

DIGITAL MAPPING TECHNIQUES 2017

The following was presented at DMT'17
(May 21-24, 2017 - Minnesota Geological
Survey, Minneapolis, MN)

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2017)

<http://ngmdb.usgs.gov/info/dmt/>

DGS Has a Story to Tell

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STORY MAP GALLERY

The Delaware Geological Survey (DGS) GIS Specialist started working with ESRI web mapping application templates in 2014. DGS web maps created from these templates were made available to the public through FirstMap, the state of Delaware's enterprise GIS (FirstMap, 2017). Since the amount of DGS web maps is increasing and the popularity of ESRI Story Maps (ESRI, 2017a) is strong, the Survey decided they should be available on the DGS website. Visitors can go to the Story Maps link on the DGS home page (DGS, 2017a) to access these ESRI web mapping applications. The DGS Story Map Gallery page uses the ESRI Public Gallery template (ESRI, 2017b).

ANNUAL REPORT 2015-16

The DGS printed its Annual Report of Programs and Activities for Fiscal Year 2016, and it is available on the DGS website as a downloadable document (DGS, 2017b). The GIS Specialist decided to take information from this document and assemble it in a ESRI Story Map template to make it available in a mobile-friendly format.

The Map Series (Tabbed) template was selected for the main layout, and the Map Journal template was embedded in each tab. The Water Resources tab references a Map Journal template that contains information about DGS projects in this category. Other tabs include Geology & Mapping, Natural Hazards, Data, and Publications & Service. This way users do not have to scroll through a single Map Journal and can select an area of interest to browse.

Projects that had an accompanying map image in the document have an interactive version in the Story Map. For example, a map of well locations in the National Ground-Water Monitoring Network includes attribute information such as site ID, site name, local aquifer, aquifer type, altitude, well depth, and a photo of the site. Another interactive map example is a cross section line on a map that can be clicked to access a stratigraphic cross section image of the area.

DGS FIELD TRIP 2017

DGS hosted its third Geologic Research Symposium as a field trip on April 21, 2017 where attendees could observe Delaware geology in the field. A geologic field trip guidebook was printed and handed out to participants. Since there were no plans for this guidebook to become a publication, the GIS Specialist created a Story Map with the guidebook information. Each location comes alive in the Cascade template with maps, imagery, and summarized, non-scientific text from the document. Detailed scientific geologic information was put into a separate Story Map that can be accessed by a hyperlink in the main story map.

ESRI COLLECTOR FOR ARCGIS UPDATE

The GIS Specialist started working with the ESRI Collector for ArcGIS App (ESRI, 2017c) in 2014. The goals were to save time creating custom maps for field work and give surficial geologists the ability to create GIS data points and attribute information while in the field so post field work is minimized. For the past three years, a combination of using paper and digital maps was being used by the geologists since they were not yet comfortable with a complete transition to a digital workflow.

During February 2017, the weather was unusually warm for the mid-Atlantic area. DGS surficial geologists decided to do field work that was outside the digital custom field map area, so they used the traditional workflow instead. After one field day using paper maps and taking notes in a notebook, the geologist spent approximately 2-3 hours the next morning entering information into a database. By experiencing the traditional workflow and comparing that to digital data collection, the geologist realized that after using the Collector App it took a fraction of the time to prepare data for entry into the DGS well and outcrop database than with traditional methods.

The GIS Specialist creates and publishes custom field maps to ArcGIS Online (AGOL) (ESRI, 2017d) for use in the Collector App. An AGOL group was created so the geologist can be a member and view the field maps. The geologist was also interested in viewing database picks on the field map. Since the database is modified on a regular basis, it was decided that the geologist should publish these points to the map. Once the data points are published and the feature layer is shared to the AGOL group, the GIS Specialist can access this layer and add it to the custom field map. The geologist is able to publish data points at any time and overwrite the existing file. An efficient workflow between GIS and geologic staff has been established since custom data layers are published simultaneously by multiple group members to an online web map.

REFERENCES

Delaware Geological Survey, 2017a, DGS Story Map Gallery, accessed June 15, 2017, at <http://dgs.udel.edu/story-maps>.

Delaware Geological Survey, 2017b, Annual Report of Programs & Activities 2015-16, accessed June 15, 2017, at <http://www.dgs.udel.edu/newsletter>.

ESRI, 2017a, Story Maps, accessed June 15, 2017, at <http://storymaps.arcgis.com/en/>.

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ESRI, 2017d, ArcGIS Online, accessed June 15, 2017, at <http://www.arcgis.com/features/index.html>.

FirstMap, 2017, Home Page, accessed June 15, 2017, at <http://firstmap.gis.delaware.gov>.

DGS Has a Story to Tell

Lillian Wang, GISP
GIS Specialist/Cartographer

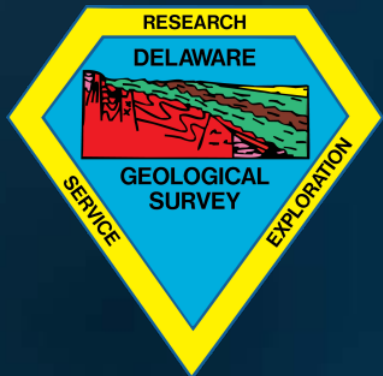


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Delaware Geological Survey Story Map Gallery



Search maps

Delaware Geology in the Field
2017



Delaware Geological Survey
Annual Report 2015-16



Explore Delaware Geology



Delaware Geological Survey Map
Viewer



The DGS distributes geologic and hydrologic information through publication and public service. Web applications such as ESRI Story Maps are another way for us to deliver our scientific information online with interactive maps that accompany informative text and imagery.

