Creating Web and Mobile Maps Using ArcGIS Online

SCO Technical Paper

Version History

Version	Date	Notes	Author/Contact
1.0	February, 2012	Initial document created.	John J Czaplewski

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Introduction: What is ArcGIS Online?

ArcGIS Online is a simple cloud-based utility for producing, editing, and sharing geospatial data. Designed by Esri, the makers of the popular ArcGIS software suite, ArcGIS Online is meant to act as a Web-based mapping solution for everyone from GIS professionals to those with no formal GIS training.

ArcGIS Online allows you to:

- ✓ Upload and manipulate data
- ✓ Map points, lines, and areas
- ✓ Create point, choropleth, and other thematic maps
- ✓ Embed maps in Web sites
- ✓ Share maps in a multitude of ways
- ✓ View maps on mobile devices

For more background on ArcGIS Online, please visit
help.arcgis.com/en/arcgisonline/help/index.html#/What_is_ArcGIS_Online/010q00000074000000/

Extensive help documentation for the product can be found here:
help.arcgis.com/en/arcgisonline/help/index.html#//010q00000002000000

Some possible uses of ArcGIS Online include:

- ✓ A kayaking club creates a map of boat launching points along local waterways, and then embeds the map into their Web site.
- ✓ A medical researcher makes a map of a state showing the locations of coal mines as well as lung cancer rate by county.
- ✓ After tracking her route through London with a GPS, a tourist uploads her track and waypoints to document her trip.
- ✓ To ensure a quick response, a municipality creates a map of pot holes and allows residents to add new points.

Known limitations of ArcGIS Online include:

- ✓ Users are limited to 2 GB of storage using their Esri account
- ✓ Only 1,000 points are allowed in each file upload
- ✓ Problems saving and viewing may occur if more than 10,000 points are inserted into a map

Getting Started: Introduction to the Interface

ArcGIS Online requires an Esri global account to upload data and save maps. If you do not already have an account, you can create one by clicking the *Sign-up now* button in the bottom left corner of www.arcgis.com. If you already have an account, or after you have created an account, you can log in by clicking *Sign In* on the main screen of www.arcgis.com.

The main ArcGIS Online toolbar

Once logged in, you will be redirected to the *My Content* section. This is where you can see and organize all of your existing maps, as well as set permissions. From this screen, click the *Create Map* button to enter the ArcGIS Online web application. You will be presented with a screen similar to this:
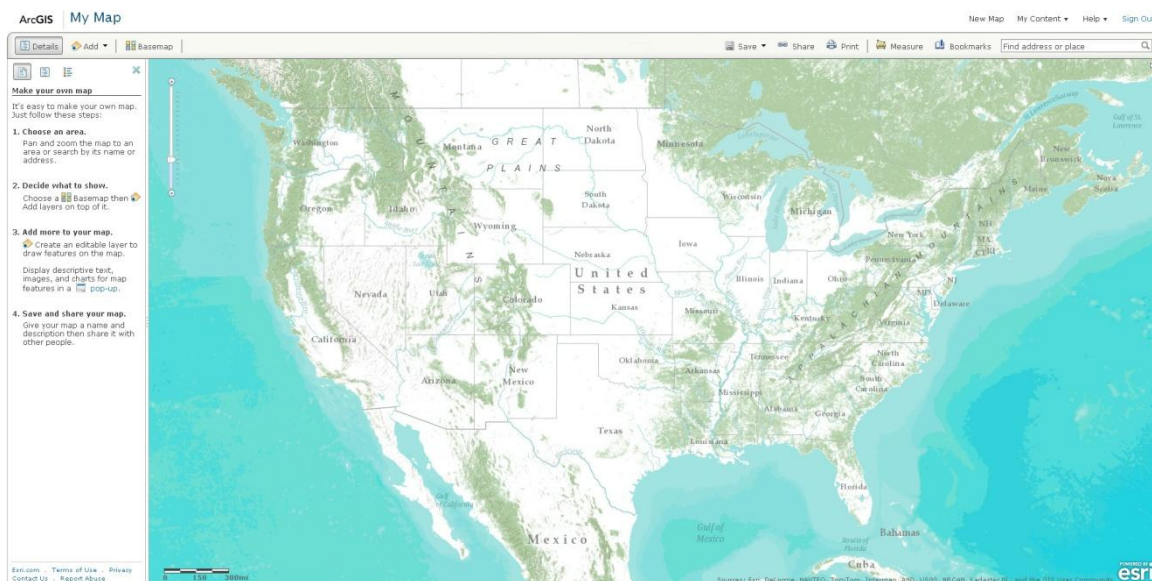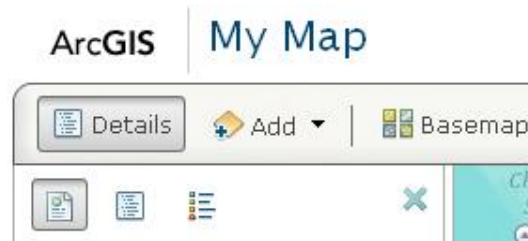

