DIGITAL MAPPING TECHNIQUES 2015

The following was presented at DMT'15
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Salt Lake City, UT)

The contents of this document are provisional

See Presentations and Proceedings
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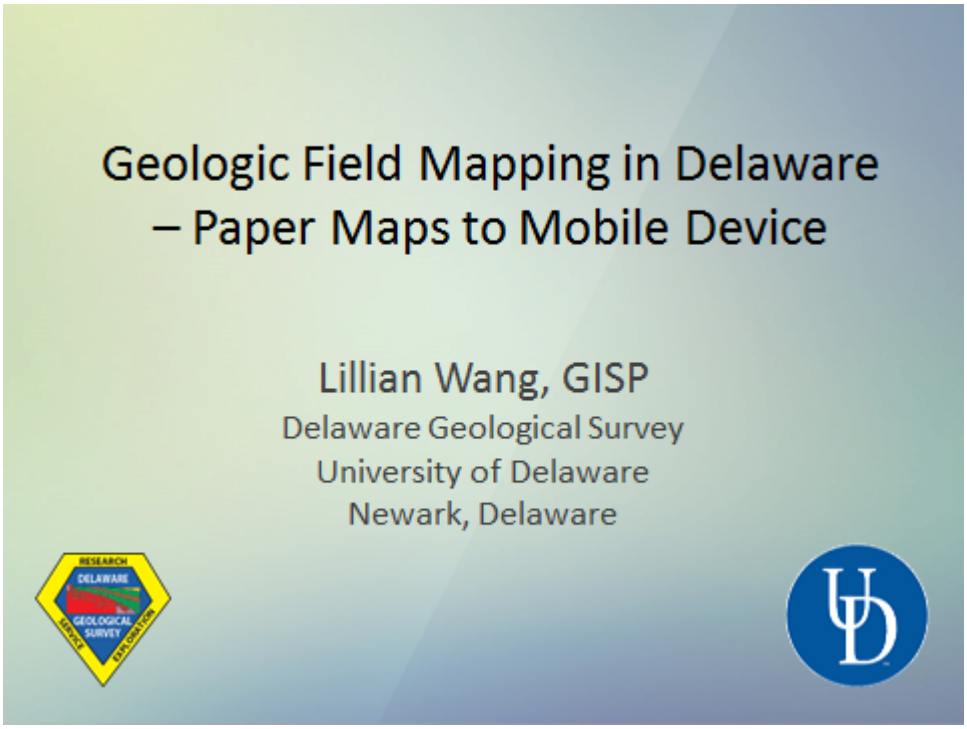
http://ngmdb.usgs.gov/info/dmt/



This presentation is focused on the surficial geologic mapping work being done in Delaware.

Our surficial geologists are currently using paper maps in the field, and I would like to move their work flow toward viewing maps and editing data on a mobile device.

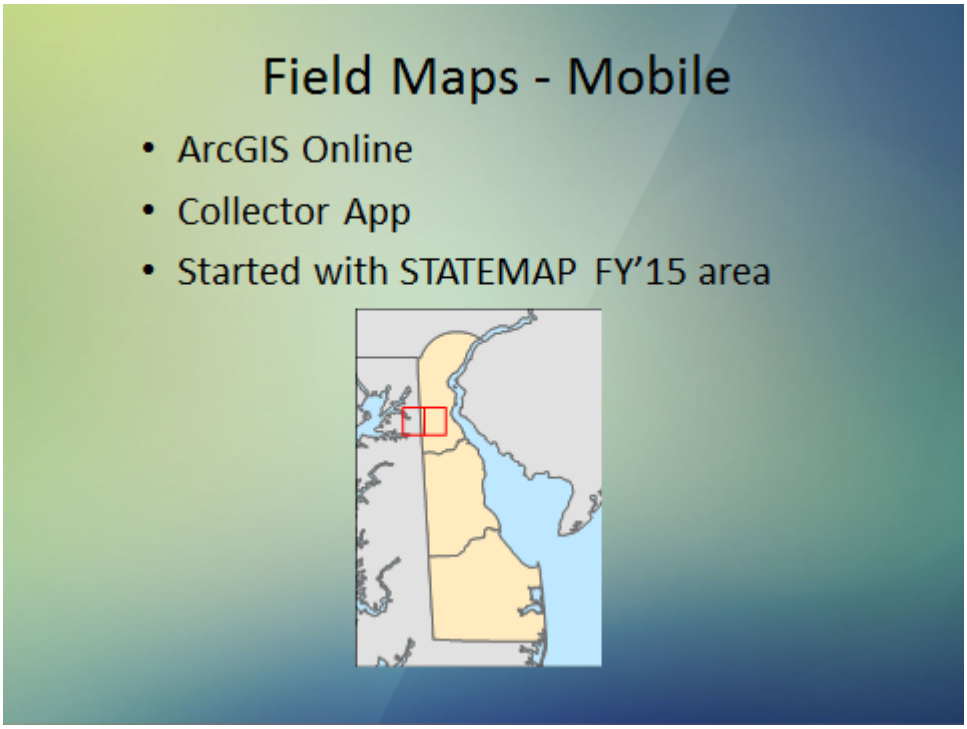
Delaware has several statewide basemap digital datasets available from municipal, state, and federal agencies http://firstmap.gis.delaware.gov/.