Please browse our Story Maps and web map applications. If you have any comments or suggestions, please contact us:

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(302) 831-2833

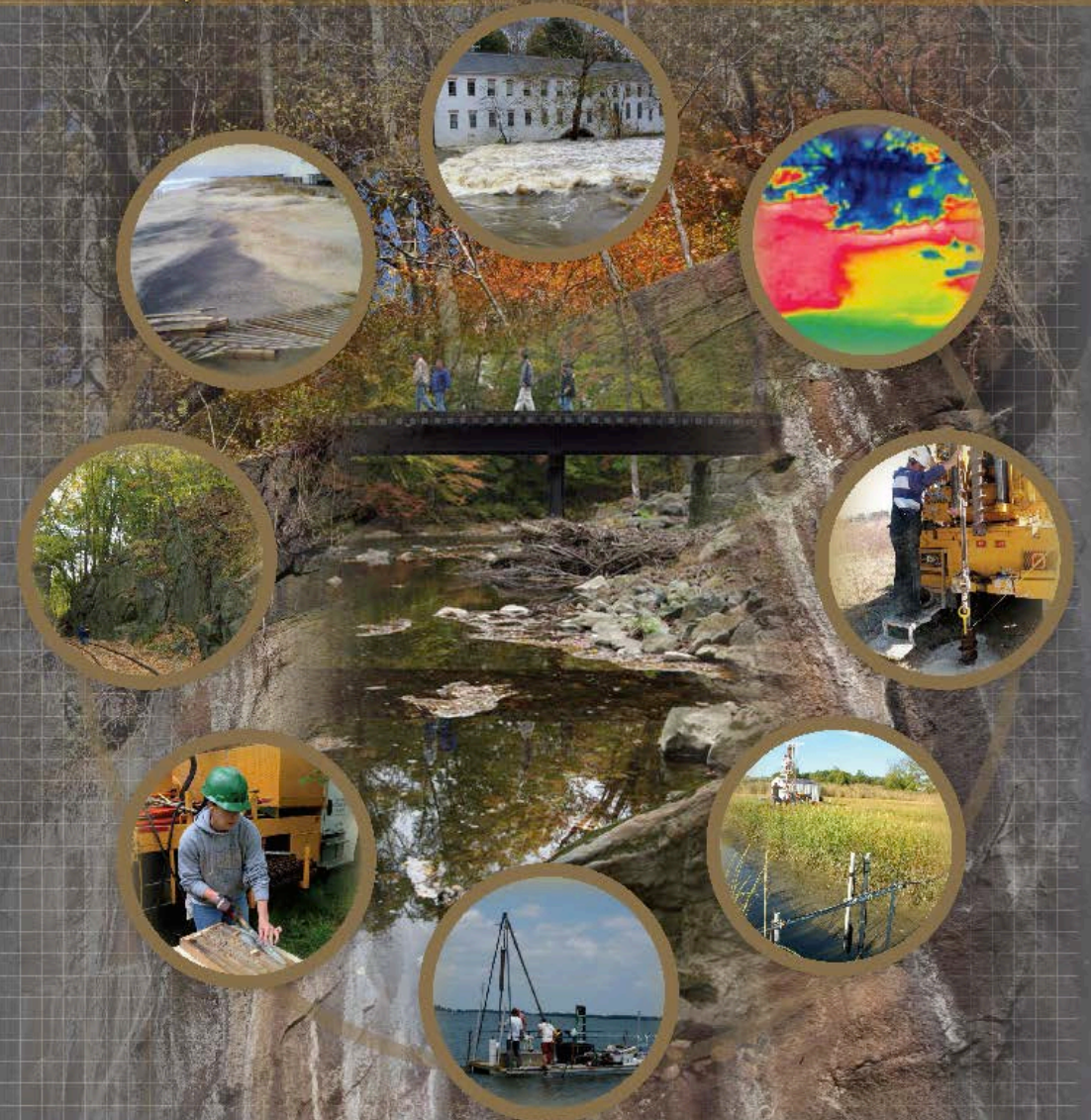
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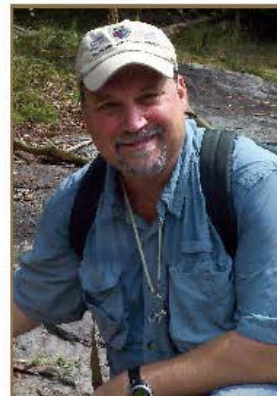


DELAWARE GEOLOGICAL SURVEY Annual Report of Programs & Activities

2015 – 16



Message from the Director



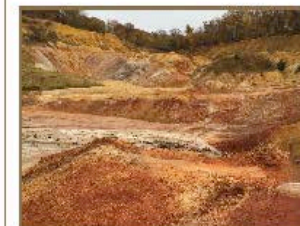
It has been said that the best geologists are the ones who have been exposed to the most exposures. And in some ways, fieldwork is the essence of geology. Many of us became geologists because of the promise of spending at least part of our careers in the field examining the geology, absorbing the scenery, collecting specimens or samples, and compiling field notes that record our observations. I have always been a person who has to visit and observe any field site that I am working on. Even when studying groundwater, which for the most part is hidden in the subsurface, I find that getting a lay of the land is important for letting your training and instincts inform your observations and hypotheses.

The DGS routinely collects field data to augment our efforts to map the state's surficial geology, characterize offshore sand and gravel resources, and to evaluate the hydraulic properties of aquifers. Fieldwork results in the need for sample collection and preservation, so over the past several years DGS has made several investments in improving the quality of our core repository and laboratories so we can better process and preserve samples. For example, we recently upgraded one of our labs to designate it as a core evaluation lab with ergonomic work tables, better lighting, and plumbing. We also improved ventilation and added dehumidifiers to reduce moisture. We are also currently working to construct an offsite storage facility to protect our steel drill rods and other ancillary field equipment. DGS also has several funded projects underway that are enabling us to improve the storage, organization, and cataloging of existing cores and cuttings.

In 2017, the DGS will be hosting our third biannual Delaware Geological Research Symposium. In an effort to highlight and celebrate the field components of our research, this symposium will consist of a daylong field trip. Participants will join DGS staff in reviewing new exposures and land forms in the crystalline Piedmont rocks, as well as observe the methods DGS scientists use to collect and characterize subsurface cores. You will also participate in discussions to help us address new geologic

questions. More information on the field trip agenda and registration details will be forthcoming. So mark April 21, 2017, on your calendars and plan to attend our first field symposium—because geology is better observed in the field.

– David R. Wunsch
Director and State Geologist



SAVE THE DATE!

*Delaware Geological
Research Symposium*

APRIL 2017						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

A DAYLONG
FIELD TRIP EXPLORING THE
PIEDMONT AND COASTAL PLAIN
OF DELAWARE



Our Mission

Water Resources

Geology & Mapping

Natural Hazards

Data

Publications & Service

DELAWARE GEOLOGICAL SURVEY

Annual Report of Programs & Activities 2015-16

The Delaware Geological Survey's mission is, by statute, geologic and hydrologic research and exploration, and dissemination of information through publication and public service.

