116
Antrim	208		2,750	4,356	2,291	0	181
Arenac	362		1,076	2,498	457	0	731

Geology – Water

Stop kicking the geology can down the road!

Thank you

Questions?



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