

## Lesson Plan K-16 grade – Interactive Introduction to Land Cover Change Detection Utilizing Remote Sensing Imagery

### An Interactive Memory Game

**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.

**Land Cover Change Detection** –Using change detection techniques (analyzing satellite remote sensing data at different spatial, spectral, and temporal resolutions by using the appropriate combination of bands) to bring out the geographical and manmade features for detecting changes in a predefined specified area.

### Learning Objectives:

Upon successful completion of this learning game, student will:

- be familiar with remote sensing imagery from various locations throughout the world.
- visualize land cover change over a certain time period.
- learn about specific locations on earth and their characteristics.
- stimulate and train their memory through pattern recognition.

The Earth is comprised of a wide variety of landscapes. These landscapes, like the landscape where you live, are all unique - no two are alike. Some are forested, others are deserts, and still others are grasslands, agricultural areas, cities or towns, or are covered in permanent snow and ice. Think about your landscape where you live, and describe it in a paragraph. These are no 'right' or 'wrong' descriptions, but be as detailed as you can, *and break the landscape down into **land cover groups, or classes***. Think about what vegetation is around you. Is it natural vegetation, or has it been planted? What type of vegetation is it? Is it forested, or are there shrubs, or grasses, or a mixture? Is the landscape mountainous or rolling hill, or is the landscape flat? Is it highly developed, largely undeveloped, or a mixture of development and natural areas?

Landscapes change over time, and these changes can have significant affects on those who live in the landscape, including humans, animals, and plants. Also, the water quality and water quantity are greatly influenced by the landscape, as is the quality of the air that we breathe. Some land cover classes' change, while others remain more or less the same. Scientists study how the landscape changes, using remotely sensed images from satellites. They study the changes in land cover because these changes affect many things, including the air and water, the climate, and human health. In this exercise (game), you will explore changes in land cover using remotely sensed images from around the world.



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Teacher Prep time: 30 minutes to become familiar with the game rules and to familiarize with the imagery and its characteristics.

Class Time Requirement: 50 minutes

Materials needed: Computer with Internet connection and access to the website <http://earthobservationday.com/>

Teacher Prep Instruction: One Internet enabled computer per student to access the desired memory gaming level on the EOD website <http://earthobservationday.com/>

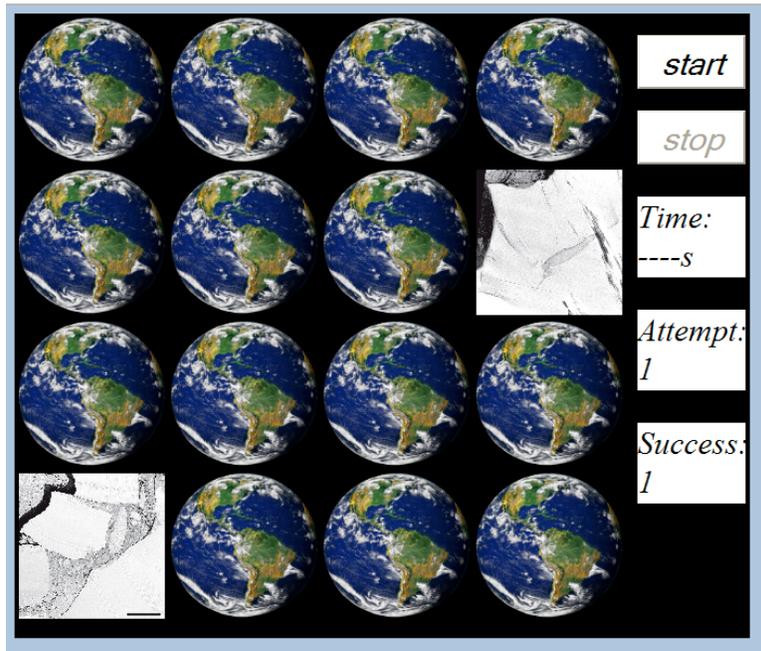
Classroom Instructions: Go to the website click onto '**HELP**' and read together with the students the game rules. On each turn, the player will first turn one card over by clicking onto the earth logo, then a second by doing the same. The images to be matched are taken from the same location and at higher gaming levels even at different periods in time. If the two cards match (either same location, same year or same location, different year), the player scores one point, the two cards stay image side turned up on the game board and the player continuous. If the images do not match, the cards are turned back over. The objective of the game is to locate two images from the same location out of the possible tiles. Continue this process until time runs out or students collected all sets. The winner is the one with the least amount of time needed to locate all pairs. At the end of the game the matching images reveal information about its location and characteristics. The game can be used as a basis for classroom discussion for higher-grade levels. To play the game again with different image locations, please reload the website.