Message from the Director



David R. Wunsch, Director and State Geologist

It has been said that the best geologists are the ones who have been exposed to the most exposures. And in some ways, fieldwork is the essence of geology. Many of us became geologists because of the promise of spending at least part of our careers in the field examining the geology, absorbing the scenery, collecting specimens or samples, and compiling field notes that record our observations. I





- Our Mission
- Water Resources
- Geology & Mapping
- Natural Hazards
- Data
- Publications & Service

Programs & Activities - Water Resources

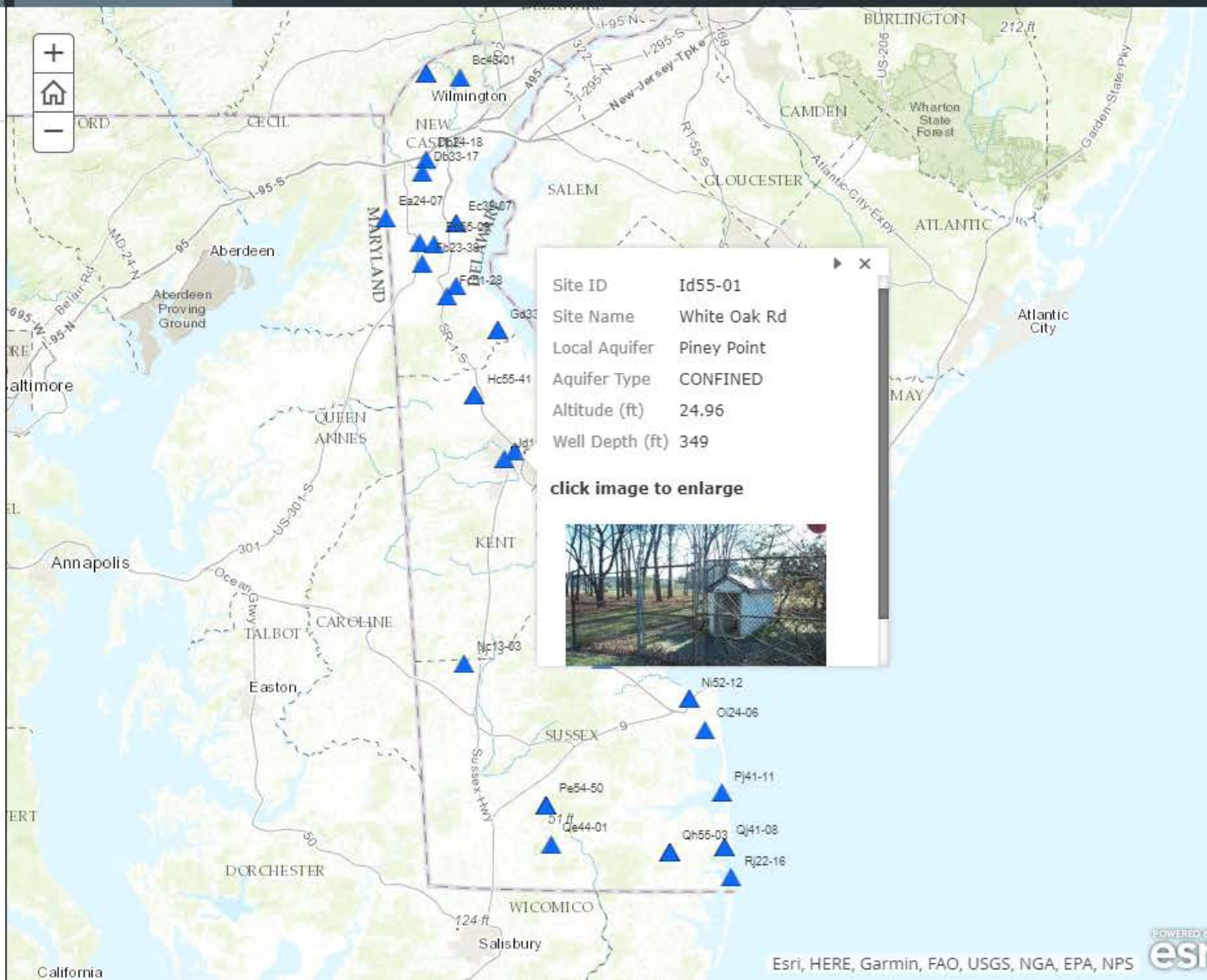
To navigate between projects, scroll with your mouse or click on navigation bar (left).

National Ground-Water Monitoring Network

DGS participation in interstate data sharing consortium helps improve national and state groundwater data infrastructure

The DGS became a data provider for the National Ground-Water Monitoring Network (NGWMN) in early 2016. NGWMN is a consortium of state and local agencies and the U.S. Geological Survey (USGS) that was established in 2013 to create a single point of access for scientists, engineers, policy makers, and the public to view and acquire important physical and chemical data on the nation's ground-water resources. The network will ultimately allow users to view groundwater data across state lines to observe trends in groundwater quality and availability in a local, regional, or national context. NGWMN resources are managed by the USGS Center for Data Analytics and can be accessed at <http://cida.usgs.gov/ngwmn/>.

Project team members A. Scott Andres, David Wunsch, Changming He, John Callahan, and Thomas McKenna have identified nearly 40 monitoring wells (shown on right, click on location for more information) in 13 aquifers to add to the network and have led the work to create the technology infrastructure that delivers data from internal DGS sources to the



