Ecology

with the Luquillo Long Term Ecological Research Program

Talking *points*

Knowledge

1. What class of hurricane were Hurricanes Hugo (1989) and Maria (2017)? What wind speeds did they bring to Puerto Rico?

Comprehension

2. Why is the El Yunque forest a 'natural laboratory' for ecologists?
3. How did Hurricane Maria impact the soil chemistry, vegetation and forest morphology in El Yunque?
4. What did Omar discover about how changes in soil chemistry during and after Hurricane Maria influenced vegetation?
5. Why are long term research projects, such as those conducted through the Luquillo Long Term Ecological Research Program, important for understanding and conserving ecosystems?

Analysis

6. What factors might influence a forest's resistance and response to a hurricane?
7. Thinking about Marla's research, how does land use around a river influence the species living in the river?
8. What do you think Jesús observed when studying how food webs were affected by hurricanes?

Synthesis

9. What do you think Alyssa will observe in tree rings if her hypothesis about tree resistance is correct?
10. Why do you think Alex observed that slow-growing trees are better at recovering from hurricane damage than quick-growing trees?

Evaluation

11. What would you most enjoy about a career in ecology?
12. How could you find opportunities for ecology work experience or conservation volunteering?

Creativity

13. Stefani highlights that shrimp are an indicator of ecosystem health and that the health of an ecosystem links to human health. How could you use this information to design an outreach event to educate the public about the importance of ecosystem health?

Activity

In this activity, you will explore long-term hydrology (rainfall and discharge) data from El Yunque, display the data in graphs, and use these to develop a scientific argument to answer the investigation question: Does the amount of discharge from the Río Grande river vary in different rainfall periods?

Glossary

Attribute — a field in a dataset, e.g., rainfall period, discharge in Río Grande

Discharge — a measure of the volume of water that flows through a point in a river each second

Hydrology — the study of the distribution and movement of water

Monthly mean discharge — the mean (average) discharge of all discharge measurements collected during a month

Rainfall period — in Puerto Rico, the high rainfall period (HRF) is from June to November and the low rainfall period (LRF) is from December to May

A scientific argument

Scientists use data as evidence to develop a scientific argument for an investigation question. When developing a scientific argument, there are three important elements to consider:

1. The claim (what is your answer to the investigation question?)
2. The evidence (what data support your claim?)
3. The reasoning (what background information could explain how your evidence supports your claim?)

Background information

On average, 3,860 mm of rain falls on El Yunque National Forest every year, equivalent to over 100 billion gallons of water! The water that flows out of El Yunque is some of the cleanest on the island and supplies 20% of Puerto Rico's population. Ten rivers originate in the forest, but 80% of the water drains through just four of these: Río Blanco, Río Espiritu Santo, Río Grande de Loíza, and Río Mameyes.

Data

You can access Luquillo long-term hydrology data from the Data Jam data portal. The dataset uses the Common Online Data Analysis Platform (CODAP). doi.org/10.51420/data.2023.1

The hydrology CODAP dataset includes a map showing the locations where data were collected, a dataset containing rainfall and discharge records from different rivers in El Yunque, and a description of what each attribute represents. The 'Discharge in Río Grande' is the monthly mean of the discharge flowing through the Río Grande, measured at a monitoring station where the river flows through the city of Río Grande.

Create your graphs

Create graphs to display the hydrology data in a way that can provide evidence to help answer the investigation question. To do this in the CODAP platform, click on the 'Graph' icon, then drag and drop the attributes you would like to visualise onto the graph's axes.

Describe your graphs

What do your graphs show? What patterns can you observe? How does discharge in Río Grande river vary between high and low rainfall periods?

Develop a scientific argument

What is your claim (statement) that answers the question: does the amount of discharge from the Río Grande vary in different rainfall periods? What evidence (details from your graph) supports your claim? What is your reasoning (background information) to connect your evidence to your claim?

More *resources*

- Read the article and activity sheet in Spanish at: **www.futurumcareers.com/how-do-hurricanes-impact-forest-ecosystems**
- Learn more about the Luquillo Long Term Ecological Research Station: **www.luquillo.lter.network**
- Learn more about the Luquillo Data Jam: **data.datajam.cloud**
- The NSF Long Term Ecological Research Network hosts a wide range of education initiatives and resources: **www.lternet.edu/k-12-education**
- The Luquillo Data Jam is supported by The Learning Partnership: **www.jointhepartnership.net**