Obtaining information from imagery

Measuring the Rondonia rain forest

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.

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 high-resolution imagery and a Landsat 8 image that shows dry and wet areas.

Build skills in these areas

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

What you need
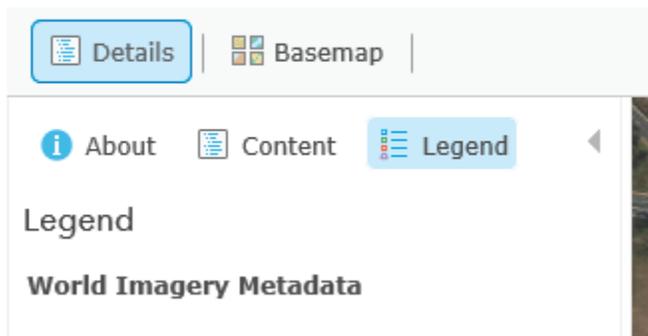
- Account not required
- Estimated time: 30 minutes – 1 hour

Investigating Rondonia

1. Click Imagery with Metadata.

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 Rondonia, Brazil.

   Take a few minutes to zoom in and out and observe the fish-skeleton-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.

Q1 What are the major cities in Rondonia?

Q2 Zoom into the city areas. Describe the urban areas.

To calculate the percentage of Rondônia that has been deforested by clear-cutting, 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 Rondonia is visible.

8. On the upper right, click Measure and then the Area icon. The unit is Sq Miles.
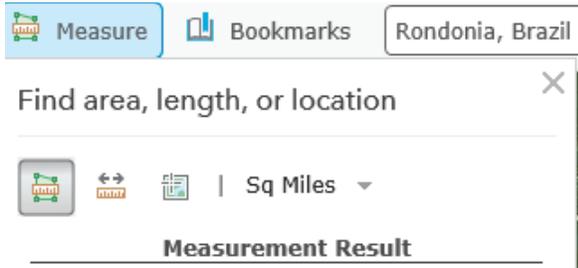
9. After clicking the Area icon, digitize around the country by selecting points and creating a polygon. When the polygon is complete, record the area.


Total area of Rondonia_____ sq miles.

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

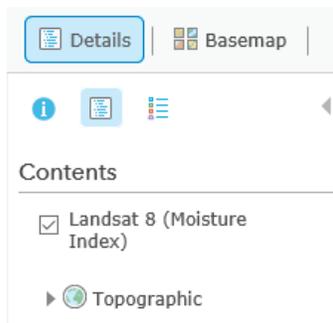Total area of deforestation _____ sq miles.

Total area of Rondonia/Total area of deforestation 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?
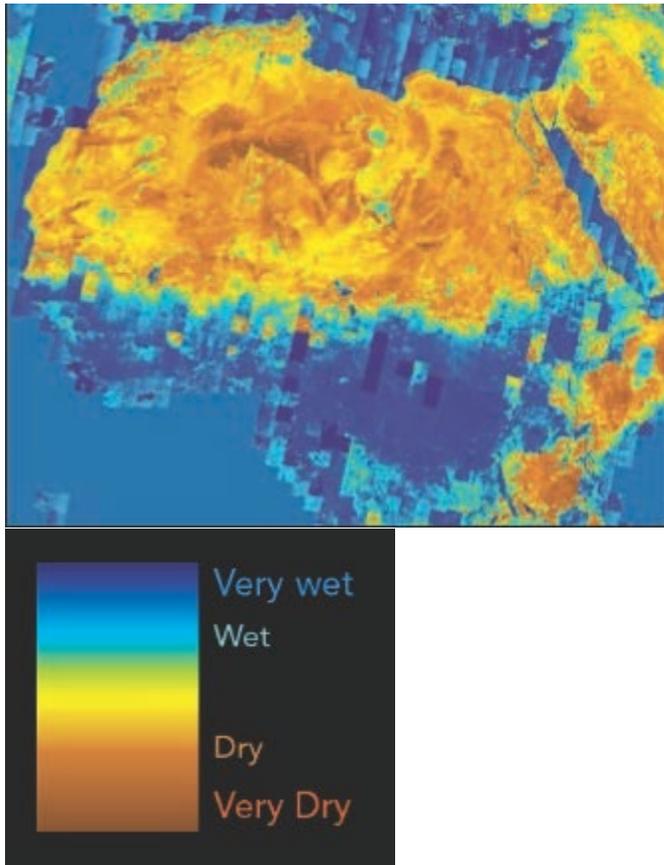
12. On the right panel at the bottom, click Data Source. This opens the Landsat 8 (Moisture Index).
13. Click Landsat 8 (Moisture Index) and then Open in Map Viewer.
14. In the upper-right search box, search for Rondonia, Brazil.
15. Below Details on the left, click Contents. This shows the two layers on the map. You can turn off the Landsat 8 (Moisture Index) to observe the outline of R0ndonia.

Q3 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 Rondonia that you obtained previously.

Total area of Rondonia:_____ sq miles.

Total area of deforestation_____ sq miles.

Total area of Rondonia/total area of deforestation X 100 = _____ of deforested land.

In this lesson, you have identified deforestation areas using both aerial and derived remote sensing imagery. You have used this imagery to obtain measurements to quantify the area of deforestation.