

# The Earth's Mosaic: Land Use/ Land Cover

## Virginia Geocoin Adventure Activity Guide and Project Reflections

In this activity, your group will explore:

- Geography and Geographic Terms
- Land Use and Land Cover
- Introduction to Remote Sensing



**Laura Johnson**  
Educational Consultant  
Virginia Geospatial Extension  
Program



**John McGee**  
Extension Specialist  
Virginia Geospatial Extension  
Program  
VirginiaView Coordinator



**James Campbell**  
Professor of Geography  
Virginia Tech

at:

## Earth Mosaic Activity Overview

Have you ever flown in an airplane over the American Midwest? As you look out the window and down to the land below you, you see what looks like a patchwork quilt or a glass mosaic—different shades of brown and green, even different shapes. Each section of this aerial mosaic represents a different field, perhaps a different farmer, or a different farming technique. Imagine being able to tell more about each field: what exactly is being grown, how much soil may have eroded from that area in the past year, how productive that field might be—just by the color or shape, while sitting in the airplane. You may be surprised to learn that this is actually possible!

We'll be viewing satellite imagery of the earth to learn more about **land use and land cover**. The travels of your Virginia Geocoin will give us the locations to study. (For more on the Virginia Geocoin, be sure to read the Getting Started Guide.)

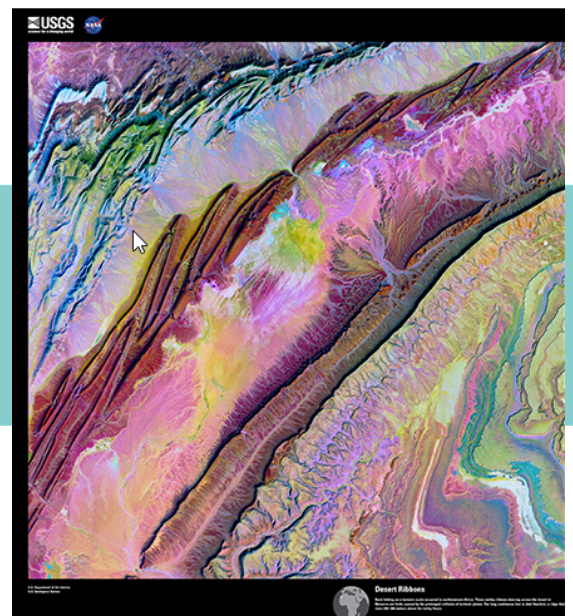
### Remote Sensing : getting a picture of the mosaic

**Remote Sensing** : to gather information about something without being close to the object of study. Here, we apply remote sensing to study the earth's surface from above: using airplanes or satellites equipped with sensors.

Scientists use **Remote Sensing** to learn more about the Earth, how we use it, and how we might be able to solve environmental and social problems. Remote Sensing means, simply, to gather information about something without being close to it. We commonly apply remote sensing by using sensors placed on airplanes or satellites to take images of the earth's surface. Scientist can then interpret these photos to learn many different things about processes on the earth.

**Note to leaders:** if possible, have the participants check out the USGS Earth as Art webpage ( <https://eros.usgs.gov/image-gallery/earth-as-art> ) and view some more of the fascinating satellite images from all over the world.

Figure 1. Desert Ribbons from the Earth as Art gallery (<https://eros.usgs.gov/image-gallery/earth-as-art-6/sand->



# Land Use and Land Cover: tiles of the earth mosaic

**Land Use:** The human use of land. Some examples of different human land uses would be industrial, commercial, agricultural, and residential.

**Land Cover:** The physical features that cover land. Some examples would be forested, grassland, agricultural, urban, water, and others.

We are going to compare the land use and land cover in your community with a place where your Virginia Geocoin has traveled. By doing this, we will be taking a quick look at two “tiles” in the earth’s mosaic of different land uses. We can use the information we gather by looking at imagery to discuss differences between places and changes over time.

## Exploring Land Use

**Note to Leaders:** You’ll want to make sure your Geocoin has traveled to at least one new place before starting this activity .

You or someone else in your group should have dropped off a Geocoin in a Geocache a while ago (See Virginia Geocoin Adventure: Getting Started Manual if these terms sound unfamiliar). Now, we can use your Geocoin’s log information to explore land use and landscape changes over time.

