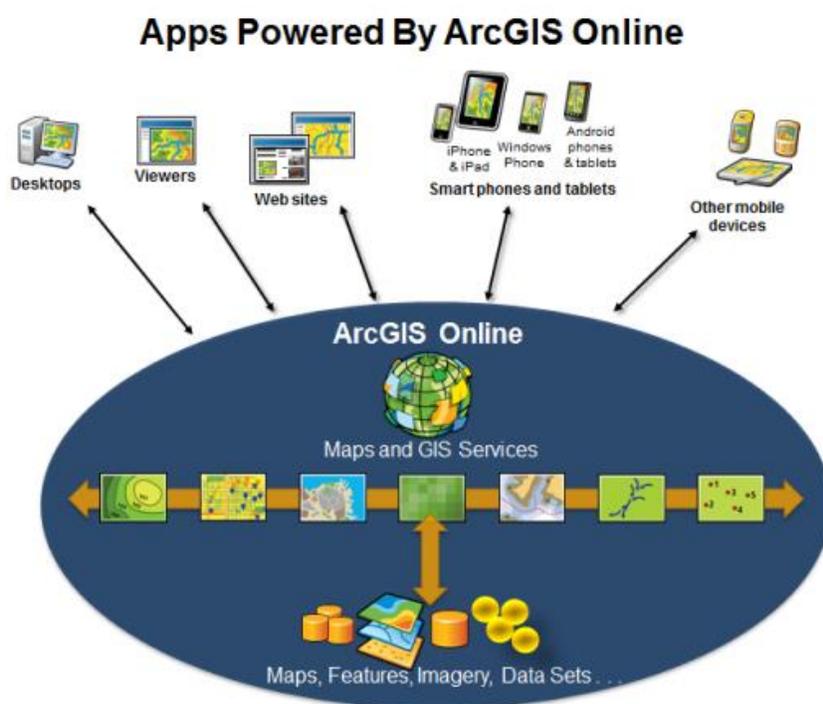# Cookbook 9 September 2013
Online GIS (Part 1)

Overview

1. What is Online GIS?
2. Base Layers and Analysis Layers
3. Digitizing!
4. Homework for Wednesday

Damn, President Dobelle just called again:

Carsten, now I need a map showing the main campus with our 3 newest buildings digitized, shown in a different color, and labeled with its name and the year is was built. Please get me the map ASAP so I can view it on my iPad.

Details:
- Use a suitable base layer from ArcGIS Online.

1) What is OnlineGIS?

The classic dilemma: how do you share geographic intelligence?

Data	shapefiles, feature classes, geodatabases, rasters, tables, images, etc.
Maps	*.mxd files, layer files, annotations, etc.
Results	buffer analysis, models, reports, etc.
Tools	geoprocessing tool, ModelBuilder models/scripts, etc.

All this intelligence is sitting stored on your computer hard disk…now how do you share this with the rest of the world?

1. You can print the map
2. You can export your map to PDF, JPG, TIFF, etc.
3. You can create zip archives of all needed files
4. You can use map packages and/or layer packages
5. You can use an online GIS, for example ArcGIS Online

URL: http://www.arcgis.com/home/ **= *Maps for Everyone!***

You can create maps that can be viewed in a browser, ArcGIS Desktop, or on mobile devices.
You can share maps via Email, on a blog, or embed them in a websites.
You can upload data from ArcGIS Desktop or Google Earth.
You can use ArcGIS Online data in ArcGIS Desktop.

Great Resources

- Video Tutorials:
  http://resources.arcgis.com/en/help/arcgisonline/index.html#//010q00000003000000
- Help and Support:
  http://resources.arcgis.com/en/help/arcgisonline/index.html#//010q00000002000000
- More resources and tutorials:
  http://www.westfield.ma.edu/cbraun/resources/gis-resources/

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2) Base Layers and Analysis Layers

A data frame often contains one (or more) *analysis layers* shown on top of one (or more) *base layers*.

Analysis Layers(s)
- 'Active' data layers that show your GIS analysis, for example your choropleth map.

Base Layer(s)
- Static background data that provides spatial context without distracting from the GIS analysis shown in the analysis layers.
- Here we are often using satellite images, aerial photographs, roads, town lines, etc.