The ArcGIS Online mapping application

The top left corner contains three important tools: the *Details* sidebar, the *Add* menu, and the *Basemap* selection button.

The Details, Add, and Basemap buttons

The *Details* sidebar has three additional buttons at the top: *About this Map, Show Contents of Map,* and *Show Map Legend*.

The three above-listed buttons are respectively located under Details

Once some data has been added these buttons can be used to provide information about the resulting map:

- *About this Map* displays basic metadata about the map, such as who created it, the date it was created, ratings, views, and comments.
- *Show Contents of Map* lists the layers of the map, and allows the user to edit their attributes.
- *Show Map Legend* displays map symbology.

The *Add* menu is how map layers and other data are added to the map document. The user can choose to search for layers, create an editable layer, add a layer from a file, or add a layer from the Web. The option to add a layer from the Web can be useful in scenarios when the information contained in the layer will be frequently updated. For example, you could create a CSV file on your computer that contains the latitude and longitude of local trailheads. From here you could save that file to Dropbox (www.dropbox.com) or another Web-based file storage service. Then, after getting a direct link to this file, you could import it into ArcGIS Online as a layer. That way, each time changes are made to the CSV file on your computer, those changes will automatically be reflected in the ArcGIS Online document.

The *Basemap* button allows you to choose one of twelve different basemaps. These range from satellite imagery, to street maps, to topographic maps. The best basemap is application-dependent and will depend on the dataset being visualized.

Take some time to explore the application. Knowing what tools and options are at your disposal will not only stimulate ideas for your own project, but also save time and frustration later.

First Steps: Making a Simple Point Map

To create a point map a data source is required. For this exercise we will use a combination of US Geological Survey (USGS) and National Geodetic Survey (NGS) control points. For more information about these and other control point systems, see the ControlFinder application and documentation from the State Cartographer's Office (www.sco.wisc.edu/controlfinder/controlfinder.html).

To simplify these huge datasets, they have both been clipped to Door County and zipped as Shapefiles. They can be found at (www.sco.wisc.edu/images/stories/download/arcgis_sample_data) and are named *usgs_door* and *ngs_door* respectively. If you want to use these files in this exercise, you should download them to your computer. You do not need to unzip them.

ArcGIS Online is capable of reading zipped shapefiles, CSV, TXT, and GPX files as layers. In every case, each layer is limited to 1000 features. Additionally, a new map document can be made from a single KML file, with the option of adding other layers on top. However, KML files cannot be added as layers to an existing map document at this time. This means that if you wish to use a KML file, you must create a new map document from that single KML file. The KML file then functions almost as part of the basemap, meaning that you cannot alter it in any way with the exception of toggling it on and off. If you create a new map document, you will not be allowed to add a KML file as a layer.
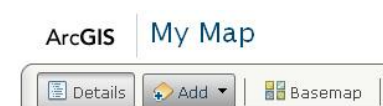
As previously mentioned, files or services from the Web can be added as layers using a URL. Data can come from an ArcGIS Server, an OGC Web Service, a KML file, or a CSV file.

To get started, log into your ArcGIS Online account and from the main page click *Create Map*.

