

El Yunque Ecosystem Services Project: A Decade Later



Tania López Marrero and L. Annie Hermansen-Báez



Introduction

In 2009 we embarked on a project, called El Yunque Ecosystem Services: A Participatory Research Approach, to develop a methodology that incorporated the views of different stakeholders and integrated various research methods and participatory techniques. The overall goal was to understand stakeholder knowledge about ecosystem services provided by El Yunque National Forest (El Yunque, hereafter) and factors influencing those services (López Marrero and Hermansen-Báez 2011). Various publications (fact sheets and methodological guides), along with Geographic Information Systems data, were developed to assist El Yunque managers, natural resource specialists, land use planners, researchers, and other groups involved in the study, planning, management,

and conservation of El Yunque's ecosystem services specifically, and natural resources more generally.

Since the development of the project's first phase over a decade ago, two intense hurricanes greatly affected El Yunque—Hurricanes Irma and María in 2017—and a new management plan was developed and approved for El Yunque in 2019—the El Yunque National Forest Revised Land and Resource Management Plan. These events occurred along with changing socioeconomic conditions in Puerto Rico, which can also influence management and conservation efforts. Within this context, we conducted a second phase of the project where we revisited the topics of El Yunque's ecosystem services and drivers of ecosystem change and additionally addressed the

topics of hurricanes and forest shared management. The aim is to provide information and resources for forest managers, researchers, planners, practitioners, and community members to support current and future management practices, community-led initiatives, and research efforts, among other potential users.

In this fact sheet, we provide a summary of the second phase of the El Yunque Ecosystem Services Project, a list of the publications and data resulting from the project's second phase, and a brief description of each.

Goal and Objectives

The overall goal of the project was to revisit the topics of El Yunque's ecosystem services and the factors driving change in the services provided by the forest and to compare stakeholder perspectives between the first and second phases of the project. During the project's second phase, we also explored the topics of shared forest resources management and hurricanes and forests. The main project objectives were to

- assess and compare stakeholder perspectives (between stakeholder groups and between the project's first and second phases) regarding the ecosystem services provided by El Yunque and the factors driving changes to the forest and ecosystem services it provides;
- analyze urban and built-up land cover expansion around El Yunque as a potential factor influencing El Yunque and its ecosystem services;
- explore the effects of hurricanes on the ecosystem services provided by El Yunque and resource management;
- identify factors that facilitated or limited stakeholder participation and shared-management project implementation in forests or protected areas in different parts of the world; and
- explore how participation and shared management experiences elsewhere (previous objective) can be

related to the current El Yunque land and resource management plan.

Study Area, Participants, and Data Collection

The study area included the lands in and around El Yunque, in eastern Puerto Rico, which contains the eight municipalities within which El Yunque lies (**Figure 1**). This study area is the same as in the first phase of the project.

As in the project's first phase, the stakeholders included scientists who work in El Yunque, forest managers of El Yunque, municipal planners from the municipalities in which El Yunque is located, and community leaders and residents living near El Yunque. An additional group of participants, including people from government agencies, non-governmental organizations, community organizations, and academic institutions that have collaborated with El Yunque, was included in the project's second phase.

The project involved 38 participants from the



Figure 1. Location of the study area in eastern Puerto Rico.

different stakeholder groups. Some participated during the project's first phase, while others were new. While we attempted to include respondents from the original project, this was not always feasible because contact information for some was not available, some were no longer living or working in the study area, and some had passed away.

Data collection for this project came from different sources. It included interviews with participants from the stakeholder groups, aerial photograph interpretation, Geographic Information System (GIS) analysis, as well as bibliographic research and summary of published information. Interviews took place between 2019 and 2021. Some were conducted in person, while others were conducted by phone or video conference due to the COVID-19 pandemic.

