



# Research Proposal: Assessing Urban Mangrove Health in Cartagena Through Biomonitoring

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Year 4  
#LACTREES

Colegio Montessori de Cartagena, Colombia

## Abstract

We study urban mangrove ecosystems in Cartagena to understand their health. Using GLOBE protocols, bird counts, microbiological water analysis, and satellite data, we compare mangrove sites under different levels of urban pressure. This project combines field data, satellite imagery, and citizen science to support environmental monitoring and student learning.

## Problem Question

### Main Research Question:

- What indicators can be used to assess mangrove ecosystem health?

### Secondary Research Questions:

- How does water quality vary among urban mangrove sites in Cartagena?
- How do urban pressures affect mangrove ecosystems?

## Hypothesis

Urban mangrove sites under higher human pressure are expected to show lower water quality, reduced biodiversity, and changes in biological indicators compared to less impacted sites.

## Data Collection Plan

We collect field data using GLOBE Biosphere and Hydrosphere protocols.

We measure water quality, count birds as bioindicators, and perform basic microbiological analyses.

We combine student-collected field data with satellite imagery and data from the GLOBE database.

## Background and Supporting Information

- Mangrove ecosystems provide coastal protection, biodiversity, and water quality regulation.
- Urban mangroves in Cartagena are affected by pollution and land-use change.
- This project builds on scientific research and a collaboration with Universidad Tecnológica de Bolívar (UTB).

## Description of study site

### Study sites and climate

This study will be conducted in Cartagena de Indias, Bolivar, Colombia, and will focus on four urban mangrove ecosystems:

Ciénaga de las Quintas  
Caño de Bazurto  
Laguna San Lázaro  
Chambacú



Photo: Google Earth, 2026

The approximate geographic location of the study area is 10.3932° N, 75.4832° W. These sites are located within a coastal urban environment and are influenced by tropical climate conditions, including high humidity and seasonal rainfall.

Satellite imagery, maps, and land cover observations will be used to support the analysis of the study sites and to better understand their environmental context.

## Expected Outcomes

- Identification of key indicators of urban mangrove ecosystem health.
- Comparison of water quality and biodiversity among different mangrove sites in Cartagena.
- Increased environmental awareness and scientific skills among students and community members.



(Right) Snowy egret (*Egretta thula*) fishing, Ciénaga de Chambacú. Photo: JRestrepo, 2024  
(Left) Adult Brown Pelican (*Pelecanus occidentalis*), resting on a red Mangrove Tree. Ciénaga de las Quintas. Photo: JRestrepo, 2024



Ciénaga de las Quintas, Cartagena: La popa on the back. Photo: Jrestrepo, 2024

## Challenges and Considerations

- Weather conditions and access to urban mangrove sites.
- Maintaining consistent data collection among different student teams.
- Limited equipment and resources, supported by GLOBE tools and shared data.

## GLOBE Data Use Plan

We will compare the data collected during this project with data available in the GLOBE database, including information collected by previous Biontessori research teams between 2021 and 2025. We will also use additional local data available in the GLOBE database, such as precipitation records and satellite imagery, to support our analysis and strengthen the interpretation of our results.

## Badges

Our research group aims to obtain the following badges:

**I Am an Earth System Scientist:** We study mangrove ecosystems by analyzing how water, living organisms, land cover, and human activities are connected. We use biological and environmental indicators to understand ecosystem health. This approach helps us see the mangrove as a complete Earth system.

**I Work with Satellite Data:** We use satellite imagery from the GLOBE database to observe changes in urban mangrove ecosystems. Satellite data help us compare land cover and environmental patterns with field data collected by students.

Combining satellite and field data improves our understanding of mangrove ecosystem health.

**I Am a Collaborator:** This project is developed through collaboration between students, teachers, and external partners. We work with mentors and with the Universidad Tecnológica de Bolívar (UTB) to support our research process. Teamwork allows us to collect, analyze, and interpret environmental data together.

## References

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