Creating a map

From here you will be taken to a blank map document. In the top toolbar, select *Add.*

Add layers to the map document

A drop down menu with four options will appear. Select *Add Layer from File*. Once the dialogue box opens select *Choose File* and navigate to the two zipped control point shapefiles you downloaded. After choosing the correct file, you will be presented with the following options:

Importing a zipped Shapefile

Because shapefiles can contain very large amounts of information with a high level of geographic accuracy, the files can be large enough to slow down the speed at which they are rendered. To remedy this issue, select *Generalize features for web display*. Under normal circumstances, and in most applications, this should not lower the accuracy of the data in a meaningful way. However, do not use this feature if the shapefile contains adjacent polygons, as slivers may be produced. In this exercise we will let this option default. For more information about importing shapefiles see Esri's online help (help.arcgis.com/en/arcgisonline/help/index.html).

Select *Import Layer* and repeat for the second zipped shapefile.

Once you are done importing you should see something like this:
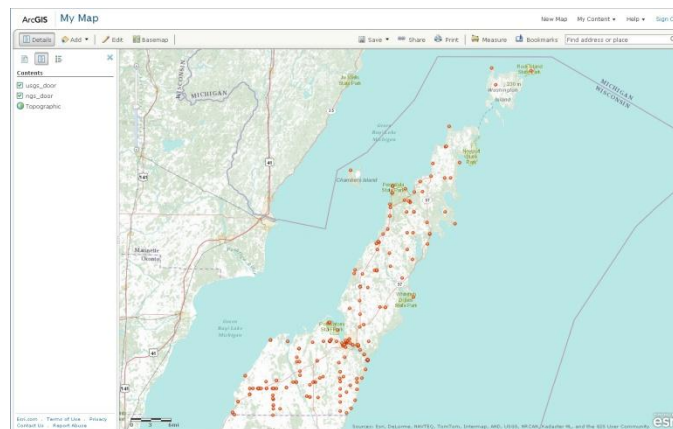
All points added

Next Steps: Customizing the Map

Take a minute to explore the imported features. You will probably notice there is no way to distinguish between the two datasets, since they both look the same. Also, when you click on a point not all fields contain information that you necessarily want to see on the map. Fortunately, ArcGIS Online allows the user to customize many aspects of the map.

To get started, click the *Show Contents of Map* button (middle button) on the top of the toolbar on the left side of the screen. This is the table of contents of the map, and lists all layers present. Mouse over the *usgs_door* layer and click the arrow to the right. You will be presented with the following options:
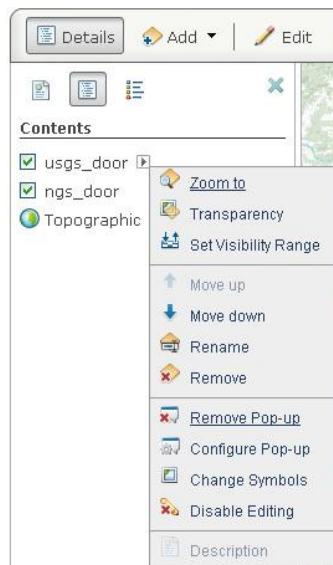
Layer options menu

To distinguish between the two layers, change the symbols of the USGS layer. Click *Change Symbols*. A bar will pop up on the left side of the screen.

The options here include *A Single Symbol*, *Unique Symbols, Color,* and *Size*.
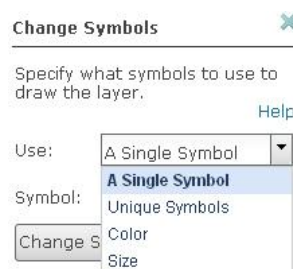
Symbol options

Since we want to use a single symbol for each dataset, we will let the *Use* field default to *A Single Symbol.* However, let's take a quick look at the other options first.
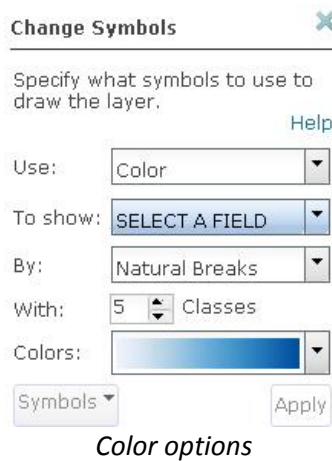
Unique Symbols allows the user to use a unique color ramp to represent different classes of data within a layer. This is best suited for data grouped into classes. For example, if the USGS and NGS points were both part of the same layer, this option would allow the use of a unique color for each.

