An Introduction to ArcGIS

**OVERVIEW & OBJECTIVES**

Students will learn how to navigate ArcGIS as a geospatial technology tool through a series of exercises. Students will be introduced to ArcGIS mapping and how to plot points, measure distances, and navigate layers. Students will also apply their learning to wildfires in California. The city of New York Mills is the example in this lesson, but any city may be used. This lesson can be applied to the investigation of a variety of topics and areas of the world.

_Students will be able to…_

Navigate ArcGIS as a geospatial technology tool including:

- Zooming in/out
- Finding places
- Changing basemaps
- Measuring distances
- Labeling features
- Changing symbols
- Measuring areas
- Navigating layers

**GRADES**

8th & 9th

**TIME**

2 classes

**REQUIRED MATERIALS**

- Computer Internet access with projector
- Computer Internet access for students
- Handout: “Web Mapping Using ArcGIS Online” (The handout may be projected.)
- Power Point: “ArcGIS Online - Web Mapping” pdf to print or scroll

**MINNESOTA SOCIAL STUDIES STANDARDS & BENCHMARKS**

(8th Grade)

**Standard 1.** People use geographic representations and geospatial technologies to acquire, process and report information within a spatial context.

8.3.1.1.2 Create and use various kinds of maps, including overlaying thematic maps, of places in the world; incorporate the “TODALSS” map basics, as well as points, lines and colored areas to display spatial information.

(9th Grade)

**Standard 1.** People use geographic representations and geospatial technologies to acquire, process and report information within a spatial context.

9.3.1.1 Create tables, graphs, charts, diagrams and various kinds of maps including symbol, dot and choropleth maps to depict the geographic implications of current world events or to solve geographic problems.
SUGGESTED PROCEDURE

The teacher will model the first day's exercises by demonstrating Exercise 1: See Your World through projecting or printing “Web Mapping Using ArcGIS Online”. The teacher may continue to model the exercises based on students’ level of technology and geospatial understanding. The three exercises are:

- Exercise 1: See Your World
- Exercise 2: Measure and Mark Your World
- Exercise 3: ArcGIS Online – Gallery

This lesson will require monitoring students' progress due to their individual levels of understanding and skill. Students familiar with other geospatial technologies, such as Google Earth, will have greater success with this lesson and progress more quickly through the three exercises.

The teacher presents the power point as an overview to the exercises that students will be doing. “ArcGIS Online - Web Mapping pdf” is a pdf version to print as a handout or scroll through as a presentation. Exercise 4: Web Mapping Application: U.S. Demographics for Schools is contained in the subsequent lesson, “Application of ArcGIS: Web Mapping Using USA Demographics for Schools”.

Assessment

Exercise 1: See Your World
Exercise 2: Measure and Mark Your World
Exercise 3: ArcGIS Online - Gallery

RESOURCES

ArcGIS
http://www.arcgis.com

ArcGIS Online Gallery
http://www.arcgis.com/home/gallery.html#c=esri&t=maps&o=modified

“Western Wildfires: California Wildfire Ravages Small Town of Weed” from NBC News
Web Mapping Using ArcGIS Online

Exercise 1: See Your World

1. Open ArcGIS Online: Go to http://www.arcgis.com, and click "Map"

2. New Map: When you initially open a new map, the left panel gives a quick four-step walkthrough on how to make your own map. We’ll cover all that and more in this lesson. **Grab, hold, and move the map** to pan and see the rest of the world.

3. Zooming in/out: Test **zooming in and out**, use the map's **zoom bar**, the mouse's **scroll-wheel**, double-click, and "shift+click drag". **Zoom out** to the world and then all the way in to your home. Notice what happens when you zoom in and out. See how the numbers in the Scale Bar change.
4. **Finding Places:** Use the **Search** box in the top right to find your city. Type: **New York Mills, Minnesota.** A menu of choices appears. Click on **New York Mills, Minnesota United States** and it will zoom in and open a marker on the city. Click X to close.