Programs & Activities - Geology and Mapping

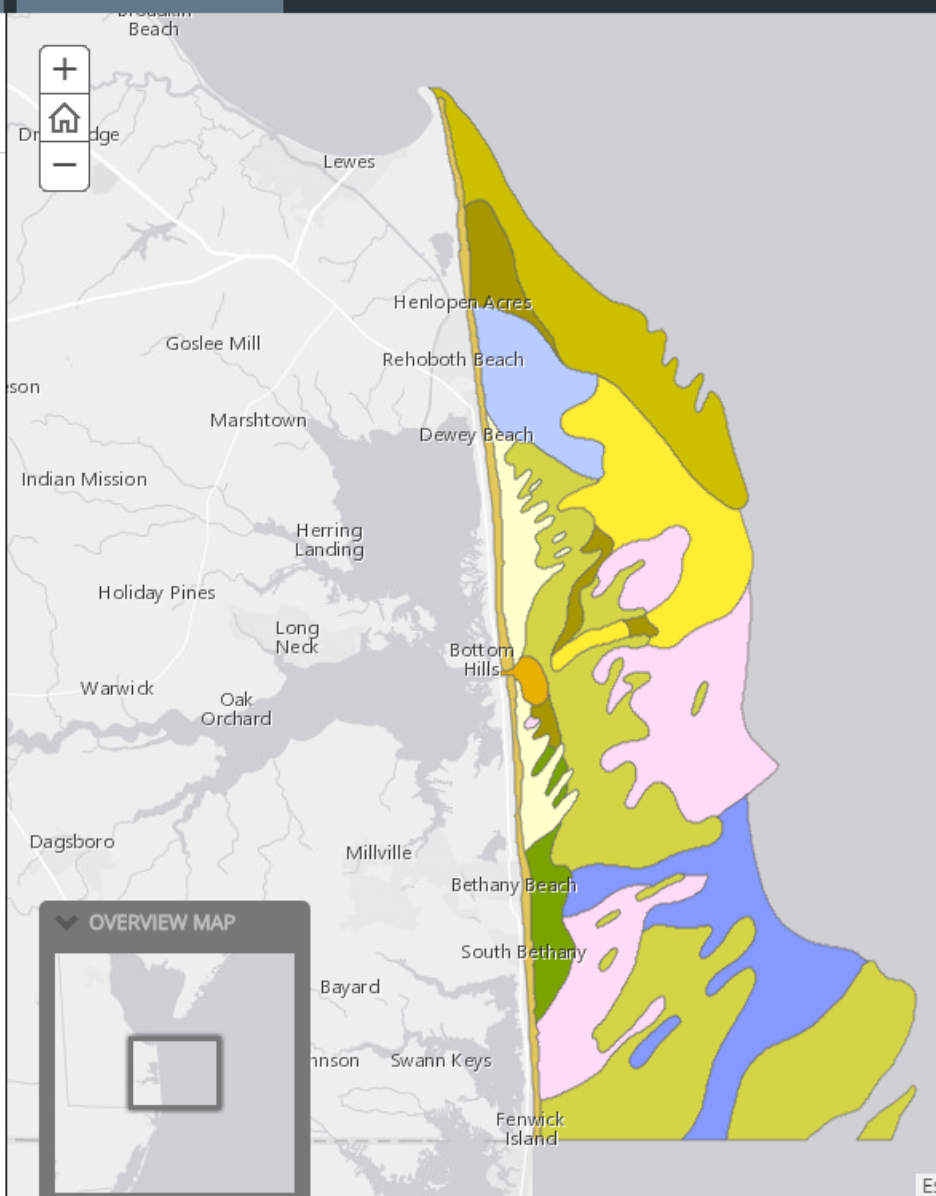
To navigate between projects, scroll with your mouse or click on navigation bar (left).

Delaware Offshore Sand Resources - Update

Identifying sand resources for coastal resiliency and restoration efforts.

This year, DGS completed a two-year cooperative agreement between the Bureau of Ocean Energy Management (BOEM) and the state of Delaware as part of the Atlantic Sand Assessment Project (ASAP). The main focus of this project, which was renewed for an additional two years in July 2016, is to identify offshore sand resources for coastal resiliency and restoration efforts. To this end, the DGS developed a preliminary geologic map connecting the onshore geology with the offshore.

A better understanding of offshore geology (shown on right, click legend tab for more information) will be valuable for offshore sand resource investigation and identification of target areas for beach replenishment material. Identifying the sediment characteristics of each geologic unit and the unit's geographic proximity to replenishment sites can significantly streamline the process of targeting sand resources, constraining their distribution, and determining volumes available for future nourishment projects. Onshore Delaware mapping



LEGEND

boem_FY2016

- Beaverdam Formation
- Lynch Heights Formation
- Omar Formation
- Sinepuxent Formation
- ebb tidal sand deposits
- finger shoal deposits
- lagoon deposits
- nearshore deposits
- quiet-water



- Our Mission
- Water Resources
- Geology & Mapping
- Natural Hazards
- Data
- Publications & Service

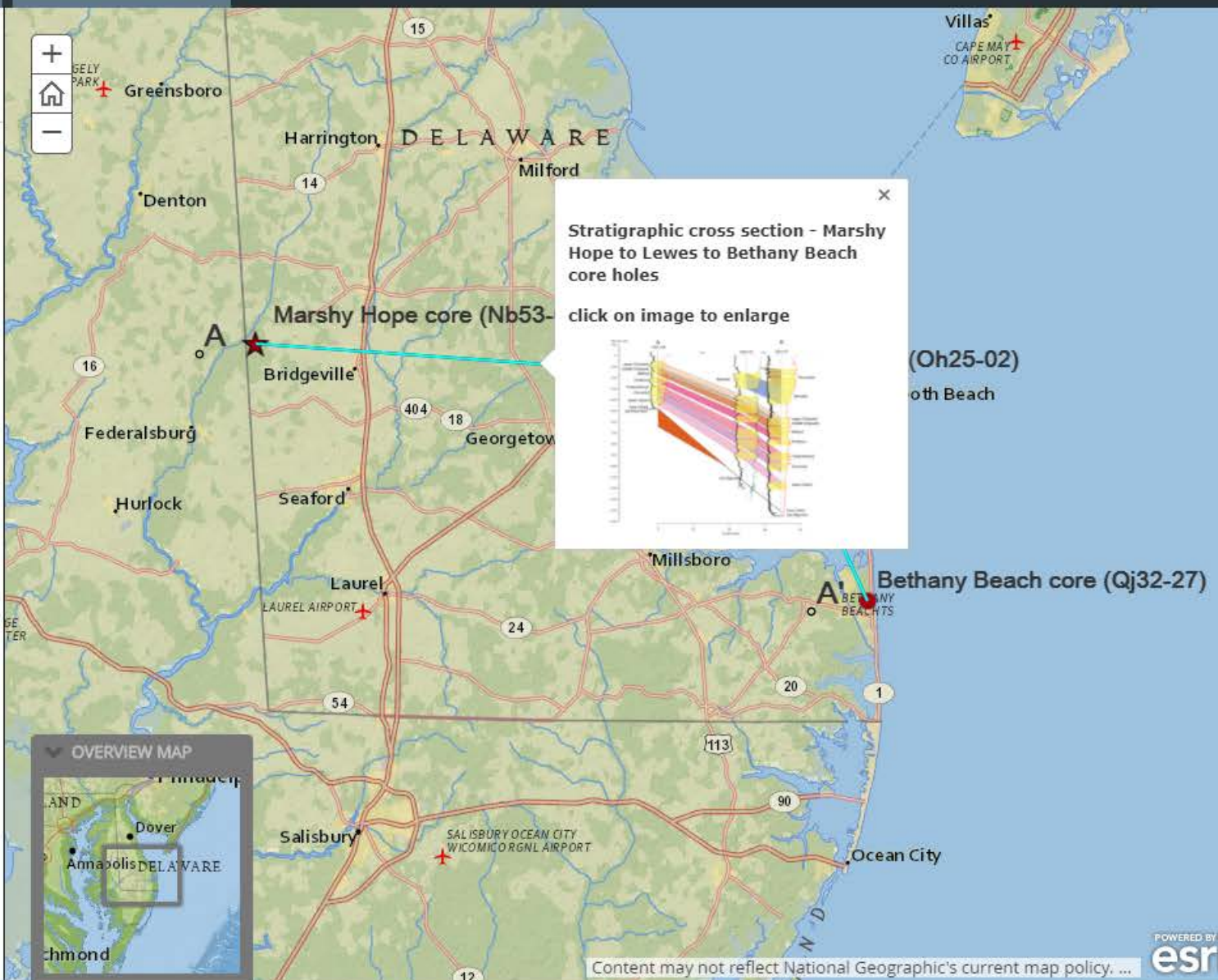
Programs & Activities - Geology and Mapping