1. Log in to [www.geocaching.com](http://www.geocaching.com) with the login you used when you dropped off the geocoin.
2. Go to the tracking log page for your geocoin.
  - Go to the Play -> Find Trackables menu item to go to the Trackables page. Enter the Tracking Code (from the coin itself) or the Trackable name (from the coin package, for example, VirginiaView Geocoin-79). Click on the geocoin name to view the log page.
4. From your geocoin’s log page, click on “View in Google Earth” under the Trackable Options menu. (You may need to scroll up to the top of the log page to see this). This will launch Google Earth and the tracks for your geocoin will now be listed on the menu and should show up as a yellow track on the map (Figure 2).

**Note to Leaders:** Be sure that Google Earth is already installed on your computer(s) – visit <http://www.google.com/earth/index.html> for the download and basic information. For a primer on how to navigate in Google Earth, visit <http://sitescontent.google.com/google-earth-for-educators/tutorials-and-tips> and look under “Basic Tutorials and Tips.”



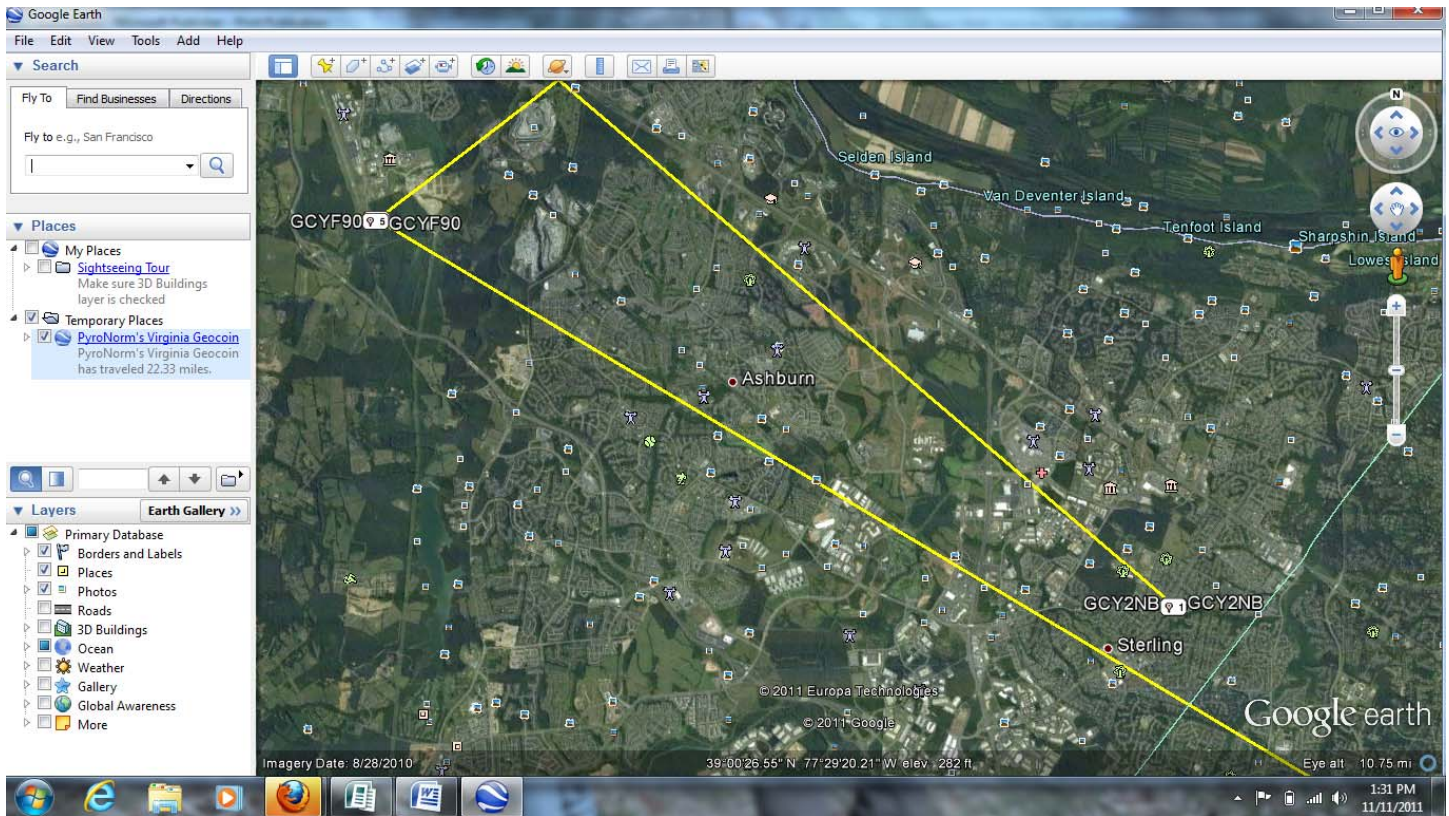
