

## Lesson Plan 2 - Middle and High School Land Use and Land Cover Introduction

### Understanding Land Use and Land Cover using ArcGIS Online

**Image** – an image is a *representation of reality*. It can be a sketch, a painting, a photograph, or some other graphic representation such as satellite data. Satellites capture and store electromagnetic waves that are reflected or emitted from features on the Earth, somewhat like a camera.

**Remote Sensing** – remote sensing can be defined as the scientific and technical discipline that involves acquiring information of various Earth features from a distance. Sometime the distance is great, such as satellite-based remote sensing where the satellites are in orbit high above the Earth; other times the distance is much less, such as aircraft-based remote sensing where the airplane is much closer to Earth.

**National Education Standards:** (see GLOBE)

#### Learning Objectives:

Upon successful completion of this exercise, students will be able to:

- Define land use and land cover
- Provide examples of land cover classes
- Understand how to create a simple land cover map

This exercise was developed using ArcGIS Online (August 2014)

Teacher Prep time: Depends on the teacher's experience with ArcGIS Online. One hour is required for those who are new to ArcGIS Online. Fifteen minutes is required, to review the lesson, for those with a working knowledge of ArcGIS Online and an understanding of land use and land cover.

Prerequisite: Lesson 1

Class Time Requirement: 50 minutes

Materials needed: Windows or Mac computer with internet connection and Google Earth 4.3 or higher installed

Teacher Prep Instruction: Explore the following website to familiarize yourself with the content <http://video.arcgis.com/series/18/arcgis-online>

Classroom Instructions: (Windows-based)

Access the following website to familiarize yourself with the concepts of Land Use and Land Cover - <http://landcover.usgs.gov/usgslandcover.php>



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### Classroom Instructions:

#### **Background:**

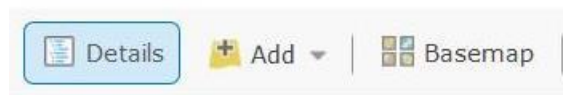
Land *use* can be defined as *how land is utilized*. Examples include “Park”, “Intermediate Density Residential”, and “Industrial”. Land *cover* is slightly different. A park, for example, could be a deciduous forest, a conifer forest, or a mixed forest, or some other type of natural or artificial ecosystem. The land use in this example is “Park”, while the land cover *type* would be either deciduous forest, conifer forest, or mixed forest. Similarly, an Intermediate Density Residential land use would be considered one *type* of developed land use.

Keep it simple, as this can be confusing if complicated examples are used. And keep in mind that there is some overlap between land use and land cover. For example, agricultural land use can also be agricultural land cover, if the *type* of agriculture is not defined in more detail.

Finally, review lesson 1 or follow this second lesson soon after completing lesson 1.

1.) Start ArcGIS Online by going to <http://www.arcgis.com> and click sign in. You should sign in for a Public Account if your school does not have an organizational account. Please remember ArcGIS Online is free for all K – 12 schools. Then Click Map at top of the page or click at the ‘Make a map’ link on the site.

2.) Re-familiarize yourself with the ArcGIS Online main menu, below in Figure 1.



**Figure 1.** The ArcGIS main menu.

3.) Click on ‘Basemap’ in the main menu and choose Imagery.



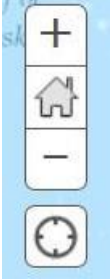
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2.) In the right top corner, you will see the search bar. Please type in the address of your school.



**Figure 2.** The ArcGIS search option

3.) Using the Zoom tools, adjust the scale so that you can see your whole campus.



**Figure 3.** The ArcGIS Tools

What is the predominant *land use type* around your school? In other words, what is the most common land use type on the screen? Is it residential use, or forest, or agricultural, or some other type?

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What is the second most common land use type?

\_\_\_\_\_

What land cover types exist around your school? Think about the different spatial patterns (shown by various color and texture patterns in the imagery). What do these spatial patterns represent? Are they neighborhoods (developed areas, with residential development), or areas of dense trees (forests), or some other land cover type? List three land cover types.