Geological Characterization of Aquifers and Depositional History of the Miocene Sediments of Northwest Sussex County, Marshy Hope Core Site

An investigation of the subsurface geology of an agricultural area where the relationship of confined aquifers and intervening confining beds may be important to groundwater protection

The Miocene-age sediments of central and southern Delaware include four important confined aquifers: Cheswold, "Federalburg," Frederica, and Milford. The DGS drilled a continuously cored test hole (site Nb53-08*) at Marshy Hope Wildlife Area, west of Greenwood, adding data from northwestern Sussex County that complements previously studied sites near Lewes (site Oh25-02) and Bethany Beach (site Qj32-27) (*shown on right, click on core locations and cross section line** for more information*). Detailed, sample-based data from the Marshy Hope site, and comparison to the Lewes and Bethany Beach sites, has improved our characterization of these aquifers and the confining beds that protect them across a wider area of Sussex County. The results allow us to better estimate trends in aquifer quality, recognize the decreasing thickness of confining beds between the aquifers, and understand issues with aquifer connectivity in Sussex County and nearby parts of the Eastern Shore of Maryland.

* Map (right), click on Marshy Hope core (Nb53-08) location to show formations, aquifers, and well logs for the Marshy Hope test hole.





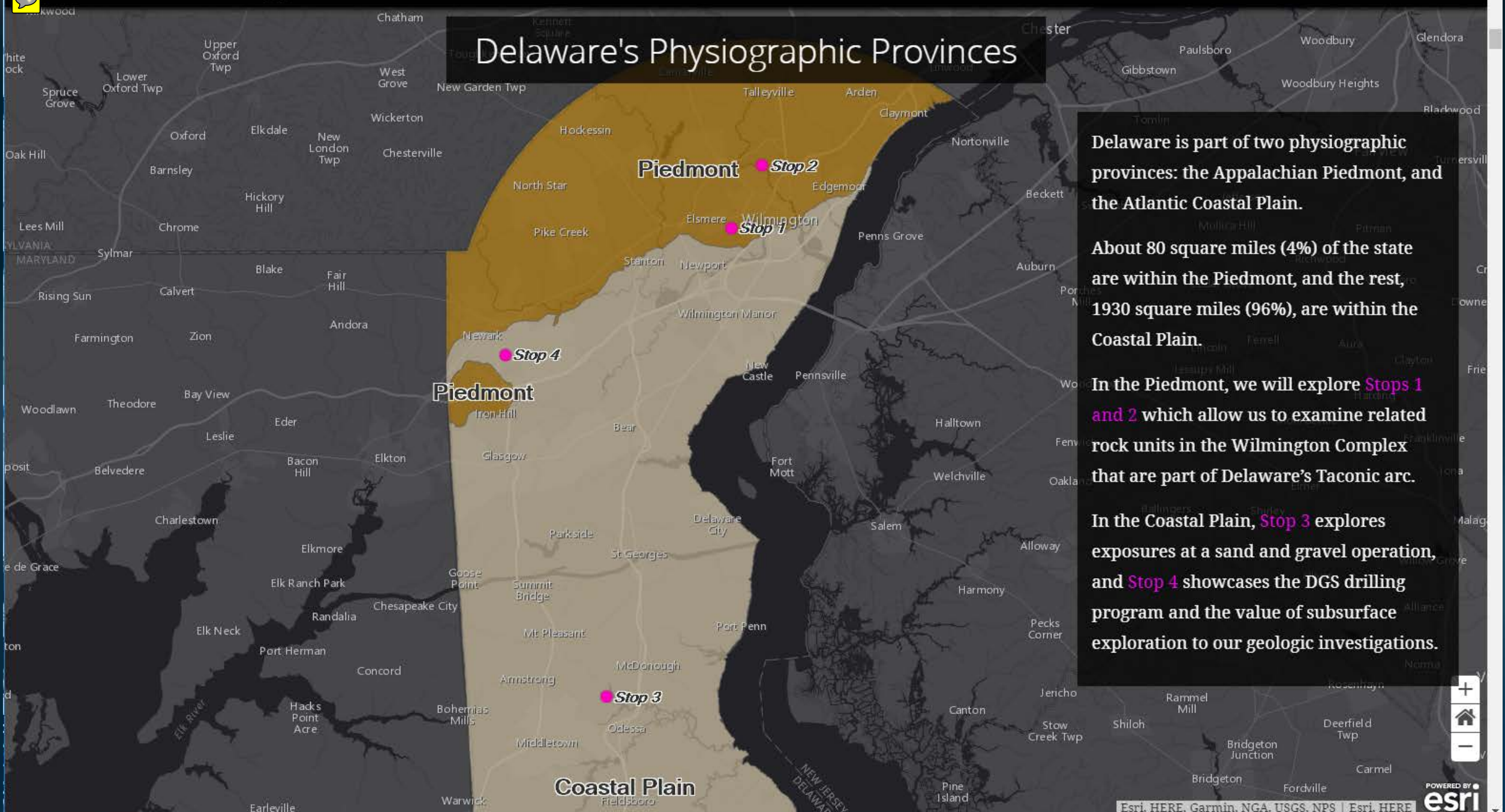
Delaware Geology in the Field

3rd Delaware Geologic Research Symposium





Delaware's Physiographic Provinces



Delaware is part of two physiographic provinces: the Appalachian Piedmont, and the Atlantic Coastal Plain.