In other words: Your analysis layers show your creativity and intelligence in GIS analysis, whereas the base layers are only supposed to look good and show where the analysis layers are located in space.

Example 1: Stanley Park Trail Map

The map sheet in 18 by 24 inches and contains just one data frame. This is a simple trail map, so we did not include any graphs or tables. Text is included to provide some information about Stanley Park and the trail network. We also did not include photographs to give us as much room as possible on the map sheet for the data frame.

- The main *analysis layer* is the colored lines showing the trails that we mapped using GPS. This is essentially a choropleth map where the color of each line represents a trail characteristic, here its name. There is also a second analysis point layer showing important points.

- The *base layer* is an aerial photograph from 2005 – without it we would just see a bunch of colored lines printed on white paper. But, the aerial photograph is 'static' – I just downloaded it from a website – I did not perform any GIS analysis with it.

This map is intelligent and meaningful because it combines analysis layers with base layers.
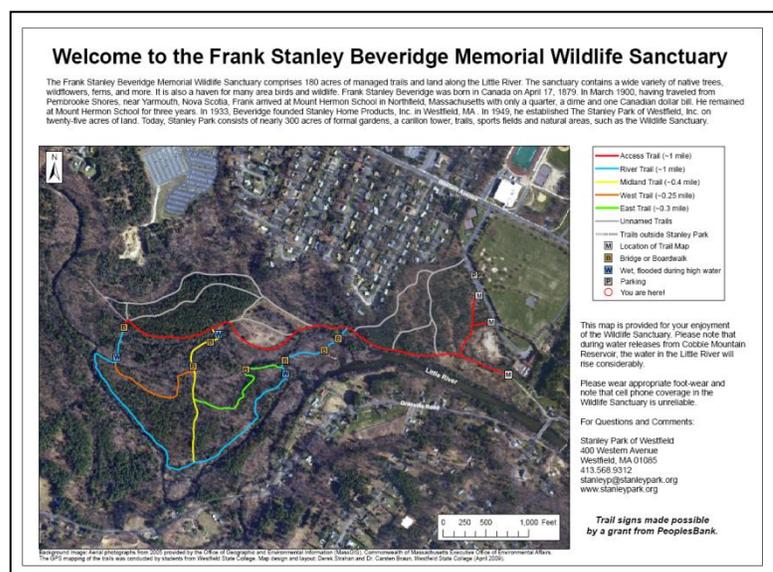
Example 2: Pittsburgh Schools

Here you had one analysis layer in each data frame: the schools shown as circles, with the size of the circles as a function of student enrollment. That analysis layer was shown superimposed on a base layer showing the neighborhoods in Pittsburgh. That neighborhood layer did not show any GIS analysis – it just provided the spatial context for the analysis layer (see example below) – without it all you would have seen is a bunch of colored circles printed on white space.

The base layer was static: the neighborhood lines in Pittsburgh do not really change.
The analysis layer was dynamic: here you conveyed meaningful information as a choropleth map.

This is an example of the Pittsburgh school map – a classic point choropleth map where the size of the symbols (here: circles) is a function of the characteristic of the feature.

1 map sheet (size 8.5 by 11 inches) with 3 data frames.

1 analysis layer = the point layer showing the schools as a function of student enrollment.

1 base layer = the neighborhood lines.

Without the base layer…the analysis layer would just be a bunch of points floating in space.

Without the analysis layer…the base layer is just a boring wire frame map without any real content.