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Can you differentiate *natural land cover* from *developed land cover*? How might you tell the difference between natural and cultural features? Describe three natural and three cultural (man-made, or *anthropogenic*) land cover types around your school.

Natural features: \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

Cultural Features: \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_



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### Land Cover and Land Use Mapping

Let's make a *land use map* of the area around your school.

A map is a two dimensional model of an area on the surface of the earth. Most maps are oriented with north at the top of the map, and south at the bottom (east is right, and west is left).

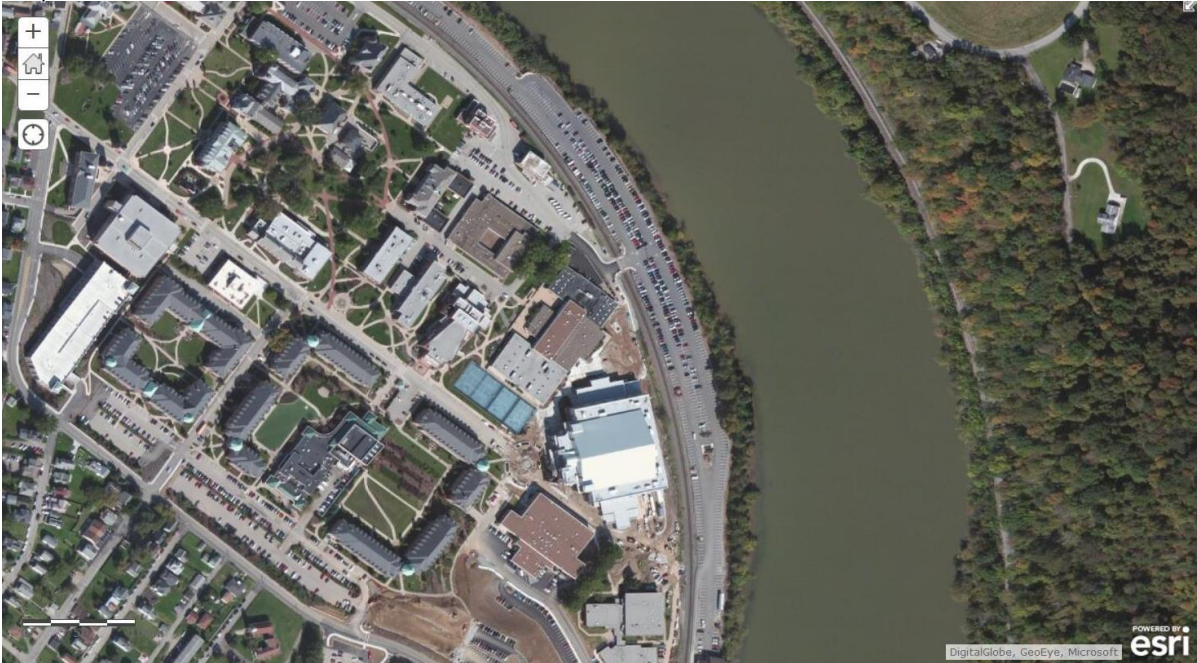


Figure 4. College campus.

Now that you have identified several land cover and land use types, we will now begin to create a simple land use map of the area around your school.



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6.) With the screen showing the 1 km<sup>2</sup> area around your school, click Add, then click Add MapNotes

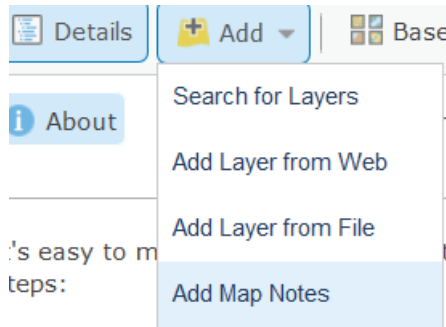


Figure 5. The ArcGIS Map Notes.

7.) Once you've selected the MapNotes by clicking on it, you will see a box appear (Figure 6).