In 2007, our surficial geologist asked me to create customized paper topographic maps for him using these datasets.

Datasets included 2 ft contours from LiDAR (2005-2007), roads from the Delaware Dept of Transportation (DelDOT), trails and unimproved roads from USGS DLGs (1993), vegetation cover from land use and land cover (2012), outdoor recreation inventory boundaries, and property owned by the University of Delaware. Detailed labeling included names for every single road, such as in ADC map books (1:2,000-scale).

The GIS data were exported from ESRI ArcMap to Adobe Illustrator to create the cartographic detail of these maps.

One of these field maps is approximately a quarter quad (1:12,000-scale), so one 1:24,000-scale quadrangle size field area is 4 maps. The most recent statewide aerial photography for each map was also requested, and there were two geologists going out in the field and each wanted their own set of maps. Result was 16 large format paper maps and aerial photography to be printed for use in the field.

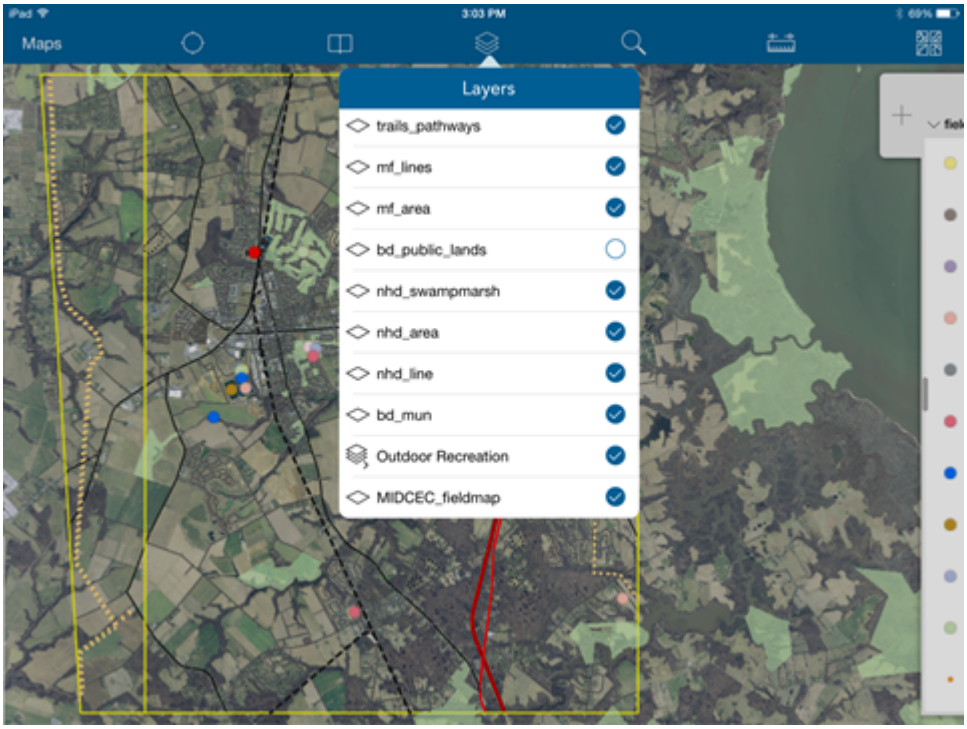


As of May 2015, DGS essentially has not moved toward using mobile devices in the field, with the exception of at least one staff member who has been using ArcPad.