Unique Symbols – options

The *Color* option is used for creating choropleth maps and allows the user to specify a field to represent, a break scheme (Natural breaks/Jenks, Equal interval, Standard deviation, or Quantile), the number of classes to be used, and a color ramp to use.
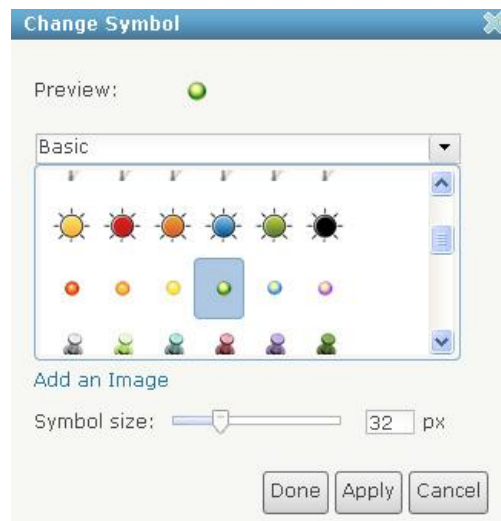

Color options

The *Size* option is used to create a proportional symbol map, i.e., one on which the size of the dot (or other symbol) is representative of an attribute of that layer.

As noted above, we want to use a single symbol for each dataset, so we will be using the *Single Symbol* option. Select *A Single Symbol* and click *Change Symbol*. Scroll down and find the green dot that matches the existing red one. Change *Symbol size* to 20px.

The Change Symbol Window

Click *Done* and notice the changes on the map. It is now easy to distinguish between the two layers as they now are differentiated by color. Notice the many options available for single symbols. The dropdown menu provides application-specific symbols, such as business, outdoor recreation, and transportation.

Next, we will configure the pop-up boxes used to identify points on the map. Click on the X to close the *Change Symbols* bar. Click on the arrow next to the *usgs_door* layer, but this time select *Configure Pop-up*. A window will appear on the left side of the screen.
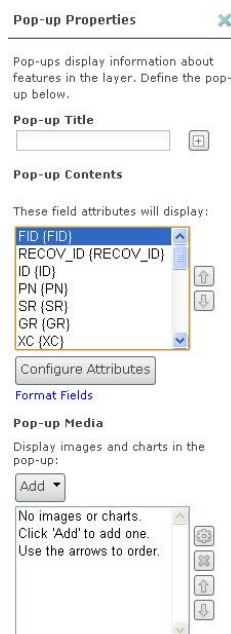

Configure Pop-ups

Select the *Configure Attributes* button. Here you can change whether or not a field displays, and also what name it displays as. In the *Display* column, deselect the fields called ID, ZC, ZN, RE, AH, OW, and HG. These fields do not contain any information, so there is no need for them to display. Select *OK* to close the window, and make sure to select *Save Pop-Up* on the *Pop-up Properties* window.

Do the same thing for the NGS layer, but this time deselect the fields called ELLIP_HT, ELLIP_SRCE, ELEV_ORDER, ELEV_CLASS, ELEV_CHECK, DIST_RATE, ELLIP_ORDER, ELLIP_CLASS, SAT_USE, SAT_DATE, and STABILITY. Now when you click on a point the pop-ups will not display these fields.

ArcGIS Online is capable of displaying media, such as images or charts, from other Web sites. To do this you can include the URL (Web site address) of the media in a field in your layer. The URL will appear as a clickable link in the pop-up window when you click on a point.

Creating an Editable Layer

ArcGIS Online also allows users to create editable layers. These layers allow anyone who has permission to add specific information to a map. To get started, click on *Add* and select *Create Editable Layer*.
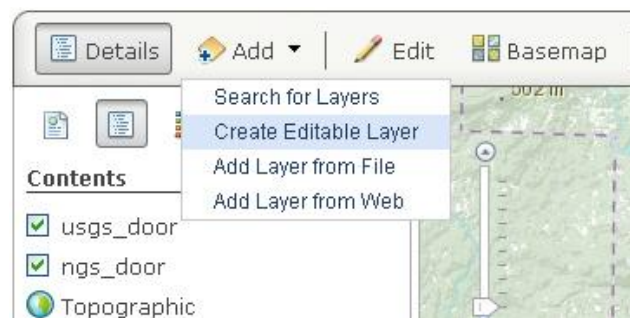
Creating a new editable layer

A box will appear allowing you to name the new layer as well as select a template. Templates consist of a series of icons and other presets that restrict what kinds of information can be added to the map. Currently, the templates include Map Notes, Citizen Requests, Civic Events, Oil & Gas Infrastructure, Park Planning, and Recreation. These layers are especially useful for crowd sourcing data, such as infrastructure requests, community events, or simply adding another layer of richness to a map.