- 1.) Start the game by double-clicking the **9-16<sup>th</sup> grade memory game link**.
- 2.) Read the game instructions by clicking on '**Help**' (bottom right of the game).
- 3.) Click on the '**Start**' button to start the game.

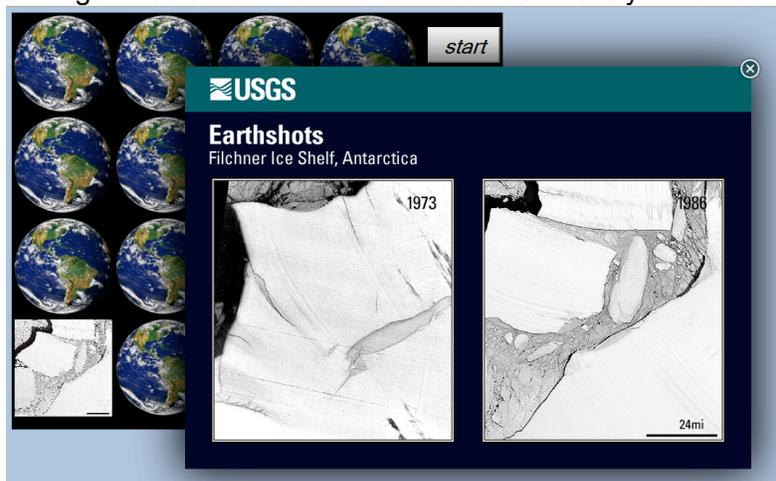


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4.) Click on a globe image to reveal its underlying remote sensing image. Click on another globe image to find the matching remote sensing image, either the same image or for advanced game images taken at different times. Continue until you matched all pairs.

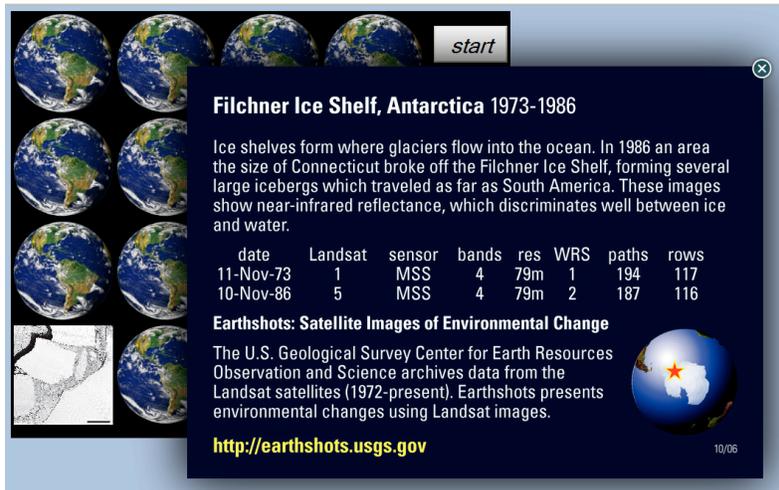


5.) Click on the image once to learn about its location and the year it was taken in.



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6.) Click on the image again to learn more about its characteristics. Discuss these in your classroom.



The screenshot shows a presentation slide with a dark blue background. On the left side, there is a grid of satellite images of Earth, with a larger, detailed image of the Filchner Ice Shelf at the bottom left. A 'start' button is visible in the top right corner of the slide area. The main text on the slide provides information about the ice shelf's calving in 1986 and includes a technical table of satellite data.

**Filchner Ice Shelf, Antarctica 1973-1986**

Ice shelves form where glaciers flow into the ocean. In 1986 an area the size of Connecticut broke off the Filchner Ice Shelf, forming several large icebergs which traveled as far as South America. These images show near-infrared reflectance, which discriminates well between ice and water.

| date      | Landsat | sensor | bands | res | WRS | paths | rows |
|-----------|---------|--------|-------|-----|-----|-------|------|
| 11-Nov-73 | 1       | MSS    | 4     | 79m | 1   | 194   | 117  |
| 10-Nov-86 | 5       | MSS    | 4     | 79m | 2   | 187   | 116  |

**Earthshots: Satellite Images of Environmental Change**

The U.S. Geological Survey Center for Earth Resources Observation and Science archives data from the Landsat satellites (1972-present). Earthshots presents environmental changes using Landsat images.

<http://earthshots.usgs.gov>

10/06