In 2012 ESRI's ArcGIS Online came along, and so did apps for field work such as the Collector App. In order to use maps in Collector, you must have an ESRI ArcGIS organizational account.

Since we are part of the University of Delaware (UD), we have access to the UD ArcGIS Online subscription, so during summer 2014 I decided to test these applications out.

I started with our FY'15 STATEMAP project area in Middletown and Cecilton quadrangles, since the paper field maps were already created & being used.



This is a general view what my re-created map looks like in the Collector App on an iPad Air.

To begin building this map, I logged in my ArcGIS Online account at my desktop in a browser and the first thing I did was select a basemap. During fall 2014, the state of DE set up a state enterprise GIS called FirstMap <http://firstmap.gis.delaware.gov/>, so I was able to easily add the state's most recent aerial photography which is preferred since it is ¼ m resolution and collected during spring 2012 (leaf-off).

I added the vector datasets I used to make paper maps as shapefiles. That option was available as long as each shapefile is less than 1,000 features, and file size 10 MB or less. Each shapefile was zipped individually and added to the ArcGIS Online map, which is similar to adding data to an ArcMap map document (.mxd).

When the user zooms in, they can view the 2 ft contour data. I used a different method to add the contours and roads data since they exceeded the shapefile size limitation. These datasets are in a tile layer, or a map service.

Since this layer is essentially an image, the attribute information is not available. Instead of labeling, I color coded the index contours (red line = 10 ft, blue = 20ft). This is the color-coding method I used to display index contours on the paper field maps.

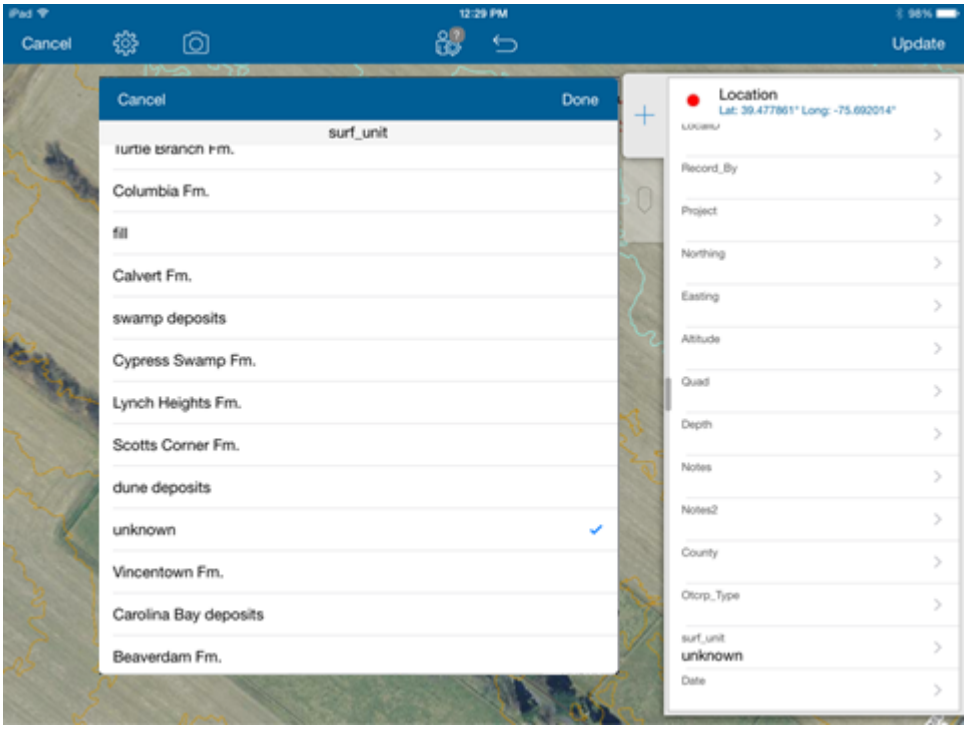
The green line is part of the DelDOT trails & pathways dataset – since this was added as a shapefile, I can access the attribute information and see who manages the trail, type of surface it is, length, etc. This is why adding this layer as a shapefile instead of including it with the tile layer is preferred.