When you have one or more editable layers on your map, an *Edit* button will be added to the top left toolbar.

By default, new editable layers can be edited by anyone who can view the map. To turn this feature off, click on the layer in the table of contents and select *Disable Editing*.

Set Visibility Ranges

Another useful tool within ArcGIS Online is the ability to set the visibility range of each layer. This can be useful if the items on a map look too crowded at certain zoom levels. For example, zoom out so that the whole continent is visible. It should be obvious that at this scale it is impossible to discern individual points within Door County. This can also be a problem when a combination of national, regional, and local data is layered together. When trying to view the national data at a small scale the regional and local data points probably crowd the map so much that it is almost impossible to discern the types of points.

These problems can be fixed by changing the visibility range of a layer. To do so, click on the arrow next to a layer in the table of contents and select *Set Visibility Range*.
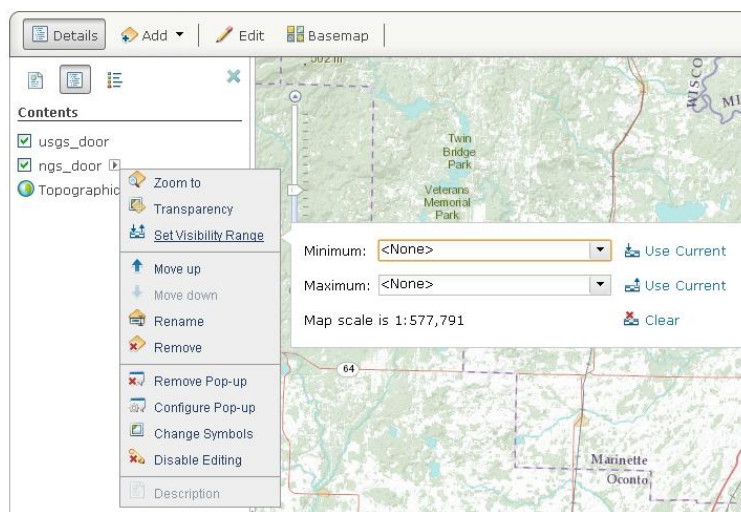
Setting the visibility range

From here, use the drop-down boxes to select the scale range in which you would like that layer to appear.

Sharing the Finished Product

Before the map is actually shared, there are a few settings to take note of, the first being the extent of the map. The extent of the map can be thought of as the zoom level and frame of the map when it is first opened or embedded. ArcGIS Online does a good job of automatically selecting the extent, but there are situations where a different extent is better.

To get started, save your map, then click on the *My Content* tab near the top of the page. Click on the desired map. From here, click the *Edit* button.
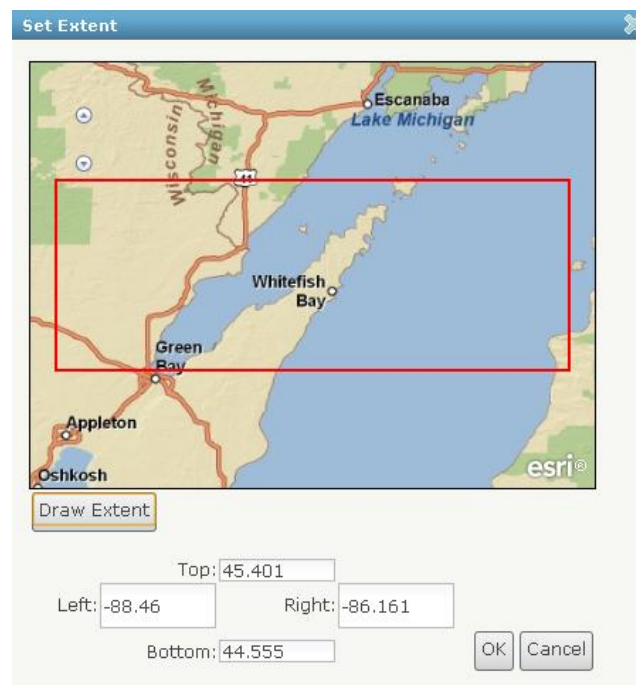

Edit Properties

This is where all the properties of the map document can be changed, including the title, summary, description, tags, and extent. To set the extent, scroll to the bottom of the page and click *Set Extent*. The following box will appear.