About 80 square miles (4%) of the state are within the Piedmont, and the rest, 1930 square miles (96%), are within the Coastal Plain.

In the Piedmont, we will explore **Stops 1 and 2 which allow us to examine related rock units in the Wilmington Complex that are part of Delaware's Taconic arc.**

In the Coastal Plain, **Stop 3 explores exposures at a sand and gravel operation, and **Stop 4** showcases the DGS drilling program and the value of subsurface exploration to our geologic investigations.**





Columbia Formation exposure near Odessa, DE



The exposures at stop 3 provided field trip participants an opportunity to see a number of interesting geological features in the Columbia Formation.

Participants examined the sediments of the Columbia Formation, discussed the geological processes that formed this unit, and considered the implications of the geological features present for groundwater storage and movement.

- 1
- 2
- 3
- 4

Stop 1
Canby Park, outcrops in Little Mill Creek
 by William "Sandy" Schenck

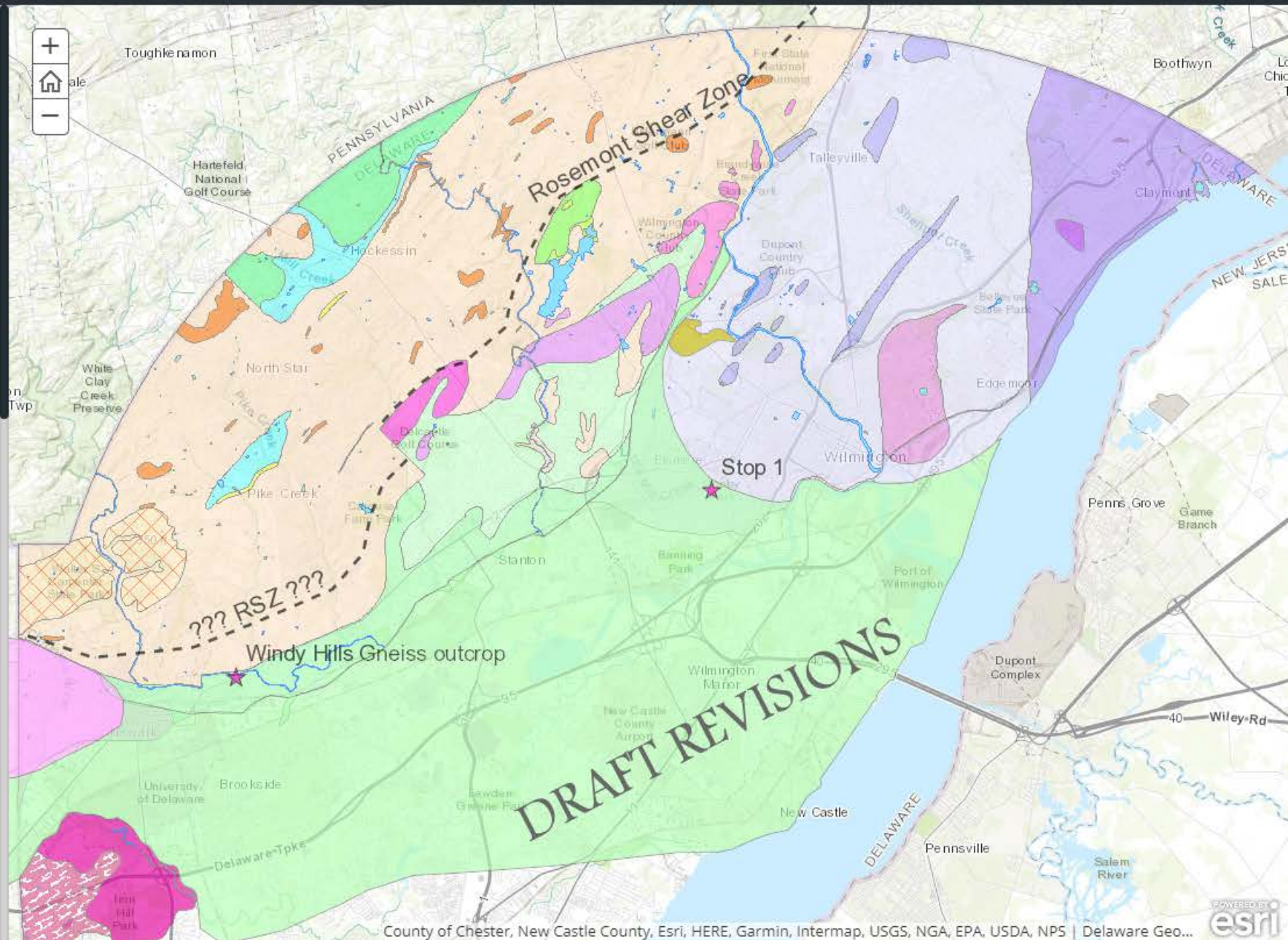
Descending from the ball fields in Canby Park, an urban setting in Wilmington, Delaware, the rocks exposed along a stretch of Little Mill Creek presented a mystery.

The rocks look a lot like the outcrops of layered mafic and felsic Windy Hills Gneiss exposed in White Clay Creek at the Kirkwood Highway Bridge at Windy Hills, more than five miles away. (*Locations shown on right.*) But they also resemble Rockford Park Gneiss, which is layered felsic and mafic gneiss, including boudinage within the mafic layers. The Windy Hills Gneiss also shows some mafic layer boudinage but the layers are folded into steeply plunging folds. Because both units are layered mafic and felsic gneisses, they were hard to separate for the 2000 map (Schenck et al.).

