NATIONAL GEOGRAPHIC

Obtaining Information from Imagery

Use satellite and aerial imagery to to learn more about the size, growth, and deforestation of the Rondônia rainforest.

GRADES

6 - 12, Higher Ed

SUBJECTS

Earth Science, Climatology, Meteorology, Geography, Geographic Information Systems (GIS), Human Geography, Physical Geography

CONTENTS

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OVERVIEW

Use satellite and aerial imagery to to learn more about the size, growth, and deforestation of the Rondônia rainforest.

For the complete activity with media resources, visit:

http://www.nationalgeographic.org/activity/obtaining-information-imagery/

DIRECTIONS

Satellite or aerial imagery can be described as a direct measurement or primary data source. Products derived from the primary source are considered secondary sources. Secondary sources can be derived by digitizing and obtaining vector information from imagery. With imagery serving as the basemap, you can use a mouse to perform manual digitizing, the process of converting geographic features on an analog map into digital format. As in any human procedure, errors can be introduced.

Present the following scenario to your students and have them follow the steps to use the Landsat Explorer App to identify and measure deforestation in the rainforest of Rondônia.

Scenario

Deforestation is defined as the removal of a forest or stand of trees where the land is thereafter converted to a nonforest use. Clear-cutting is a type of deforestation logging practice in which most or all trees in an area are uniformly cut down. The practice of clear-cutting can be clearly seen from imagery in the state of Rondônia in Brazil. The deforestation in Rondônia is seen in a pattern that looks like a fish skeleton because the cutting fans out along the roads. You have been asked to provide a quick approximation of how much of Rondônia's land has been affected by clear-cutting. You have access to both <u>high-resolution imagery</u> and a <u>Landsat 8</u> image that shows dry and wet areas.

1. **Click <u>Imagery with Metadata.</u>**

2. **Click Open in Map Viewer**

3. **Click Content in the left panel**

4. **Zoom all the way out to the world view of the map.**

5. **Search for Rondônia, Brazil.**

   Take a few minutes to zoom in and out and observe the fish-sekeleton-like pattern of clear-cutting in Rondônia. As you zoom inward, you can see that the land is now agricultural.

6. **Click Basemap on the left and change to Imagery with Labels**

   Ask students:

   - *What are the major cities in Rondônia?*

   - *Zoom into the city areas. Describe the urban areas.*

To calculate the percentage of Rondônia that has been deforested by clearcutting, you need to know two numbers: the total number of square miles of Rondônia and the number of square miles already clear-cut. Remember, at the beginning of the exercise, it was determined that this secondary information can be obtained from the primary image source.

7. **Zoom out so the entire state of Rondônia is visible.**

8. **On the upper right, click Measure and then the Area icon. The unit is square miles.**

9. **After clicking the Area icon, digitize around the country by selecting points and creating a polygon. When the polygon is complete, record the area.**

   Total area of Rondônia: _____ square miles

10. **Zoom in and digitize around the areas of Rondônia that have been deforested by clear-cutting. You need to digitize several polygons and add the areas together for a total.**

    Total area of deforestation: _____ square miles

    Total area of deforestation / Total area of Rondônia x 100 = _____% of deforested land

    In the previous section, high-resolution aerial imagery was used to observe Rondônia. In the next section, a Landsat 8 Moisture Index image will be used. The moisture index has been derived from the most recent Landsat 8 imagery and is an estimated level of moisture in vegetation. Wetlands and other vegetated areas with high levels of moisture appear as blue, whereas deserts appear as tan to brown. The Normalized Difference Moisture Index (NDMI) is calculated by using the near infrared (band 5) and shortwave infrared (band 6). The map is updated daily, retaining the four most recent scenes for each path/row that has cloud coverage of less than 50 percent.

11. **Open The Moisture Index: How wet or dry?**

12. **On the right hand panel at the bottom, click Data Source. Search for "Landsat 8 (Moisture Index). This will pull up the Landsat 8 (Moisture Index)**

13. **Click Landsat 8 (Moisture Index) and then Open in Map Viewer.**

14. **In the upper-right search box, search for Rondônia, Brazil.**

15. **Below Details on the left, click Contents. this shows the two layers on the map. you can durn off the Landsat 8 (Moisture Index) to observe the outline of Rondônia.**

    Have students write a description of the deforested land using the Moisture Index Legend.

16. **Following the procedure explained in steps 8–10, digitize around the deforested region and perform the calculation for percentage of clear-cutting again. You may use the total area of Rondônia that you obtained previously.**

    Total area of deforestation: _____ square miles.

    Total area of Rondônia: _____ square miles.

    Total area of deforestation / total area of Rondônia x 100 = _____% of deforested land.

Find the original activity and esri here.

O B J E C T I V E S

Subjects & Disciplines

Earth Science
- Climatology
- Meteorology

Geography
- Geographic Information Systems (GIS)
- Human Geography
- Physical Geography

Learning Objectives

Students will:

- Opening an existing online map
- Interpreting clear-cut forest regions
- Digitizing on screen
- Measuring on screen
- Calculating percentage
- Interpreting Landsat 8 (Moisture Index) imagery
- Visualizing derived moisture content imagery

Teaching Approach

- Learning-for-use

Teaching Methods

- Hands-on learning

Skills Summary

This activity targets the following skills:

National Standards, Principles, and Practices

PREPARATION

What You'll Need

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per learner, 1 computer per pair, 1 computer per small group

PHYSICAL SPACE

- Classroom
- Computer lab

ESRI ArcGIS Online account NOT required.

BACKGROUND & VOCABULARY

Background Information

Prior Knowledge

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Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
deforestation	noun	destruction or removal of forests and their undergrowth.
moisture	noun	wetness.
moisture index	noun	method for monitoring soil's water budget, based on the concept of potential evapotranspiration.
rainforest	noun	area of tall, mostly evergreen trees and a high amount of rainfall.
satellite	noun	object that orbits around something else. Satellites can be natural, like moons, or made by people.
satellite imagery	noun	photographs of a planet taken by or from a satellite.
urban	adjective	having to do with city life.

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