Since the objective in the field is to drill and collect information about the borehole/well, I created a feature class point file to collect the data.

To add a point, you can use the locator service – accuracy will be as good as the device can get. If you require increased accuracy, I read an article that said you can connect your device to external GPS receivers and improve accuracy.

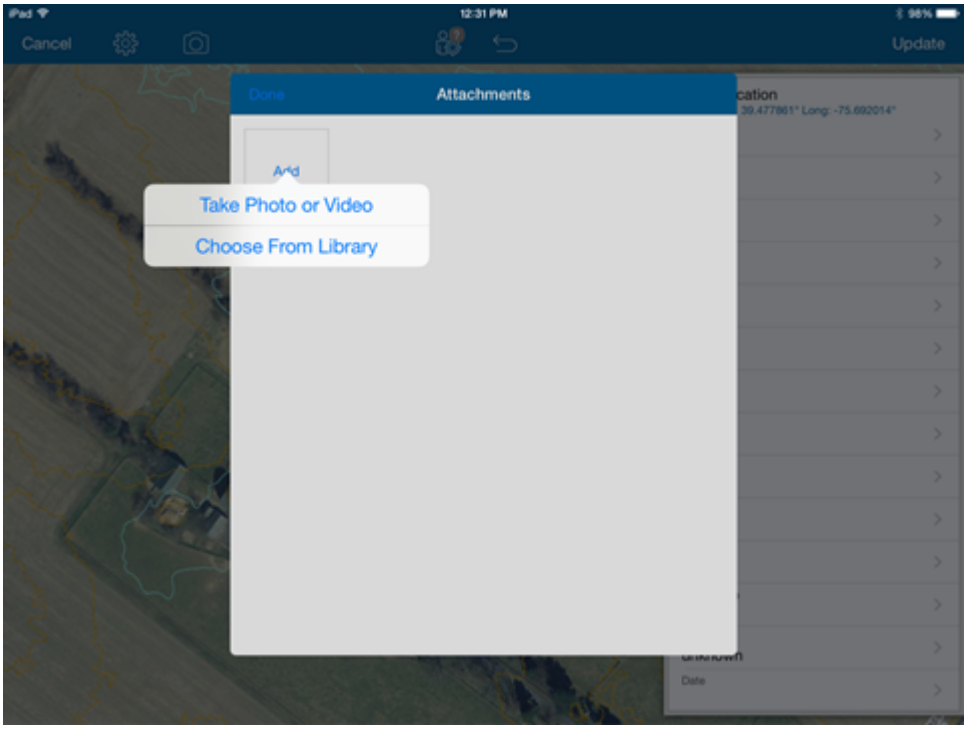
Another option is to turn off the locator service within the app and add the location manually.

I also created domains in the geodatabase so I could provide a list of choices for the user to select from when they are collecting data.



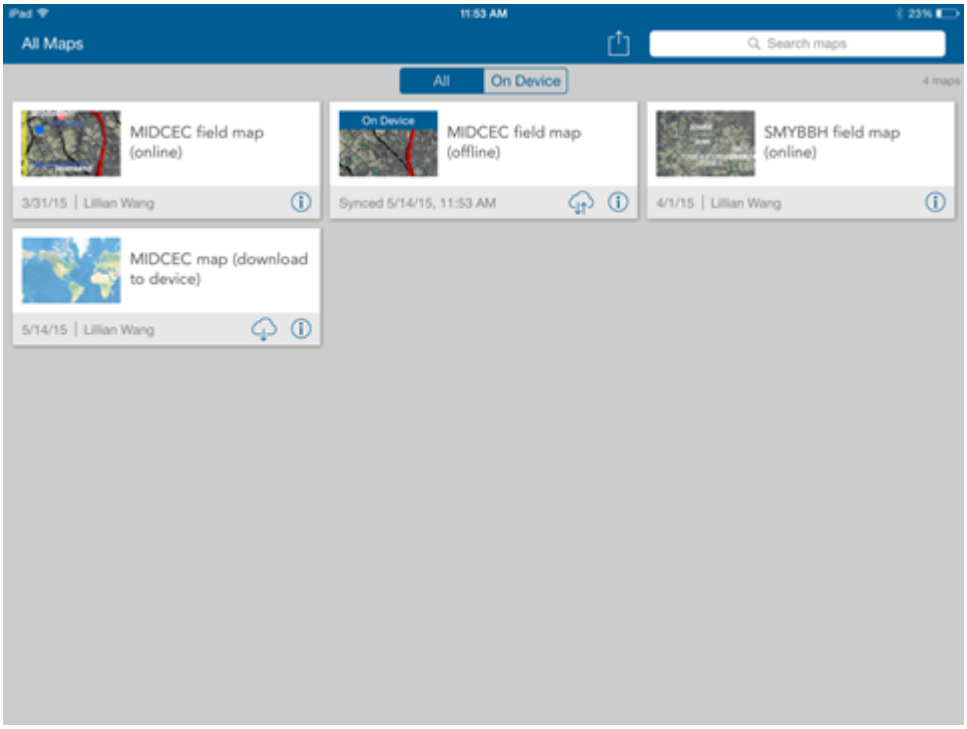
For example, when they go to fill out the surficial unit name, they click on that attribute field and a list comes up to select from.