5. **Changing Basemaps:** Click the **Basemap** button and look at each of the nine basemaps. Select **Imagery with Labels** and zoom all the way out to see more of Minnesota. Try **Streets and National Geographic.** These are the most common Basemaps. Notice what happens in each as you zoom in and out.

   **Note:** **Topographic** is ArcGIS Online’s default Basemap.
EXERCISE 2: Measure and Mark Your World

1. **Measuring Distances:** The Measure tool has three options: Area, Length and Location. Zoom out to the world. Click "Measure" and choose "Ruler", middle option. Click on the south coast of Alaska, then click on the northern tip of South America. Double clicking will end the measure tool.

2. **Measure Feature:** Click on West coast of USA and Double Click on England. This is like a flight from Seattle to London. (Extra credit: What's a "great circle"?)

3. **Location Feature:** Change the measure tool from the ruler to the location tool *(looks like a little globe)*. Click it, wander the map, then zoom in and find the coordinates for your home, Mt. Everest, and the White House. You can use the search option to find Mt. Everest. Close the Measure window.
4. **Adding Labels:** Click "Modify Map." Click the "Add" button, choose "Add Map Notes," and use the "Map Notes" template by clicking "Create." Drop a pushpin on Mt. Everest and name it "Mt. Everest."

5. **Changing Symbols:** Zoom back to your city. Select Imagery with Labels Basemap. Click the Add button and select Map Notes. Select Pushpin and give it a title: New York Mills. This time, click "Change Symbol," and scroll down the symbol choices, in "Basic" and the other palettes. Select a flag and then click Done. *Note: the flag can be moved!"
6. **Measuring Areas:** Zoom back home and use the "Add Features" palette to add an "Area" for the school grounds. Click on CHANGE SYMBOL and select **yellow with a blue outline.** Change the Transparency to 72%. This will let the air photo show through. Click **Done** when you are finished. You are back at the Map. To close the Editing click the **Edit** button.
7. **Save your map:** Click on the “Prt/Scr” button on a desktop or click “Ctrl, Prt/Scr” buttons at the same time on a Laptop. This will copy the screen to the Windows clipboard. To save the image, open **Paint** program. To edit, **paste** the image or Right Click on the Mouse and **Paste**. Students can add a title or clip off unwanted portions. To save the image, select file format as a **JPG** and Name the file: **Your name_map title.** Your teacher will tell you how to print the file or to send it to her.

8. **Display Legend and Map Notes:** Click on Details and Layers to see how Map Notes are added to the Legend area as layers. When you are done close **ArcGIS Online.**
EXERCISE 3: ArcGIS Online - Gallery

http://www.arcgis.com/home/gallery.html#c=esri&t=maps&o=modified

1. Click on the web link above to jump to ArcGIS GALLERY to see a sampling of maps in the GALLERY or open ArcGIS Online and select Gallery. 
Note: Not all maps in the Gallery can be opened.

2. Maps in the GALLERY are stored in folders. Click on People and a list of subfolders appears.

3. Click on Risk and a new set of maps appear.

4. Hover over the US Wildfire Activity Web Map and a box appears that describes the map.

5. Click on Open and a drop down menu appears.

6. Click on Open in map viewer to see the map.
7. Wildfires are a constant threat to communities in western and south western states. Zoom in on California to see active Wildfires identified by **New Fire Locations**.

8. Monitoring national TV news identified several dangerous wildfires in California. As an example: On September 16, 2014, NBC NEWS reported wildfires ravaging near the small town of Weed, California. A Google search for **“Weed, California Wildfires”** found several internet links and dramatic videos of the devastation. Click on [NBC video](#) link to see videos of the devastation.

**NBC video:**
Search for Weed, California

9. To find maps and information on the Weed wildfire, use the **Find** option in ArcGIS Online. In the **Find Address or Place** box, type: **Weed, California, United States** and then click on the **Magnifier**.

