Research Proposal: Determining mangrove ecosystem health by comparing field and satellite data

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January, 2026

Summary

Mangrove ecosystems are important coastal environments because they protect shorelines, support many living organisms, and help keep water and air clean. However, mangrove health can change depending on environmental conditions and human activities. The purpose of this project is to compare the health of mangrove ecosystems in different locations.

To do this, we will collect field data using GLOBE protocols, such as cloud observations, air temperature, water temperature, pH, salinity, dissolved oxygen, nitrates, alkalinity, and water transparency. We will also use non-GLOBE observations, including vegetation observations, bird counts, and general ecosystem conditions. In addition, we will use satellite images to study vegetation cover using the Normalized Difference Vegetation Index (NDVI).

By combining field measurements, satellite data, and ancestral knowledge shared by community members, we will compare different mangrove sites and identify similarities and differences in their ecosystem health. This project will help us understand how environmental factors influence mangrove ecosystems and why mangrove conservation is important.

Keywords: mangrove ecosystems, birds, bioindicators, water quality, ancestral knowledge, GLOBE protocols

Research Question

How can we determine the health of a mangrove ecosystem by using the structure of bird communities, water physicochemical parameters, ancestral knowledge from local communities, and satellite data in Ciénaga de la Virgen and Punta Arena?

Hypothesis

We hypothesize that the health of a mangrove ecosystem can be determined by combining the structure of bird communities, water physicochemical parameters, ancestral knowledge from local communities, and satellite data in Ciénaga de la Virgen and Punta Arena.

Description of the Study Site

Study sites and climate

Our study sites are located in coastal mangrove ecosystems near Cartagena, Colombia. The geographic locations of the sites are:

Ciénaga de la Virgen (left):
Bajo Aves: 10.485858° N, −75.484104° W
Bajo Meza: 10.495012° N, −75.481803° W
Juan Polo: 10.492531° N, −75.488353° W

Punta Arena (Tierra Bomba Island) (Right):
Punta Arena: 10.362618° N, −75.553675° W

The region has a bimodal rainy season, with rainfall occurring mainly from April to mid-July and from mid-August to late November

Badge Descriptions/Justifications:

Our research group aims to obtain the following badges:

I Am an Earth System Scientist

This project shows how Earth's spheres are connected through our research question. We use several GLOBE protocols, included in the **GLOBE Ocean bundle**, and some non-GLOBE observations to compare the health of two mangrove ecosystems.

In this research, we analyze data from different sources to understand how the atmosphere, hydrosphere, biosphere, and human activities are related. By studying and comparing these data, we can determine the health status of each mangrove location.

I Am a Collaborator

This project is possible because many people and organizations work together. The student researchers are Avril Maza (5°), Montserrat Macia (5°), and Emma Sands (5°). The teacher co-researchers are Sidia Sequea and Juan Felipe Restrepo.

We also collaborate with several community partners. Fundación Serena del Mar supports environmental education processes in Ciénaga de la Virgen. The Empresa Asociativa de Turismo Los Arriberos supports the project by operating canoes and helping us navigate the wetland. In Punta Arena and Tierra Bomba, Fundación Bahía y Ecosistema de Colombia supports environmental education activities. We also work with a motorboat operator who helps us reach the sampling sites, and with Bellas Artes University, which supports the project through plant watercolor illustration classes.

Working together makes this research possible. We could not count birds without the canoes to move through the wetland, and community members learn about birds and GLOBE protocols by working with us. The same type of collaboration happens in Punta Arena with Fundación Bahía. These partnerships create strong collaboration and shared learning.

I Make an Impact

Through this research, communities living near mangrove ecosystems will better understand the health of these environments and what actions they can take to help protect them. Once the research group reaches conclusions about mangrove ecosystem health, this information can support local conservation efforts.

During the investigation, there is a two-way learning process. We learn from the community by listening to their ancestral knowledge, and community members learn from us how to identify birds, use binoculars, and collect data using GLOBE protocols. This shared learning helps build local capacity and creates a positive impact on the conservation of mangrove ecosystems.

References

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