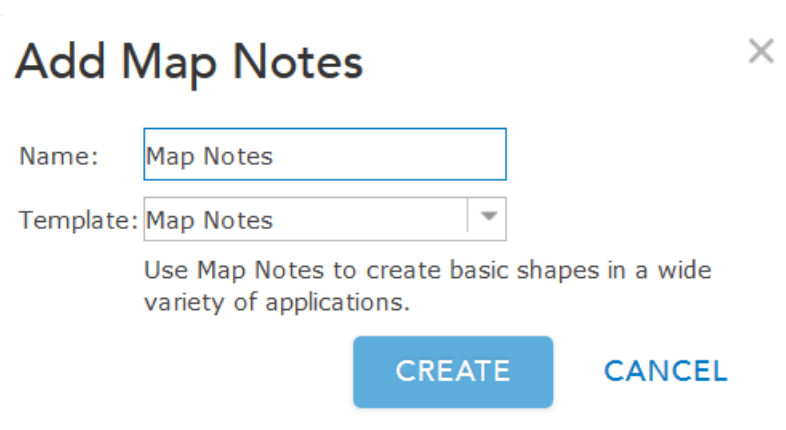


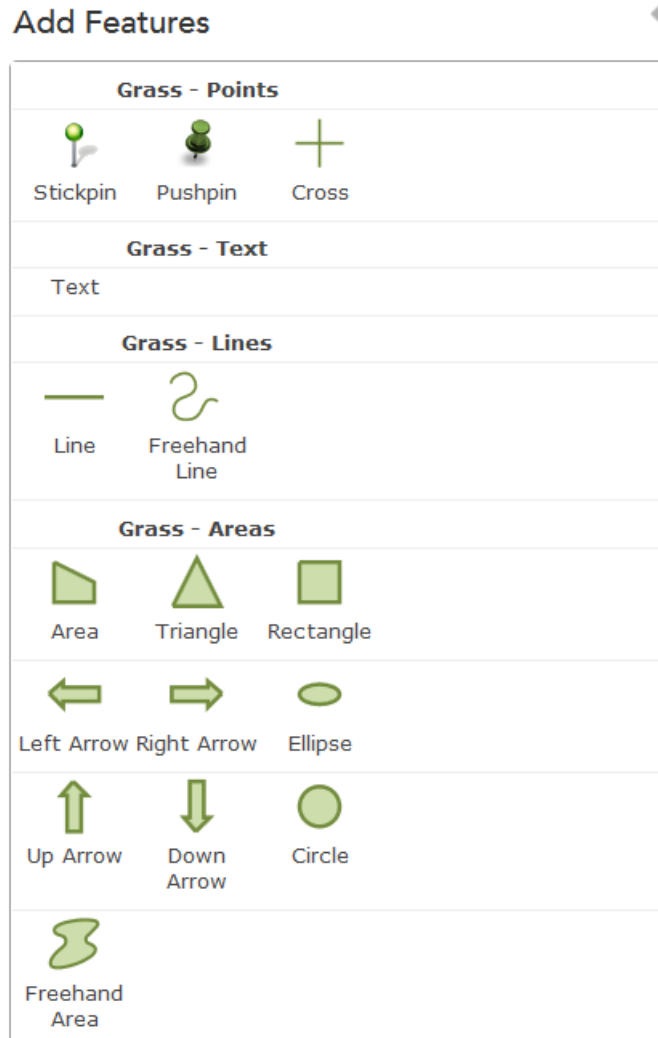
Figure 6. The ArcGIS Add Map Notes Menu

8.) In the Name section, please change Map Notes to Land Uses / Land Covers and click Create



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9.) In the Add Feature Menu – choose Area.



**Figure 7.** The ArcGIS Add Features

10.) Click with the mouse on the corner of the to-be-defined area only once. Now the cursor is turning into a line feature giving you the capability to define the land use/ land cover type. Every time you need to make a turn you have to click the mouse again. When completed double click and the Area menu will appear.