Further examination by William S. Schenck, P.G., revealed that geochemistry was the key to their separation. The Windy Hills Gneiss is associated with two-pyroxene gneisses, ultramafics, and biotite gneisses with garnets, sillimanite, and microcline as accessory minerals. In contrast, the Rockford Park Gneiss occurs in stringers and pods surrounded by the Brandywine Blue Gneiss.

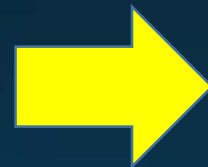
Both the Rockford Park and Windy Hills gneisses are volcanic in origin. The big difference is the mafic layers in the Rockford Park Gneiss have a boninitic affinity (Plank, Srogi, Schenck, and Plank, 2001). That is to say they were the first volcanics to erupt through the ocean floor after the subduction began similar to the current situation in the Bonin Islands, Izu-Bonin arc south of Japan. Later, the Brandywine Blue Gneiss (plutons) intruded these original volcanics leaving only small stringers and blobs.

Modal analysis of the Canby Park rocks verifies there are felsic layers that are two-pyroxene gneisses similar to Windy Hills Gneiss. Rockford Park Gneiss felsic layers primarily contain orthopyroxene.



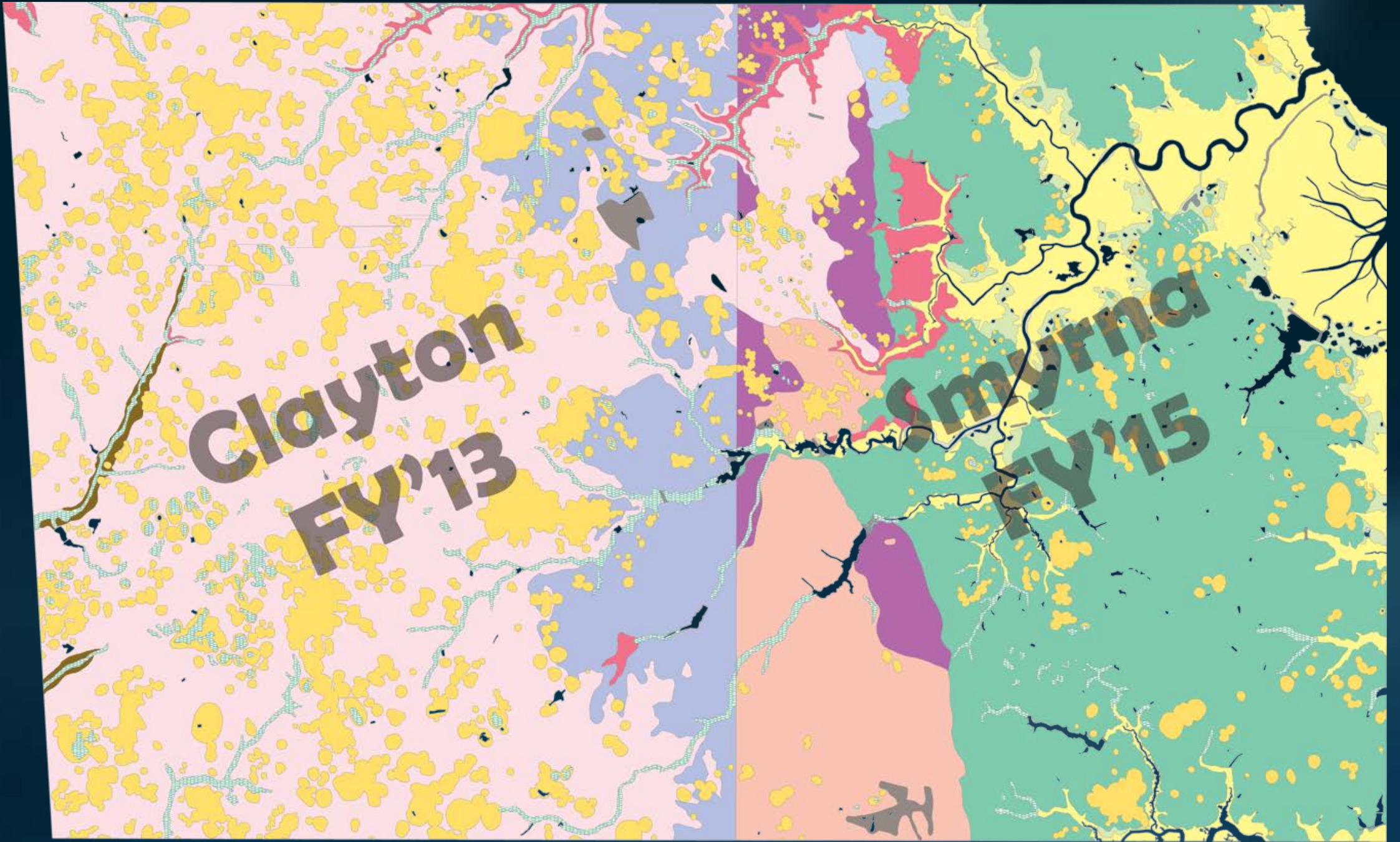
ESRI Collector app

- Custom maps to navigate in the field
- Create digital data in the field (location, attributes)
- Offline data collection available
- Take photos or videos, saves as attachment
- Download data to desktop (GIS layer, data table)
- Goal – save time before and after field work