This will save time while in the field and reduce data entry error to the database back in the office.



Another customization I did to the point file is Enable Attachments. This allows users to take pictures with the device while working in the app, and the images are stored as attachments.

When I started using the app, I was looking for the camera icon at the top to take a photo and didn't see it. Once I enabled attachments on the point feature class in ArcCatalog on the desktop, the camera icon showed up in the app!



So that workflow works great while you are online, but what about when you get to that area with no cell service?

You can work offline by saving a copy of your map to your device and continue collecting data offline.

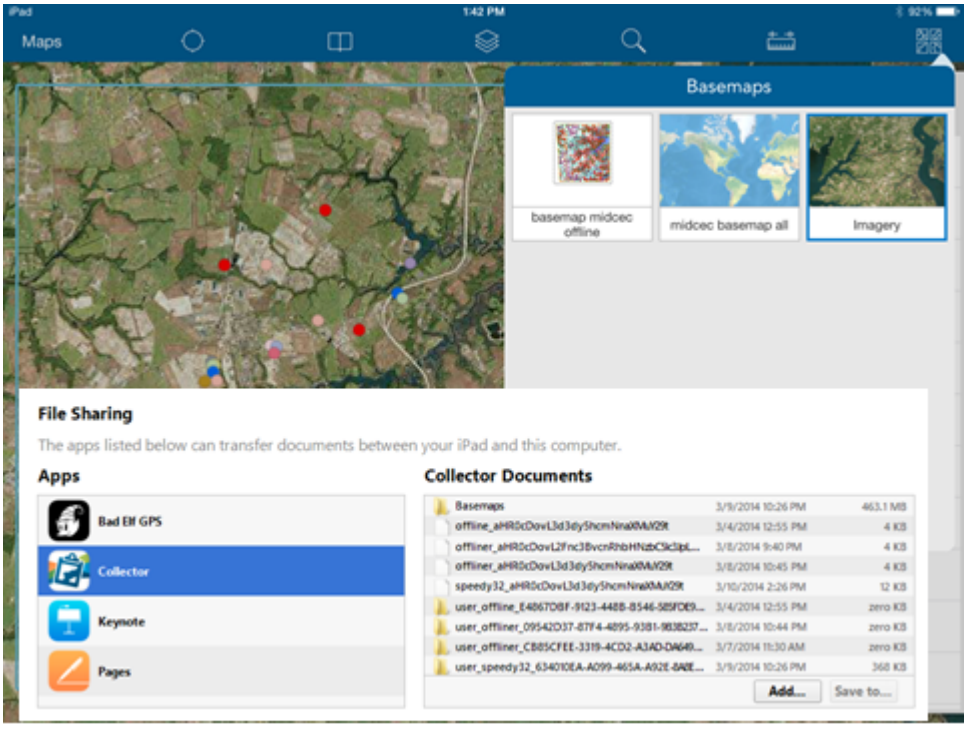
My online field map is the upper left card, and there should be a cloud with a down arrow icon to download the map to my device, and there isn't one.

I can't download this map because it contains data that is not downloadable.

I ended up doing what I consider a work around to get it on the device.

I made a separate map with the ESRI basemap imagery layer as my base map and my editable point file.

With only those 2 datasets, the download icon was visible (bottom left card). I clicked the icon and a copy of the map was saved on my device!