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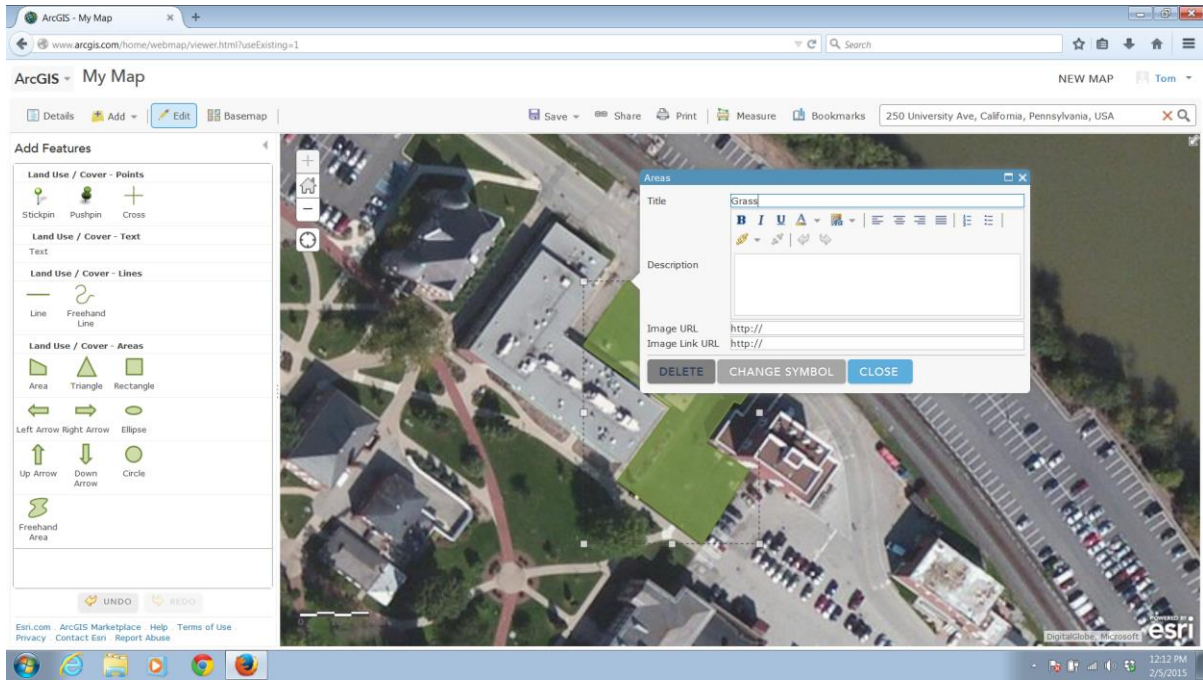


Figure 8. The Area Menu.





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11.) In Title – Name the Land Use / Land Cover (i.e. Grass)