Setting the Extent

If you know the exact coordinates of the extent you would like, you can enter them directly, or you can simply select *Draw Extent*. This will allow you to draw a box around the area of interest. When you are done, hit *Save*. Now whenever this map document is opened this will be the default view.

To change the permissions, reopen the map document in the ArcGIS Online map view. Across the top bar, click the *Share* button. The following window will open. (Note that you will not see any group information unless you belong to one or more groups.)


Sharing options

From here the permissions of the map can be changed to *Public* or shared with a group. By default, all new maps are private, meaning only the creator can view them. Setting the privacy to *Public* allows everyone on the internet to view your map, whereas sharing with a group allows only group members to view the map. If you plan on embedding your map in a Web site or otherwise widely distributing, it is best to select *Public*.

This window also provides options for directly sharing the map via Facebook or Twitter. This can be done by simply clicking their button and logging into your account. If you would like to share the map on a different social network, in an email, or other location you can copy the link from the *Link to this map* box.

Additionally, you can embed your map in a Web site by clicking the *Embed in Website* button. It will open this window.
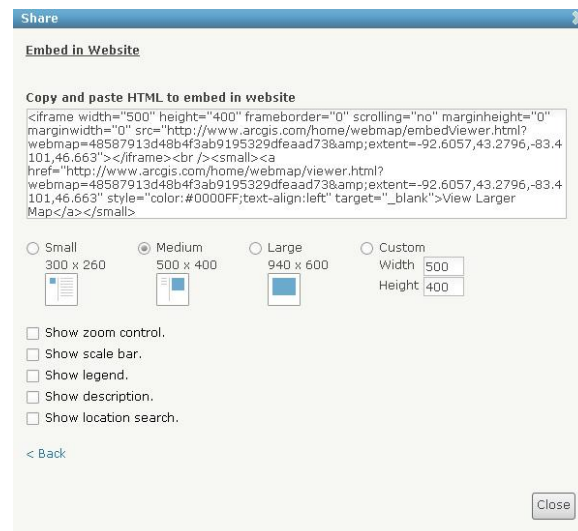
Embed in a Web site

From here you can select the size of the map frame, as well as the options you would like added to the embedded map, such as zoom control or location search. It is important to note that the extent previously set is not used by this embed function. Instead it uses the view of the map currently displayed on the screen. This means that if you are zoomed into a city, that is what will display on the embedded map.

Once the proper size, extent, and options are checked, simply copy and paste the HTML code into your Web site.

Mobile Maps

Perhaps the most powerful and unique feature of ArcGIS Online is the ability to take your map with you on your smartphone or tablet. Apps currently exist for iOS, Android, and Windows Phone 7. For more information about the app for each platform and to download, see:

- ✓ iOS download: itunes.apple.com/us/app/arcgis/id379687930?mt=8
- ✓ Windows Phone download: windowsphone.com/en-us/apps/7cb003be-990a-e011-9264-00237de2db9e
- ✓ Android download: market.android.com/details?id=com.esri.android.client

After using the Web-based platform, the ArcGIS app will seem quite familiar. Although it has substantially less functionality than its desktop cousin, the app gives users the ability to view their current location on the maps they have created. When integrated with an ArcGIS Server, users gain the ability to update their maps from their mobile device. Unfortunately, there is currently no way to edit layers (including editable layers) from a smartphone or tablet without access to an ArcGIS Server.

For these examples the Android version of the app will be used.

Once the app is downloaded, the user will be greeted with a home screen.
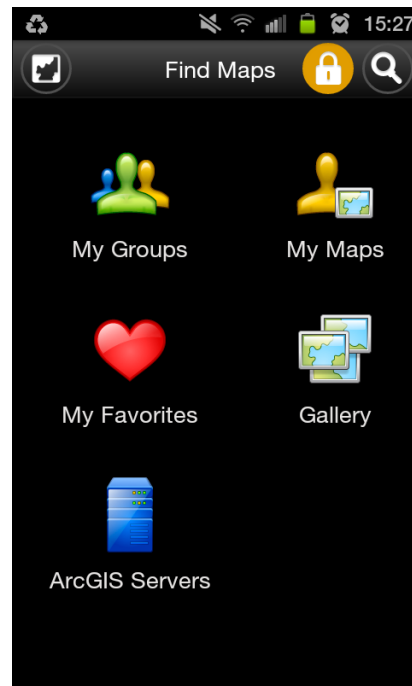
Home Screen

The button in the upper left corner will take you to the last map document opened, and the *Gallery* icon will take you to the ArcGIS Online public gallery where you can search for maps.