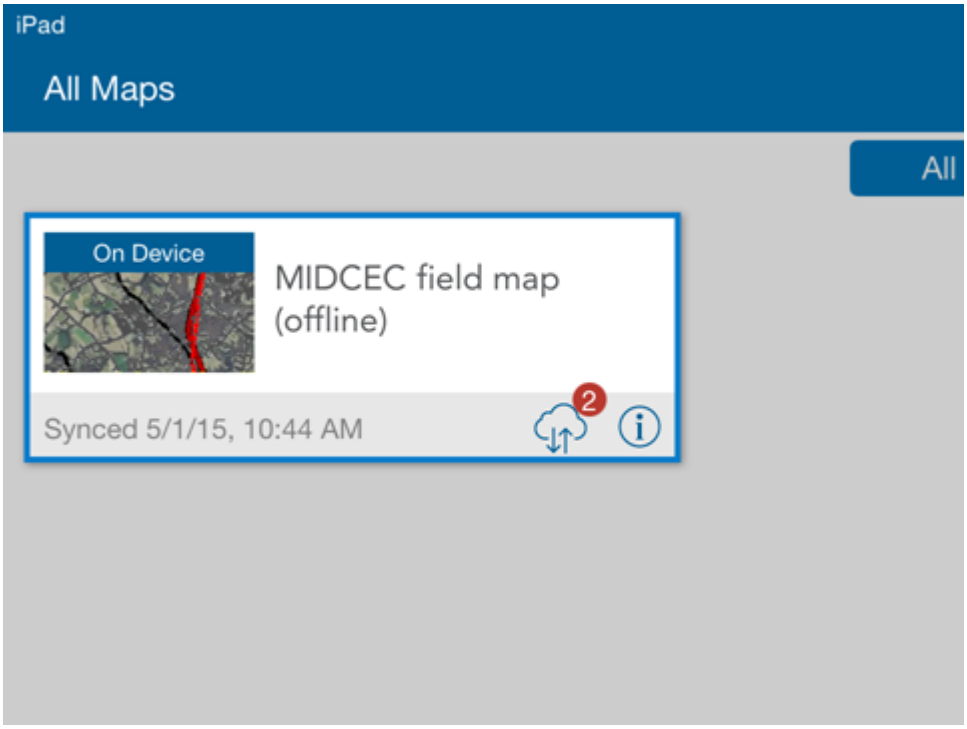


When I opened the offline map, I was able to edit the point file the same as if I were online. Since our geologists will prefer the 2012 aerial as the base map instead of ESRI Imagery, I was able to add a new base map by adding a tile package to the device.

I had the tile package I used for the contours and roads, so I modified it by including the 2012 aerial underneath those layers and created a new tile package file.

I plugged the iPad to my computer, opened iTunes, scrolled to the Collector App on the device, then dragged and dropped the tile package file into a base map folder in the app (bottom image courtesy of ESRI).

When you click the top right icon, a list of base maps is displayed. I can create multiple basemaps for the user to choose from to work with on the device, offline.