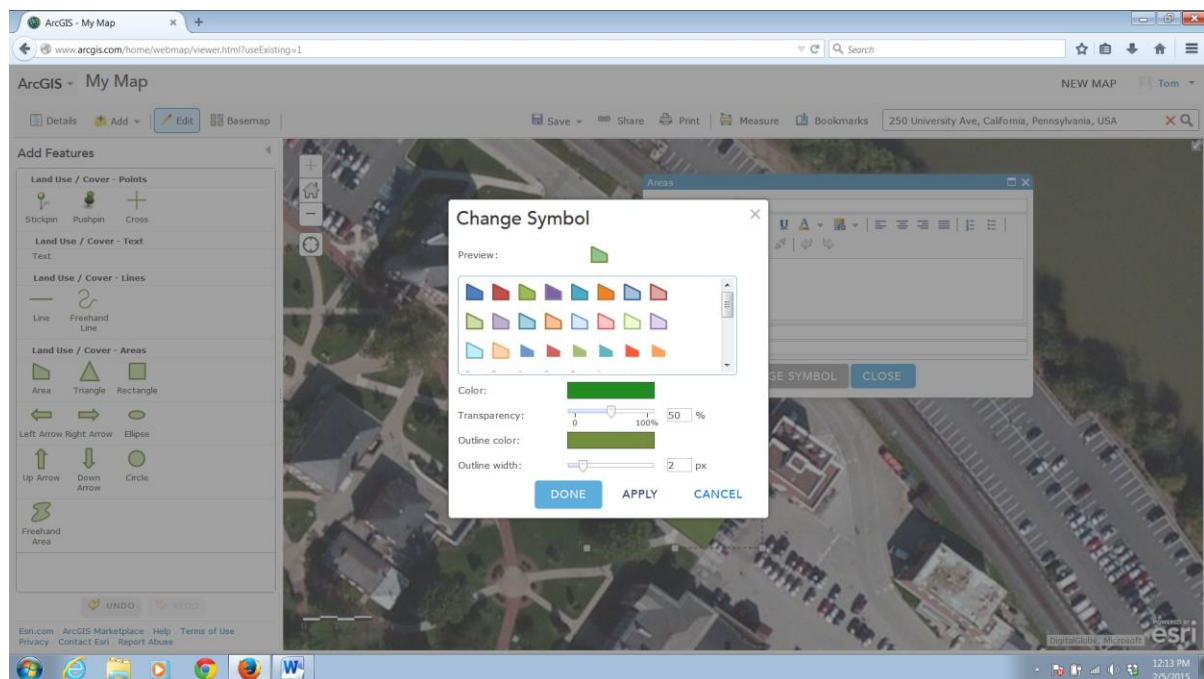


Figure 9. Change Symbol

12.) Click Change Symbol and Choose an Appropriate Color. Click Apply and Done. Click Close

**Hint:** Practice drawing polygons and making adjustments to their borders.

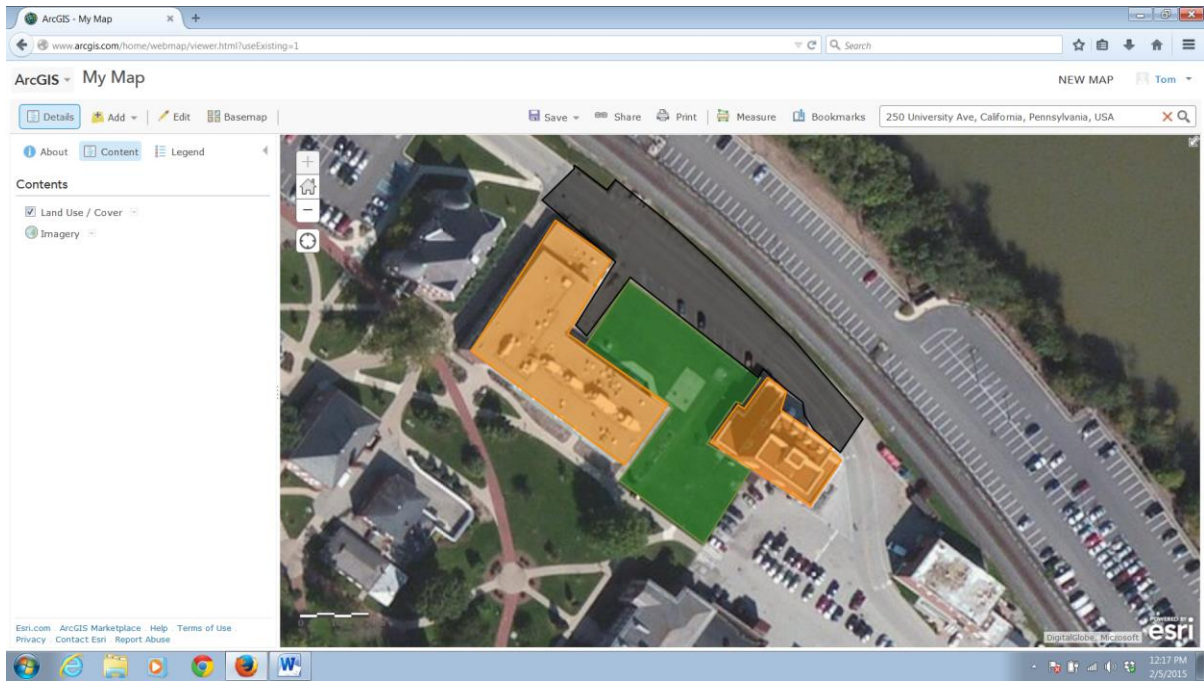
13.) Finish mapping the common land use types around your school by repeating steps 9 – 12 for each Land Use / Land Cover polygon

