



El Yunque Ecosystem Services: A Participatory Research Approach

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Introduction

Forest ecosystem services (benefits provided by forests to people and other living organisms) result from a variety of ecosystem processes and functions. Yet, the availability and the potential to provide these services do not depend on forest processes and functions alone. They also depend on policies, regulations, decisions, and actions people make regarding the use and management of forests and the services forests provide. Hence, any effort to promote conservation of ecosystem services and their wise use requires the integration of the different stakeholders that use and affect these services into the development and implementation of conservation strategies. Moreover, promoting the participation of stakeholders is especially important in locations where centralized, top-down approaches to resource conservation have not produced the expected results.

El Yunque National Forest, located in eastern Puerto Rico, provides a variety of ecosystem services—including clean air, water, and recreation—that are essential to the well-being of people in communities surrounding the forest and beyond (Figure 1). Rapid changes in urban and built-up areas in eastern Puerto Rico have put El Yunque under high pressure for urban development (Figure 2). These changes can alter forest processes and functions, and thus the services provided by the forest. Zoning regulations for guiding



Figure 1. El Yunque provides a variety of ecosystems services, such as clean water and recreation, that benefit surrounding communities.

urban expansion and minimizing its effects on the forest have had limited success; much of the urban expansion during the past decades has occurred within zoning districts where urban uses were not originally planned. This limited success has resulted from poor enforcement of zoning regulations; it could also be a result of the implementation of top-down models of land use and resource management that often excludes people at different levels, such as local communities and other stakeholders.



Photo Credit: Tania López Marrero

Figure 2. Urban expansion is considered one of the main factors affecting El Yunque National Forest and the services that it provides.

To begin to address these issues, we developed a study that incorporated the views and perspectives of different stakeholders regarding the ecosystem services provided by El Yunque. We developed a methodology that integrates different research methods and participatory techniques. The techniques can help natural resource managers, specialists, and researchers of other national and state forests better understand people's knowledge and awareness of ecosystem services and the factors affecting these services. The techniques and the products resulting from them can be used to assist in the management and planning of land use, ecosystem services, and natural resources in general.

Photo Credit: Antonio González Toro

Study Area and Participants

The study area included the lands within and around El Yunque National Forest, located in eastern Puerto Rico (Figure 3). Data collection and analysis were conducted at different geographic scales: regional, municipal (county), and proclamation area.



Figure 3. Location of the study area in eastern Puerto Rico.

- The regional area is composed of the eight municipalities that have a portion of El Yunque within their boundaries, and is the area included in the zoning regulation of 1983 that guides the region's land-use planning.
- The municipal (county) level comprises the area of each of the eight municipalities that has a portion of El Yunque within its boundaries, in which municipal land-use planning is currently being developed and implemented.
- The proclamation area is the area outside the administrative boundaries of El Yunque wherein the U.S. Forest Service has the authority to purchase lands to expand its area for forest conservation purposes.

The stakeholders in this project 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 groups, leaders, residents, and landowners living near El Yunque (Figure 4).



Photo Credit: Tania López Marrero

Figure 4. Community residents living near El Yunque were one of the stakeholder groups that participated in this project.

Goals and Objectives

The overall goal of the project was to understand stakeholders' knowledge about the services provided by El Yunque and the factors affecting these services so as to better conserve both the forest and the services. There were several main objectives of the project.

The first objective was to assess stakeholders' knowledge of El Yunque's ecosystem services and the factors influencing the availability of these services.

Specifically we (1) identified potential ways to foster dialogue among stakeholders and to enable them to share, think, act, and engage in the planning, conservation, and sustainable use of El Yunque's ecosystem services by identifying common knowledge and understandings of ecosystem services and drivers of change (Figure 5); (2) identified gaps in



Photo Credit: Tania López Marrero

Figure 5. Participants generated individual lists of El Yunque's ecosystem services during project focus groups, utilizing a technique called participatory listing. This technique was used to identify stakeholders' knowledge and perceptions about ecosystem services and factors driving change.

information, misunderstandings, and information needs; and (3) suggested actions needed to improve stakeholders' understanding of ecosystem services and the factors affecting their availability.

The second objective was to document the geographic distribution of land covers around El Yunque, with special emphasis on the distribution and expansion of urban land cover as a potential factor affecting El Yunque and its ecosystem services.

We summarized land-cover data at three geographic scales in which land-use planning and decision making take place around El Yunque, presented trends in urban expansion in the study area, and analyzed urban expansion in relation to zoning regulation around the forest. This kind of information can assist stakeholders in land-use planning and decision making around El Yunque.

The third objective was to develop geographic data and a resulting map that can assist in land-use planning efforts that support El Yunque and its ecosystem services.

We used a methodology that allowed us to identify lands around El Yunque where it is most critical to plan for land uses that can help ensure the continued provision of El Yunque's ecosystem services, rather than allow urban expansion that has the potential to limit these same services. This kind of information can assist land-use planners, forest managers, natural resource specialists, and policymakers in making land-use decisions around El Yunque.

The fourth objective was to explore the potential role of landowner-incentive conservation programs for forest conservation around El Yunque, including conservation easements, land donations, and land purchases.

We identified opportunities and limitations of potentially implementing these conservation programs as mechanisms to maintain and increase forest cover around El Yunque. This kind of information can help forest managers, policymakers, and others to better design, promote, and implement incentive-driven conservation programs.

About the Fact Sheets and Guides

A series of fact sheets was developed from the research findings to provide information that can assist land-use planning, decision making, and management around El Yunque National Forest (Figure 6). The fact sheets specifically



Figure 6. The fact sheets summarize geographic data for the study area and the findings of interviews with participants about land incentive programs for conservation. The guides provide step-by-step instructions of the methods and techniques used in the study, as well as the study main findings.

- summarize land-cover data for 2010 within the study area,
- present trends in urban expansion from 1998 to 2010,
- provide information about urban expansion and its relation to zoning regulation, and
- summarize the findings obtained from interviews with landowners assessing their knowledge and willingness to participate in land conservation programs around El Yunque.

A series of guides was developed to describe the techniques that were used in the study and to provide step-by-step instructions in their use. These techniques can be used by others to conduct studies or implement projects on similar topics. The guides also provide the main findings of the different components of the study (Figure 6). The guide topics include

- participatory listing, ranking, and scoring,
- participatory mapping, and
- the use of multi-criteria evaluation analysis and Geographic Information Systems to develop maps that can assist in land-use planning.

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Other publications in the “El Yunque Ecosystem Services” series

- Land Cover within and around El Yunque National Forest
- Expansion of Urban Land Cover around El Yunque National Forest
- Urbanization Trends and Zoning around El Yunque National Forest
- Landowner Incentives for Conservation around El Yunque National Forest
- Participatory Listing, Ranking, and Scoring of Ecosystem Services and Drivers of Change
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For more information

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