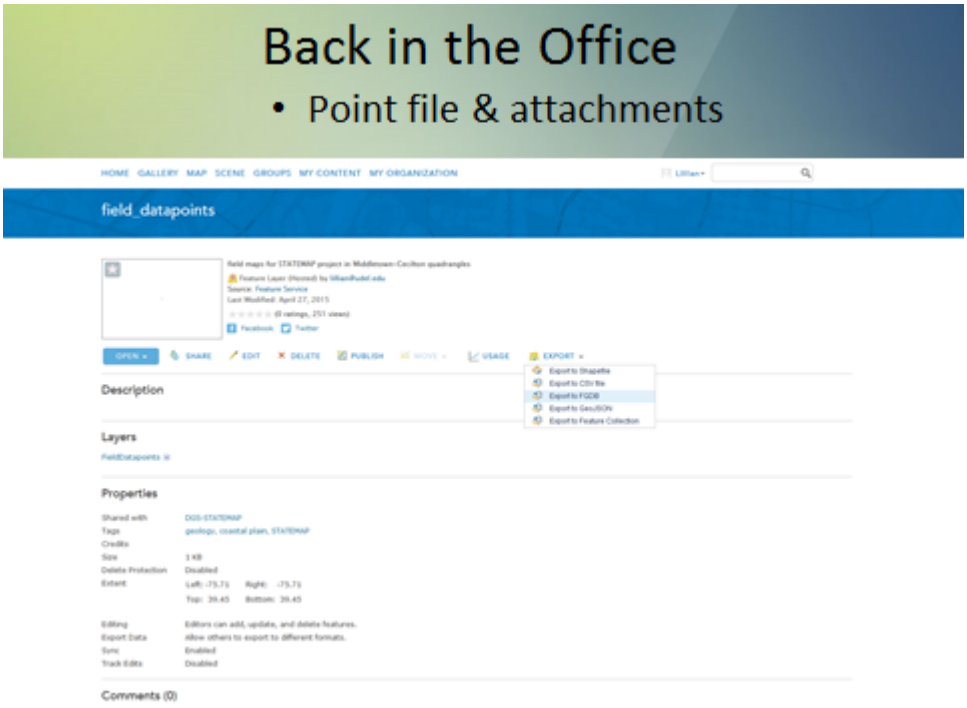


So you're working offline collecting points.

When you go back to the map gallery, when you are offline the only map visible is the offline map.

In this example, the icon  is indicating there are 2 points that were collected while offline and need to be synced with the point dataset stored in the ESRI cloud.

When you get back online, you tap the sync icon  and it syncs with the cloud data and your offline updates are saved.



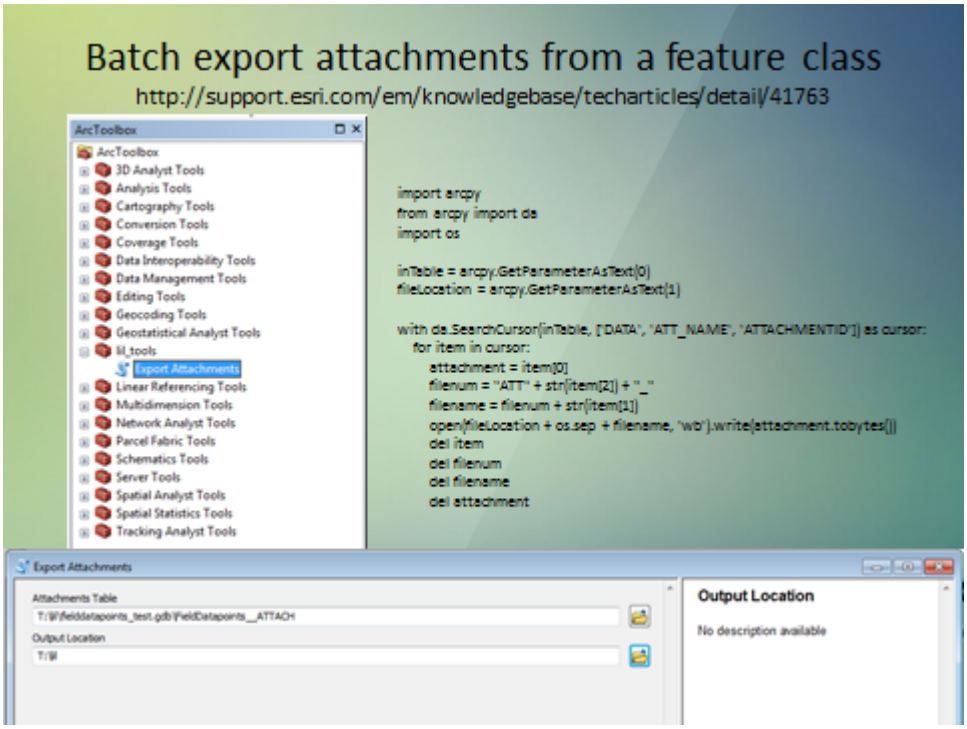
Field work is finished and I am back in the office - I need to get the point dataset and attachments from the cloud to my desktop to continue working.

Log into ArcGIS Online in browser, go to My Contents, open the data points file to view its details (on slide).

From here you can export and there are a few file format options to choose from. I chose file geodatabase. The data was downloaded in a zip file.

At my desktop, I unzipped my contents – the geodatabase with point feature class was there, but I didn't see the photo attachments.

How do I get them?