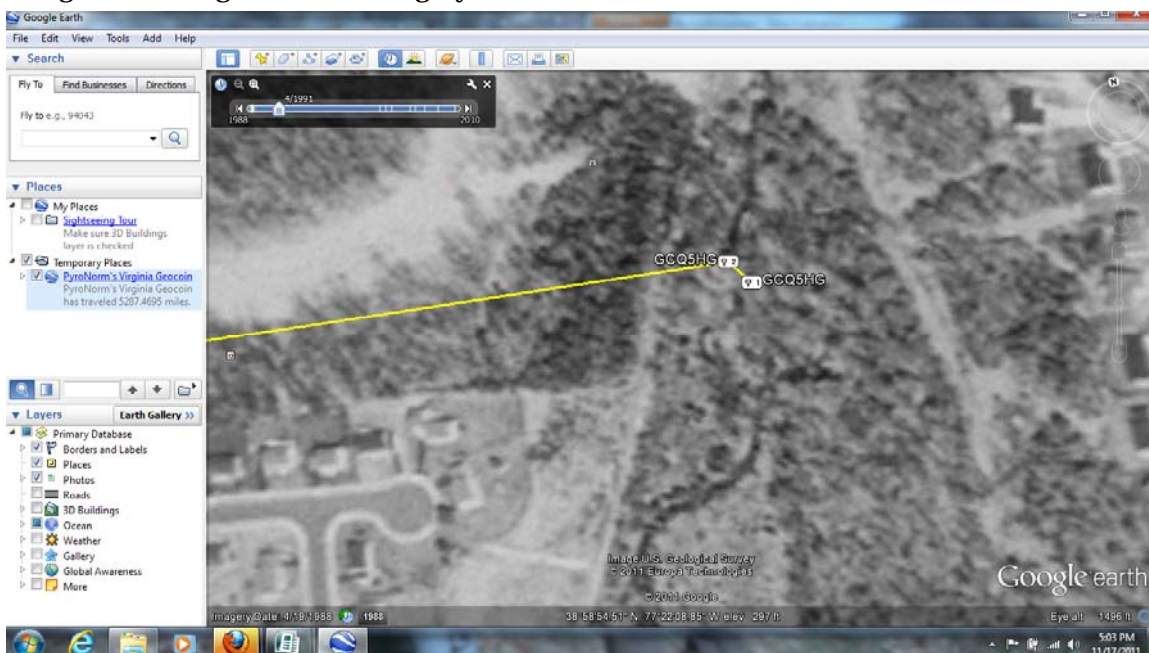


Figure 2. Points and yellow tracks between the geocoin stops in Google Earth.

5. Now you can zoom in to each stop on your geocoin’s journey. Be sure not to forget the starting location (your community) as you answer the following questions!

6. You’ll also want to play with the historical imagery on Google Earth. While zoomed in to a point, click on the Clock symbol at the top menu bar. This brings up the time slider and you can view

Figure 3. Using historical imagery and the time slider.



one or more historical images by dragging and sliding. (Figure 3)

## Gathering more information

Answer the following questions about your initial geocoin site as well as any stops your geocoin has made in its travels by using Google Earth. You can record your answers here and on additional sheets of paper.