10. The system zooms in and labels the community.

11. To see other layers click on the **Show Contents of Map** box. Click on any layer and its legend will open. Zoom in closer on Weed, California and open the **Topographic** layer. The topography layer shows developed areas, hills, steep slopes and forested areas.
12. The example images below show how Google Maps and ArcGIS Online can be used together to understand the impact of a wildfire on a community. The link above opens a special Public Information Mapping application that identifies 2014 California wildfires. The image below is an example of how the extent of a wildfire can be overlaid on top of an air photo to show the impact on a community. News reports identified that Holy Angels Catholic church was destroyed by the wildfire. The red box identifies the location of the church on the very edge of the fire.

13. Using Google Maps to search for “Holy Angels Catholic Church, Weed California” Google Maps found the church. Then by selecting Street View, users can view photos of the church and the neighborhood before the wildfire occurred. Next year, new photos will be added to Google Maps and they will show the impact of the wildfire.
14. The US Wildfire Activity Map identifies current fires. Students could monitor news reports for towns threatened by wildfires. Insert the name of the town threatened by Wildfires. The ArcGIS Online, US Wildfire Activity Web Map will have that fire identified on the map. Zoom in and click on Legend to see more information on each layer. Select **Basemap - Imagery with labels** and see the extent of the wildfire on aerial photography.

15. To return to the GALLERY, move the mouse over **ArcGIS**. As you **hover** over ArcGIS a drop down menu will appear that lists major sub-web pages available in ArcGIS.

16. Click on **Gallery** and it will display the list of map folders in the **Gallery**. Select a new map to view.
Explore maps in the Gallery

17. The Gallery has a wide variety of maps to view. Maps are stored in folders but some maps in the folders are not available. If you click a map that needs a license to open, use the back arrow to return to the Gallery.

Search the Gallery for the map examples identified below. Either zoom into an area that interests you or enter the name of your city. Do a screen capture of your map and paste the image into Paint. Save the image as a JPG and Name the file: Your name_map title. If you have forgotten how to do this, review the process listed on page 6.

18. Temporal - Imagery folder maps to check:

19. Boundary folder maps to check:

20. People - Risk folder maps to check:

21. People - Environmental Impact folder maps:
22. **Life - Ecology** folder maps to check:

23. **All maps** in Gallery to check:

24. Your teacher may ask you to prepare a report. In that case, paste your images into a Word document. Your teacher will tell you how to print the file or to send the file to her. See example below:

25. When you are finished, close **ArcGIS Online**.
What is GIS?

- A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
- A GIS helps you answer questions and solve problems.
- ArcGIS Online is an easy to use GIS that we will use today.
Web Mapping using ArcGIS Online

http://www.arcgis.com/home/index.html

Objectives: Students will be able to:

Navigate ArcGIS as a geospatial technology tool including:

1. Zooming in/out
2. Finding places
3. Changing basemaps
4. Measuring distances
5. Changing symbols
6. Measuring areas
7. Navigating layers
ArcGIS Online: Appearance

1 - Details
2 - Map Layers
3 - Zoom in/out
4 - Reference Map Insert
5 - Scale
**ArcGIS Online Basemaps**

- **Appropriate applications for different basemaps:**
  - **Reference**
    - Business locations
    - Mountain peaks (for hikers)
    - Nearby landmarks for tourism
  - **Thematic**
    - Obesity rates by state
    - Ecological footprints by country
    - Housing values by neighborhood
EXERCISE 1: See Your World

Follow instructions on your handout

1. Open ArcGIS Online: Go to http://www.arcgis.com, and click "Map"
2. New Map: Grab, hold, and move the map.
3. Zooming in/out: See numbers in the Scale Bar change.
4. Finding Places: Use the Search box to find your city.
5. Changing Basemaps: Look at each of the different basemaps
Overview

EXERCISE 2: Measure and Mark Your World

Follow instructions on your handout

1. **Measuring Distances:** The Measure tool has three options: Area, Length and Location. Zoom out to the world. Click "Measure" and choose "Ruler."