I found a Python script that downloads the attachments: <http://support.esri.com/em/knowledgebase/techarticles/detail/41763>

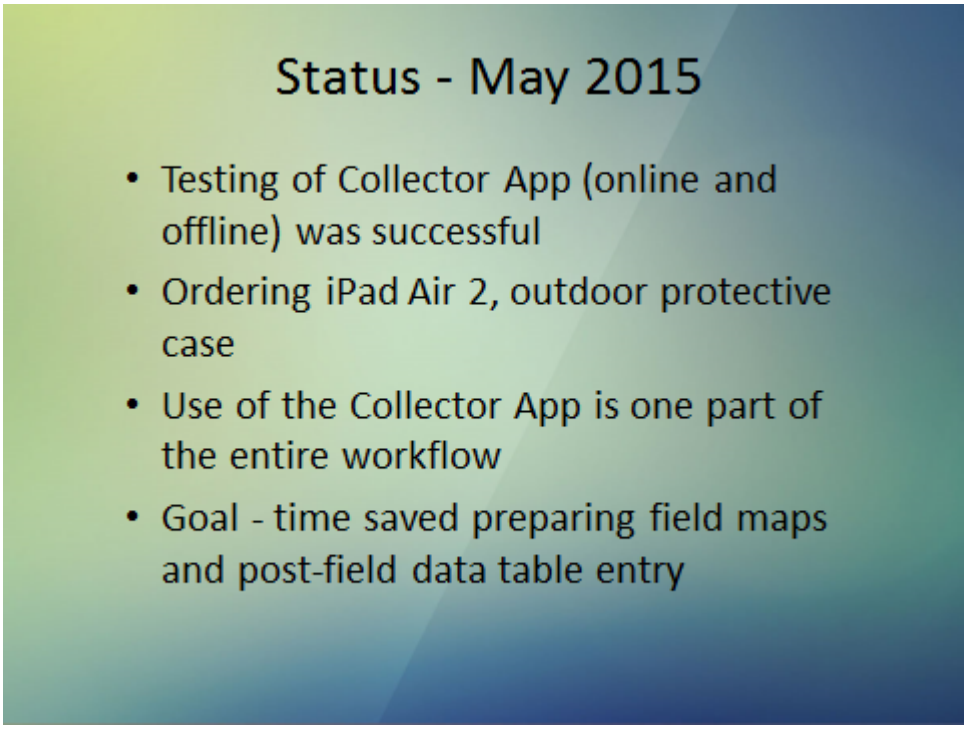
The script creates a new tool in Arc Toolbox called Export Attachments.

When you double-click the tool, you get a dialog box to select an attachments table which is in your geodatabase, then select an output location.

Photos will appear in the output location.

The user will need to keep track of which photos go to what point since it is not obvious in photo naming convention (ATT1, ATT2,….). Only way to track is go into app and look at each point and view its attachments.

I read an article that said ESRI is working to make photo identification and attachment management easier.



In conclusion - testing the Collector App capabilities both online and offline were successful – it worked!

We are in the process of ordering an Apple iPad Air 2 for field work, and also researching outdoor protective cases for the device.

Using the Collector App is only one portion of the entire workflow. There is still a lot of data table work and final entry of new data into our Oracle database that needs to be completed in the office.

My goal is to discontinue creating paper field maps in the future. Instead create digital field maps quickly with updated data from FirstMap and have it available for a mobile device.

Another advantage will be time saved when the geologist comes back in the office, a GIS point file with x,y coordinates and attributes filled in (even partial) already will be available, rather than sitting down and starting from scratch to create a new table from paper field notes and eventually creating the GIS layer.

I would like to thank Ben Mearns, UD GIS Scientific Application Consultant for his support with ESRI software and ArcGIS Online. I could not have successfully run the Collector app without his help.

I would also like to acknowledge the Delaware Environmental Monitoring & Analysis Center (DEMAC) http://demac.udel.edu/ and FirstMap http://firstmap.gis.delaware.gov/ for providing Delaware aerial photography and other invaluable GIS datasets.

Also I want to acknowledge the DNREC Division of Watershed Stewardship, Watershed Assessment and Management Section as the first (at least as far as I know) Delaware state agency branch to utilize the Collector App successfully in the field. They shared their experience with the app and provided guidance to our staff as we forge ahead to switch from paper to digital field mapping and data collection.