Together: they make an intelligent and meaningful map.
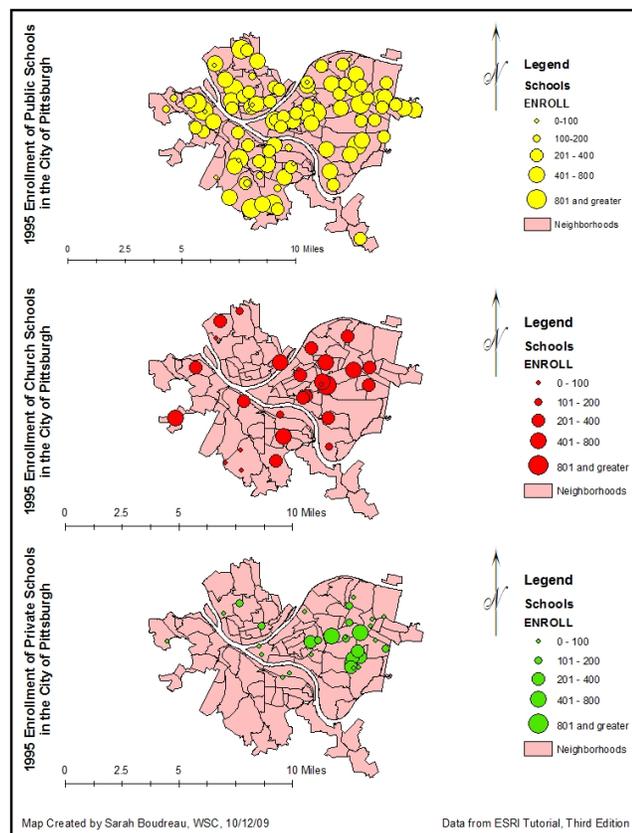
3) Digitizing!

Digitizing = Creating new and original geospatial data.
Or: Making reality (= the Earth) digital.

Here we can distinguish between two different types of digitizing: on-screen and in-situ.

On-Screen Digitizing of Spatial Features

Here you digitize points/lines/polygons from existing geospatial data sets, such as aerial
photographs, satellite images, topographic maps, digital elevation models, Google Earth, etc.

Points	Building locations, mountain summits, etc.
Lines	Streams, contour lines, roads, etc.
Polygons	Building foot prints, wetlands, etc.

In-situ Digitizing of New Features

Here you go outside and digitize points/lines/polygons using a GPS receiver. The GPS receiver
gives you latitude, longitude, and elevation. You make notes of feature types, feature attributes, etc.
and add those attributes later into the attribute table in ArcGIS.

Points	Sampling locations along a stream, locations of temperature loggers, etc.
Lines	Hiking trails, edges of glaciers, mice trails, etc.
Polygons	Wetland boundaries, neighborhoods, etc.
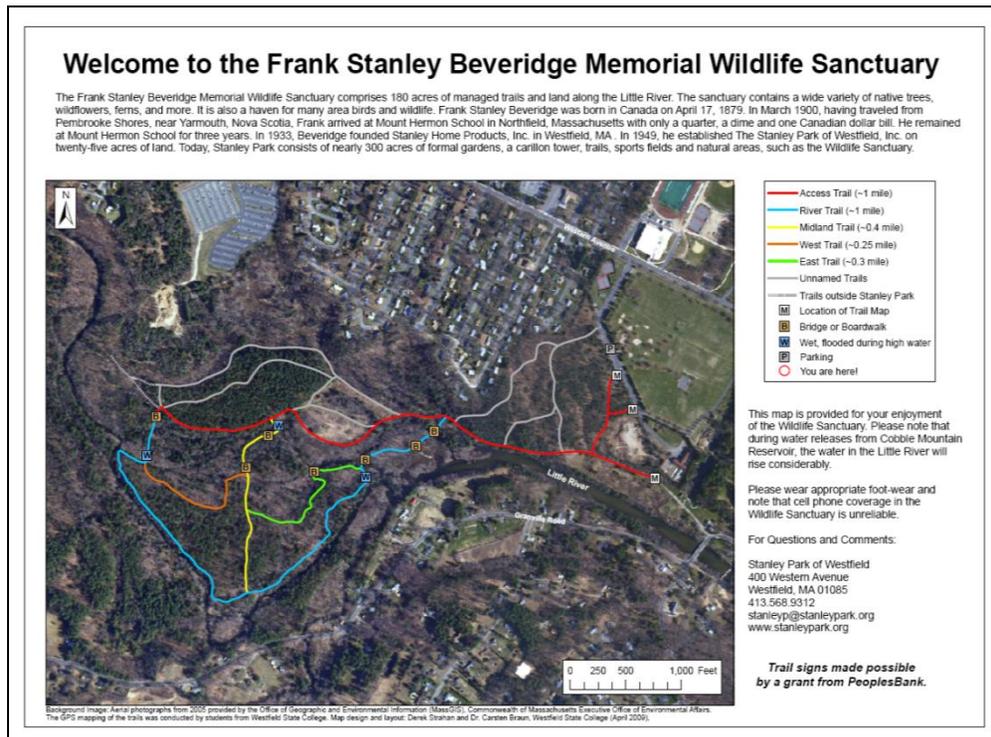
The map on the previous page is the trail map for Stanley Park. The trails were digitized by walking along with a GPS receiver. Then, we created a polyline shapefile from the GPS data and added two attribute fields: a unique name for each trail and a unique code for each trail. That unique code is used in the Symbology to show the different trails in different colors.