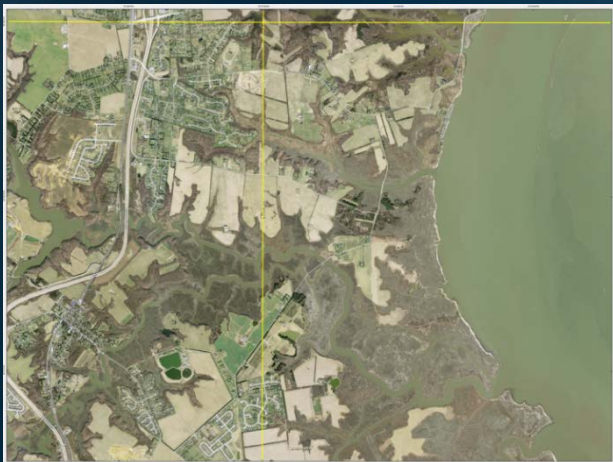


**Clayton
FY '13**

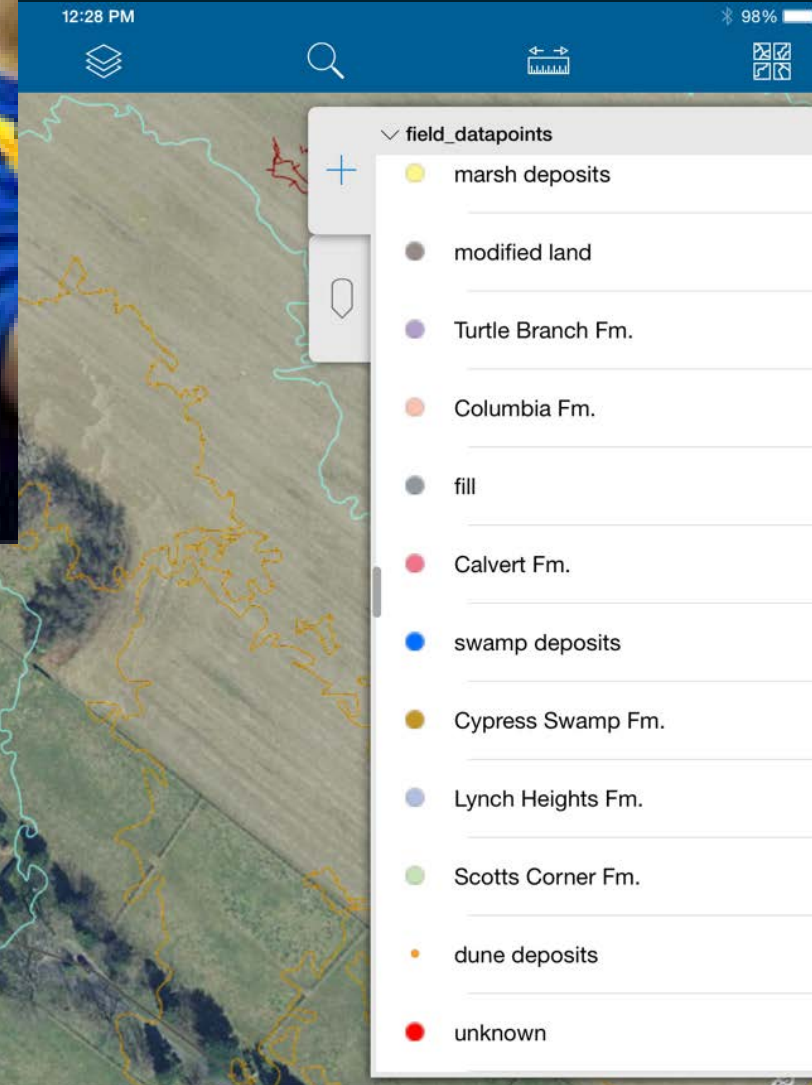
**Smyrna
FY '15**



Field maps paper copies



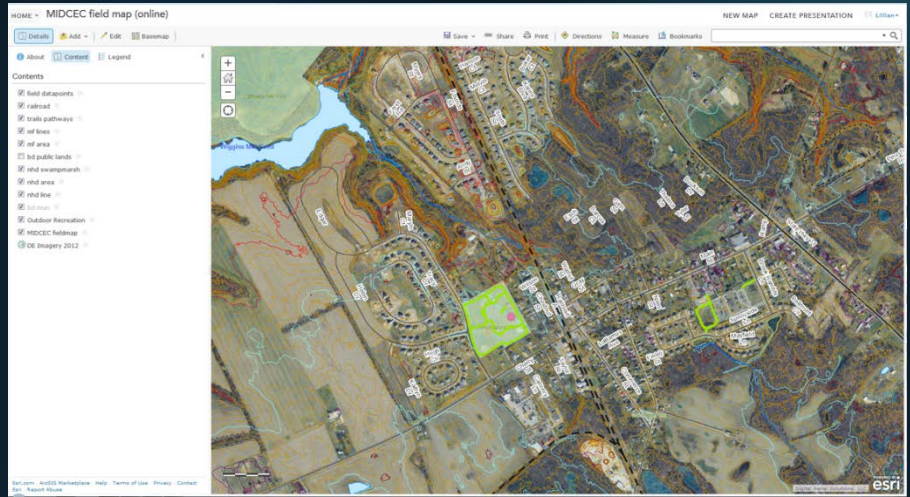
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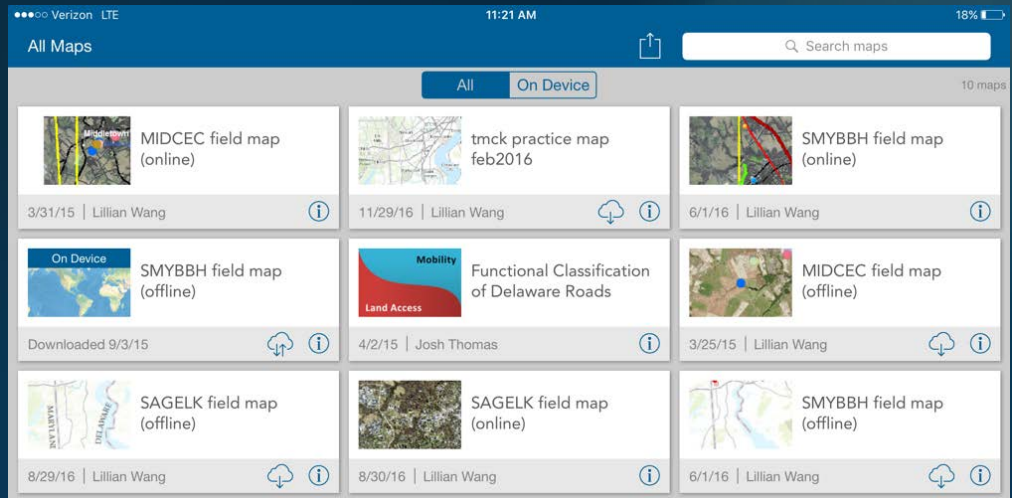
Collector
field map
navigate and
collect data



AGOL
My Content



Desktop
Geologist
data picks layer



Goals met

- Story Map Gallery ✓
- Annual Report 2015-16 Story Map ✓
- Field Trip Guide Story Map ✓
- ESRI Collector app ✓