1. Using a geocoin stop, interpret the aerial photography by zooming in to the area on Google Earth. Describe any of the following features that you can identify in your map area. For example, "I seen a big parking lot that is black and is probably asphalt":
  - A. asphalt and concrete
  - B. forests or trees
  - C. agricultural areas such as crops or pastureland
  - D. manicured lawns
  - E. structures or roof tops
  - F. roads
  - G. parking lots
  - H. swimming pools
  - I. sidewalks
  - J. natural water features (lakes, ponds, streams, rivers, marsh)
  - K. alternative transportation (bike trails/pedestrian paths/rail lines)
  - L. parks and recreation areas
  - M. Other
  
2. Hypothesize and describe how any of the features identified above may contribute to the following issues hint: you might need to research some of these):
  - A. urban heat island effect
  - B. water quality (surface or ground water)
  - C. transportation/ congestion
  - D. personal safety
  - E. presence, absence, or diversity of wildlife
  - F. carbon footprint
  
3. List similarities and differences between the geocoin stop(s) and your neighborhood/ community (the first geocoin stop) that might influence the following:

- A. air quality
- B. heat
- C. water quality and run off
- D. how people get from place to place
- E. personal safety
- F. presence or absence of wildlife/biodiversity
- G. carbon footprint

4. Compare differences in land use /land cover (LULC) on the map for your area of interest over two time periods (hint: in Google Earth use the time slider function).

A. What are the two dates of photographs you are examining?

*Hint: You may need to experiment with the amount of landscape that you are viewing, by zooming-in or zooming-out. Changes to the landscape in some communities may be evident from an elevation of 10,000 or 12,000 feet (found in the lower right hand corner of the GoogleEarth screen). Other landscapes may require a higher (or lower) elevation. Experiment and find the most suitable elevation for your particular community, or area of interest!*

B. What is the ‘Eye elevation” which you are using to view these photographs?

C. Provide coordinate information associated with the center of the photograph:

- Latitude:
  
- Longitude:

D. Identify and describe differences in the landscape within your area of interest  
Between the two photographs for each of the following:

Asphalt or concrete  
Abundance or lack of vegetation, especially trees  
Agricultural areas (crops or pasture land)  
Roof tops  
Parking lots  
Swimming pools  
Sidewalks  
Natural water features (ponds streams, rivers, marsh)  
Alternative transportation (bike trails and rail lines)  
Other:

E. Estimate (percent) the changes in land use or land cover for a give landscape feature between the two dates; for example “In 1998 there was approximately 80% forest cover for the area of interest. In 2007 there was approximately 50% forest cover for the area of interest.

F. What might have caused this change ? (development, increased population, conservation, etc.)

G. What might be some of the impacts to the environment and to the community that may be associated with these changes in land cover over time.? Think specifics: flooding from storm water runoff, less open space for recreation, improved air quality—depending on what you see.

5. What did you notice that is most interesting about land use across time?

6. Make sure that the “scale bar” is tuned on, by going to the <View> menu, and selecting <Scale Legend> This will generate a scale bar on your GoogleEarth screen.

A. Identify an isolated site (a small patch at least the size of a city block or so (zoom-in or -out

if needed!) that has experienced a significant change in land use over the time period.

- Describe how the land use of this site has changed over time..
- Estimate the perimeter of this area of change (and provide appropriate units. For example: 11 200 feet)
- Estimate the area (sq feet, sq. meters, sq. yards, etc.) of this area., and provide your answer here:\_\_\_\_\_ Be sure to provide appropriate units!
- Convert the area that you estimated above to acres:

7. What surprised you in this exploration of land use ?

8. What action can you take to curb the negative impacts associated with land use change?

9. Who would be potential community collaborators to help you in your efforts to curb the negative impacts associated with land use change.? List at least 3 collaborators, and describe how they could potentially help your efforts.



10. How could you inform decision-makers in your community about your findings?

## **Resources**

### ***Land Use and Land Cover with Satellite Imagery:***

United States. Department of the Interior. Geological Survey. *A Land Use And Land Cover Classification System For Use With Remote Sensor Data*. By James R. Anderson, Ernest E. Hardy, John T. Roach, and Richard E. Wimper. Washington: United States Government Printing Office, 1976. USGS. Web.

<http://landcover.usgs.gov/pdf/anderson.pdf>

### ***Tutorials for using Google Earth:***

<http://sitescontent.google.com/google-earth-for-educators/tutorials-and-tips>

### ***Earth as Art satellite imagery:***

<http://eros.usgs.gov/imagegallery/>