**Hint:** Don't worry too much or spend too much time being extremely accurate with the borders of your map. The idea is to get an idea of what land use types surround your school.

Your map should look something like the example below. Note that the example is not perfect, but shows the various land use types around the school, which is shown in the cyan (light blue color).



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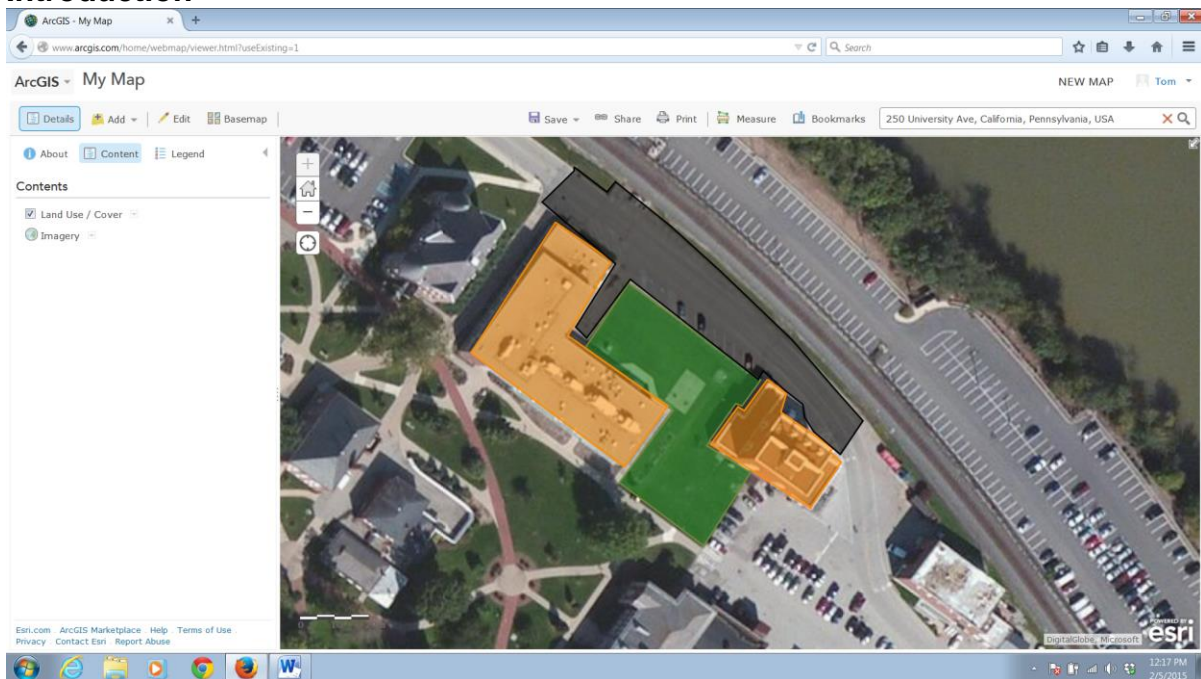


**Figure 10.** The Land Use map of the area around your school.

14.) Then Click Print Screen and paste to a New Word Document. Add a Legend below:



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Orange – Buildings  
Green – Grass  
Black – Parking Lot and Street

**Figure 11.** Your final map, with the legend.

That's it! You've created a land use map of the 1 km<sup>2</sup> area around your school. Now you can answer questions about the different types of land use and land cover around your school.