2. **Measuring Features:** West coast of USA to England

3. **Adding Labels:** "Modify Map" and "Add Map Notes"

4. **Changing Symbols:** Zoom to your city and Select Imagery with Labels Basemap.

5. **Measuring Areas:** Zoom back home and use the "Add Features" palette to add an "Area" for the school grounds.
EXERCISE 3: ArcGIS Online GALLERY

Follow instructions on your handout

http://www.arcgis.com/home/gallery.html#c=esri&t=maps&o=modified
LESSON 2: Web Mapping Application with USA Demographics for Schools

http://esriurl.com/usademographicsforschools

Objectives:

1. Navigate ArcGIS as a geospatial technology tool including: zooming in/out, finding places, changing basemaps, and exploring layers
2. Investigate demographic data
3. Compare demographic data for two communities
4. Develop a demographic profile of your community
USA Demographics For Schools
http://esriurl.com/usademographicsforschools

1. Web application opens with a view of the world and USA Pop Density as the active data layer.

2. Differences from ArcGIS Online explored in Ex 1 - 4.
   - USA Demographic data is already loaded
   - There is no Find option
   - No detail air photos

3. This app works on:
   - Chromebooks
   - iPads, iPhones
   - Android tablets
   - MACs and PCs
1. Draw, Bookmarks & Measuring features - These features will not be covered in this lesson.

2. Inset Map - Click on the arrow to open or close.

3. Zoom in/out - This feature is the same as ArcGIS Online. Scale will change as you zoom in/out. The inset map will show your location.

4. Scale - Values change as you zoom in/out

5. Latitude/Longitude - As you scroll over the map the latitude / longitude coordinates change
1. Click on **Legend** box and the active Layer’s legend appears with State, County, Tract or Block Group data.

2. Click on **Layer List** box and the list of available layers appear with the active Layer checked.

3. Click on **Basemap Gallery** box and the list of Basemaps appears. Later in the lesson you will select Streets because it has the best description of city and street names.

4. Click the X to close Basemaps Gallery.
Compare Demographic Data

USA Median Age

USA Pop Aged 0-18 Yrs

USA Diversity Index

USA Pop Aged 65 + Yrs
1. As example, **Click** on a Tract in a reservation and the pie chart shows the higher percent Native American.

2. **Hover** over each of the pie slices and the exact percentage of minority population appears.
To save your map: On an iPad hold down the main button on the top of the iPad and press the power button. This saves the screen as a jpg file. On a MAC, center your image and hold down the Shift - Crtl & #4 key simultaneously. Beginning in the upper left hand corner of the map window, drag a box to the lower right hand corner of the map. The image is saved on the MAC desktop.

On a Desktop PC, click on the “Prt/Scr” button or click “Ctrl, Prt/Scr” buttons at the same time on a Laptop. This will copy the screen to the Windows clipboard. To save the image, open Paint program. To edit, paste the image or Right Click on the Mouse and Paste. Students can add a title or clip off unwanted portions. To save the image, select file format as a JPG. Save your file using the file name protocol and location indicated by your teacher and/or print, as your teacher directs.
Students complete the “Community Profile” chart, map the data for their community and write a profile of their community.

Population Density of a community

Diversity of a community
Other Census Resources

American Fact Finder
http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

ESRI Demographic Atlas
http://atlas.esri.com/Atlas

USA’S Diversity 1960-2060
Lessons in our online warehouse have been developed through MAGE-sponsored workshops and institutes. They are indexed according to the Minnesota Academic Standards in History and Social Studies benchmarks, keywords, and grade levels. Check out the Minnesota Academic Standards in History and Social Studies here.

To search using multiple terms, enter a comma between terms. Do not use “and”.

<table>
<thead>
<tr>
<th>ID</th>
<th>GRADE LEVEL(S)</th>
<th>STANDARD(S) / BENCHMARK(S)</th>
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<tr>
<td>1</td>
<td>8, 9</td>
<td>8.3.3.6.7;</td>
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<td>Africa, conflict diamonds, war</td>
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