Project Publications

Various publications were developed from the research findings, including bibliographies and a fact sheet series (**Figure 2**). A GIS layer of urban land-cover data for 2023 was also created for the eight municipalities with portions of El Yunque within their boundaries. These publications provide information for resource management, decision-making, land-use planning, and research and education regarding El Yunque and its ecosystem services. Publications are available in both English and Spanish, with the exception of the bibliographies.

Bibliography and Annotated Bibliography:

López Marrero, T.; Heartsill Scalley, T. 2024. Tropical Storms and Ecological Research in the Luquillo Experimental Forest: A Bibliography (available only in English)

This publication provides a bibliography of 203 peer-reviewed articles identified through a systematic literature review regarding ecological research conducted in El Yunque National Forest (also known as the Luquillo Experimental Forest) on storms and



Figure 2. Sample of publications resulting from the second phase of the El Yunque Ecosystem Services project

forests. It gives researchers, managers, and practitioners a broad resource to support current and future research and management practices.

Echevarría Ramos, M.; Talavera Arboniés, M.; Melecio Torres, A.; López Marrero, T. 2023. Manejo de recursos naturales y gestión compartida: Una bibliografía anotada (available only in Spanish)

This annotated bibliography includes summaries of case studies or literature reviews illustrating natural resources shared management experiences in 35 countries, mainly related to forest or protected area management and including projects in species conservation, land-use planning, land restoration, riverine zone management, tree plantations, agroforestry, and ecotourism. Factors that have facilitated the development and successful implementation of shared natural resource management projects or have limited or hindered them are emphasized.

Fact Sheets:

López Marrero, T.; Hermansen-Báez, L.A. 2024. El Yunque National Forest Ecosystem Services: Stakeholders Perspectives Ten Years Later

This fact sheet presents the perspectives of different stakeholders regarding the ecosystem services provided by El Yunque. It also compares findings

from data collected in 2009 and 2010 during the first phase of the El Yunque Ecosystem Services Project.

López Marrero, T.; Hermansen-Báez, L.A. 2024. Factors Driving Changes to El Yunque National Forest Ecosystem Services: Stakeholder Perspectives Ten Years Later

This fact sheet presents stakeholder perspectives regarding factors driving changes to El Yunque and its ecosystem services. It also compares findings from data collected in 2009 and 2010 during the first phase of the El Yunque Ecosystem Services Project.

López Marrero, T.; Hermansen-Báez, L.A. 2024. Expansion of Urban Land Cover around El Yunque National Forest: 1998 to 2023

This fact sheet presents trends in urban land cover expansion in eight municipalities with portion of El Yunque National Forest within their borders during two time periods (1998 to 2010 and 2010 to 2023).

López Marrero, T.; Hermansen-Báez, L.A. 2025. Hurricanes, Ecosystem Services, and Management in El Yunque National Forest

This fact sheet provides different stakeholder views about the effects of Hurricanes Irma and María relative to El Yunque's ecosystem services. Recommendations for managing effects resulting from hurricane passage through the forest are provided.

López Marrero, T.; Echevarría Ramos, M.; Hermansen-Báez, L.A. 2023. Natural Resources and Shared Management: Opportunities and Challenges

This fact sheet summarizes factors that facilitate participation and the development and successful implementation of projects incorporating shared management of natural resources, along with factors that limit or hinder participation and implementation. The analysis is based on a literature review of case studies from 35 countries (annotated bibliography mentioned above).

López Marrero, T.; Hermansen-Báez, L.A. 2025. Participation, Collaboration, and Shared Management in El Yunque National Forest: Opportunities and Challenges

This fact sheet presents the views and perspectives of a group of El Yunque's collaborators regarding the opportunities and possible constraints to stakeholder participation and collaboration. Recommendations for successful collaborations and implementation of natural resource shared-management initiatives are provided.

References

López Marrero, T.; Hermansen-Báez, L.A. 2011. El Yunque Ecosystem Services: A Participatory Research Approach. [Fact sheet]. USDA Forest Service, Region 8. 4 p.

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For more information

For more information or if you have questions, contact Tania López Marrero at tania.lopez1@upr.edu.



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