The Basic Digitizing Process

1. You create a new empty feature class or shapefile. This serves as the 'shell' into which you digitize your spatial features.
2. You open this empty feature class or shapefile in ArcMap.
3. You add whatever fields you need to the attribute table.
4. You digitize your spatial features   = the spatial data!
5. You enter your attribute information = the attribute data!

➔ **Now you have new, original geospatial data!**

This map above is a nice example: the streets are digitized as polylines and the buildings as individual polygons.

Then, an attribute field was added and the building land use entered into attribute table (e.g. 1 = commercial, 2 = public, 3 = residential).

This allows you to show the buildings as a choropleth map where the building color indicates its land use.


Additional Resources

- Digitizing – The Details
  http://www.westfield.ma.edu/uploads/cbraun/digitizingdetails.pdf
- What is editing?
  http://resources.arcgis.com/en/help/main/10.1/index.html#/What_is_editing/01m500000003000000/
- Getting Started with Editing in ArcMap
  http://video.arcgis.com/watch/89/getting-started-with-editing-in-arcmap

	Task	Challenge
Step 1	Create a new (empty) feature class or shapefile	Define the correct coordinate system
Step 2	Add the new (empty) feature class or shapefile to ArcMap	None!
Step 3	Add needed attribute fields to the attribute table	Define the correct field types
Step 4	Digitize the spatial features	Learn the ArcGIS editing tools
Step 5	Enter the attribute information	None!

4) Homework for Wednesday
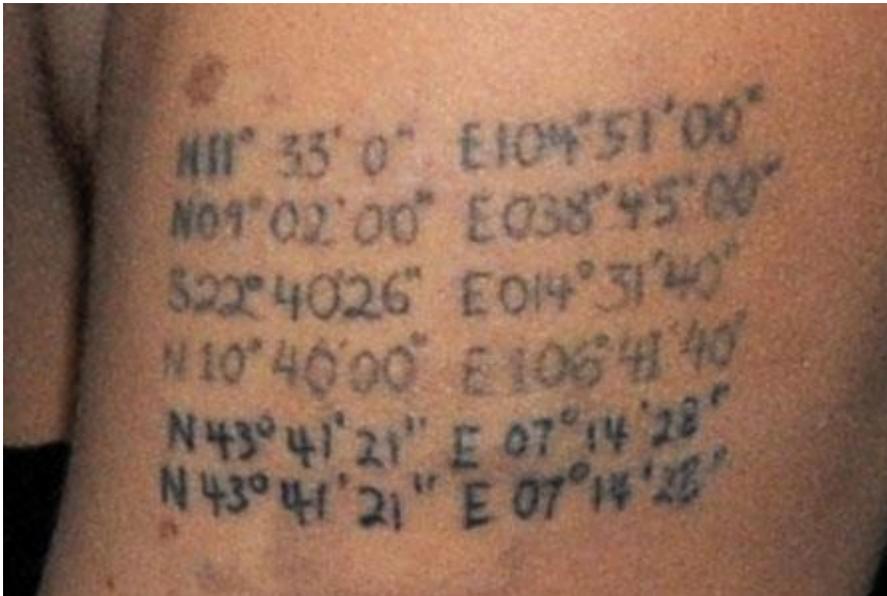
Map this!

Need help? Check www.westfield.ma.edu/cbraun/resources/gis-resources/ and look for the ArcGIS and MS Excel section.