NATIONAL GEOGRAPHIC

**RESOURCE LIBRARY I** ACTIVITY : 30 MINS

# Assessing Hurricane Maria Damage

Use the Landsat App Explorer tool to view the damage and extent of vegetation change that occurred after Hurricane Maria made landfall on Puerto Rico in September 2017.

**GRADES**

6 - 12, Higher Ed

**SUBJECTS**

*Earth science, Meteorology, Geography, Geographic Information Systems (GIS), Physical Geography*

**CONTENTS**

1 Link

## OVERVIEW

Use the Landsat App Explorer tool to view the damage and extent of vegetation change that occurred after Hurricane Maria made landfall on Puerto Rico in September 2017.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/assessing-hurricane-maria-damage/

## DIRECTIONS

Hurricane Maria made landfall on Puerto Rico as a category four hurricane on September 20, 2017. The storm brought intense winds and rainfall that lasted for several days, damaging vegetation, pulling trees out of the ground, and blowing leaves off trees. The damage and extent of vegetation can be seen by Landsat imagery before and after the storm.

Present the following scenario to your students and have them follow the steps to use the Landsat Explorer App to assess the damage caused by Hurricane Maria.

**Scenario**

The Federal Emergency Management Agency (FEMA) is doing a post-assessment of vegetation damage caused by Hurricane Maria in Puerto Rico. The agency has asked you to compare Landsat imagery of before and after the event.

**Use the Landsat Explorer App.**

1. Click on the Landsat Explorer App.
2. In the search box in the left corner of the map, search for Puerto Rico.
3. On the left panel select the Rendered and select Basemap Only.
4. Identify the cities of San Juan, Ponce, Caguas, and Mayaquez.
5. Use the Rendered to change back to Agriculture.

**Configure Time Before and After the Hurricane**

1. Click the Time Slider.
2. Click on the blue box to show dates in the drop-down list.
3. Select September 17, 2017 (before hurricane Maria).
4. Select the blue arrow to set this image as the secondary image.
5. Select the Swipe tool.
6. Select October 3, 2017.

Ask students: *What are your observations about the before and after Maria images?*

**Change Band Display to Vegetation Index**

The vegetation index is used to measure and monitor the vigor of vegetation. The color ramp ranges from brown to green. Light brown corresponds to sand, light gree represents grass, and the highest values of dark green indicate temperate and tropical rainforest.

1. Click on the Renderer and choose Vegetation Index.
2. Repeat the Time Selection and Swipe Tool.

Have students write a comparison of the two images.

**Color Infrared**

Color Infrared is highly reflective due to chlorophyll and the band combination shows vegetation in various shades of red. With dark red signifying healthy vegetation and light red signifying stressed vegetation.

1. Click on the Rendered and choose Color Infrared.
2. Repeat the Time Selection and Swipe Tool.

Have students write a comparison of the two images.

In this lesson, students have used temporal imagery before and after Hurricane Maria to visualize the effect of the hurricane on the island of Perto Rico vegetation.

Find the original activity at Esri here.

OBJECTIVES

# Subjects & Disciplines

**Earth science**

- Meteorology

**Geography**

- Geographic Information Systems (GIS)
- Physical Geography

# Learning Objectives

Students will:

- Use the Landsat App Explorer
- Filter historic satellite imagery
- Use different band combinations (vegetation and color infrared)

# 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

### OTHER NOTES

ESRI ArcGIS Online account NOT required.

### RESOURCES PROVIDED: WEBSITES

- ESRI Landsat Explorer

## BACKGROUND & VOCABULARY

# Background Information

# Prior Knowledge

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# Recommended Prior Activities

- None

# Vocabulary

| Term | Part of Speech | Definition |
|---|---|---|
| **agriculture** | *noun* | the art and science of cultivating the land for growing crops (farming) or raising livestock (ranching). |
| **chlorophyll** | *noun* | plants' green pigment that is essential to photosynthesis. |
| **correspond** | *verb* | to match or be similar to. |
| **Federal Emergency Management Agency (FEMA)** | *noun* | U.S. Homeland Security agency responsible for coordinating response and aid distribution after natural and manmade disasters. |
| **hurricane** | *noun* | tropical storm with wind speeds of at least 119 kilometers (74 miles) per hour. Hurricanes are the same thing as typhoons, but usually located in the Atlantic Ocean region. |
| **Landsat** | *noun* | American satellite that circles the Earth around 14 times a day. |
| **temperate rain forest** | *noun* | wooded areas in cool, mild climate zones that receive high amounts of rainfall. |
| **tropical rain forest** | *noun* | grouping of tall evergreen trees, usually close to the Equator, which receives more than 203 centimeters (80 inches) of rain a year. |
| **vegetation** | *noun* | all the plant life of a specific place. |