For now, select *My Maps* and open the Door County map. You should see this:
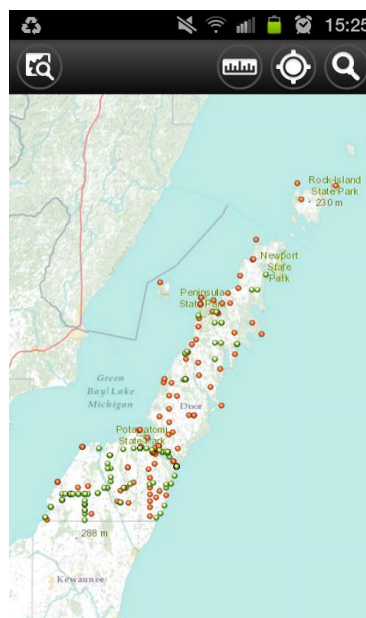
The map in mobile form

There are a few icons across the top: the map with a magnifying glass will take you back to the *My Maps* folder, the ruler icon will allow you to measure distances, the GPS logo will identify your location relative to the map, and the magnifying glass will allow you to search places on the map. Just like the native mapping application on your device, the ArcGIS app allows panning and pinch zooming.

Since an Android device is used in this example, selecting the device's options button will show this screen:
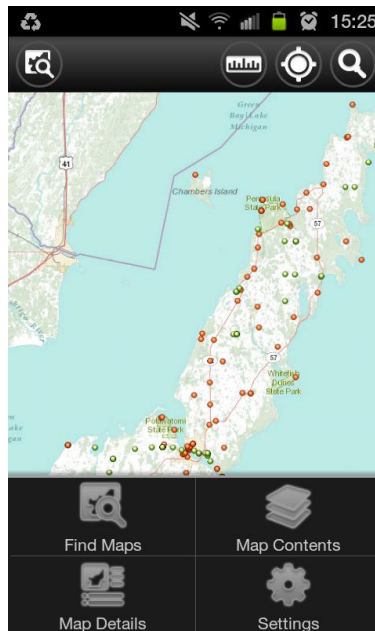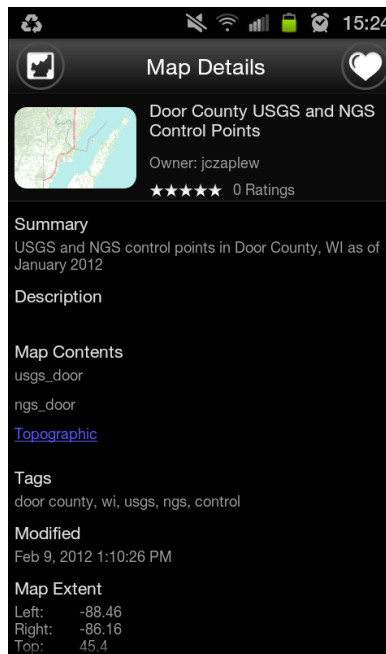

Map options

Find Maps will redirect back to the home screen whereas *Map Contents* will allow you to view the layers of the map and toggle their visibility.

Map Contents

At this time, the user is unable to change the basemap from the mobile application. Selecting *Map Details* allows users to view all the metadata they added earlier in the exercise.

Map Details

Currently, little is contained in the *Settings* other than application version information.

Next Steps

As with most web applications, ArcGIS Online will continue to evolve. With this will hopefully come more features, intuitive interfaces, and wider adoption.

Topics for future versions of this Technical Paper include:

- ✓ Creating other types of maps (choropleth, heat, etc…)
- ✓ Using ArcGIS Online as a place to store collaborative map documents (currently it can store .mxd files, but cannot open them)
- ✓ Incorporating Web map services
- ✓ More example uses
- ✓ Mobile data editing
- ✓ More complex pop-ups