



Case Study 26

Tools for Building Understanding and Promoting Dialogue

Situated only 45 minutes from the sprawling metropolis of San Juan, El Yunque National Forest has long been one of Puerto Rico's most important tourist destinations and an important getaway for the island's urban residents. The forest also provides a variety of ecosystem services that are essential to the well-being of people in communities surrounding the forest and beyond. However, proximity to San Juan also places El Yunque under considerable pressure from urbanization. Consequently, El Yunque faces many of the same problems as other national forests—increased development around the borders, overuse from recreation, and effects on ecosystem services, such as water and other resources.

Zoning regulations for guiding urban expansion and minimizing its effects on the forest have been put into place since the mid-1980s in the eight municipalities that have a portion of El Yunque within their boundaries. These regulations, however, 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 (López and Villanueva 2006; Lugo et al. 2004). This demonstrates that top-down models of land use and resource management that often exclude people at different levels, such as the regional zoning plan for El Yunque, have not been completely effective as forest conservation tools.

Consequently, and as an alternative way to approach the issue of urbanization around El Yunque, InterfaceSouth, El Yunque National Forest, the International Institute of Tropical Forestry, and the University of Puerto Rico

collaborated to look at new and innovative approaches to enhancing conservation around the forest that incorporated the view and perspectives of a variety of different stakeholders, including scientists who work in El Yunque, forest managers, municipal planners, community groups and leaders, and landowners living around El Yunque. The collaborating institutions elected to incorporate various participatory techniques the better to understand and integrate stakeholders' knowledge and perceptions regarding El Yunque's ecosystem services and drivers of change. The project also developed various geographic data to assist land-use planning and decision making around El Yunque.

Specifically the collaborators wanted to

- assess stakeholders' knowledge of El Yunque's ecosystem services and the factors influencing the availability of these services,
- document the geographic distribution of land covers around El Yunque, with special emphasis on the distribution and



Photo Credit: Antonio González Toro

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

expansion of urban land cover as a potential factor affecting El Yunque and its ecosystem services,

- develop geographic data and a resulting map that can assist in land-use planning efforts that support El Yunque and its ecosystem services,
- explore the potential role of landowner-incentive conservation programs for forest conservation around El Yunque, and
- use information developed throughout the above objectives to engage land-use planners, land managers, community members, and landowners through educational and outreach resources designed to improve understanding of the services provided by the forests of El Yunque and the factors affecting these forests and, subsequently, to influence the land-use planning and decision-making process at various levels.

Techniques and Tools

The techniques and tools used in this study helped the collaborators to understand better peoples' knowledge and awareness of ecosystem services and the factors affecting these services, as well as people's understanding about the geographic occurrence of land-cover change and landscape attributes influencing the delivery of such services. The techniques can help natural resource managers, specialists, and researchers of other national and state forests to conduct studies or implement projects on similar topics. They can also be used to assist in the management and planning of land use, ecosystem services, and natural resources in general.

Listing, ranking, and scoring

The project began with participatory listing, ranking, and scoring exercises designed to document and compare the knowledge and perceptions of different stakeholder groups

regarding El Yunque's ecosystem services and drivers of change. The stakeholders participating in this exercise included scientists working in El Yunque, El Yunque forest managers, planners from the surrounding municipalities, and community leaders from the adjacent communities.

The different stakeholder groups created lists of the ecosystem services provided by the forest. The stakeholder groups also listed the drivers of change that influence (positively or negatively) the continued delivery of ecosystem services. The top three ecosystem services were then ranked and the drivers of change were scored on a scale of one (least impact) to five (most impact).

The technique revealed varying degrees of knowledge regarding ecosystem services and the drivers of change at El Yunque. For example, water was ranked by all stakeholder groups as the most important ecosystem service provided by El Yunque; however, carbon sequestration was only listed by scientists and forest managers. Urbanization and the lack of a comprehensive and updated regional land-use plan were scored by all groups as the drivers of change having the most negative effects on ecosystem services. (For more information about this technique, see "Participatory Listing, Ranking, and Scoring of Ecosystem Services and Drivers of Change," one of the publications within the "El Yunque Ecosystem Services" series.¹)

This technique can be used by natural resource managers and specialists on other national and state forests to do a better job of collecting data about stakeholders' knowledge regarding natural resources. The ultimate goal of these techniques is to document existing knowledge, to identify ways to enhance such knowledge, and to promote collective actions and participatory management.

¹Available at <http://www.interfacesouth.org/projects/el-yunque/guides/El%20Yunque%20HTG1%20English.pdf>.



Photo Credit: Tania López Marrero

Stakeholder groups were asked to delineate areas in which they perceived urban expansion as occurring.

Participatory mapping

Participatory mapping was used to investigate further the stakeholders' perceptions about urban expansion around El Yunque, which was the main factor identified by all stakeholder groups as negatively influencing El Yunque's ecosystem services. In this mapping activity, stakeholder groups were given a base map with familiar reference points in El Yunque and surrounding areas. They were then asked to delineate the areas in which they perceived urban expansion as occurring. The perceptions of the different stakeholder groups were then compared to analyses of actual urban land-cover change developed by the researchers by using aerial photograph interpretation and Geographical Information Systems (GIS). Most stakeholder groups correctly identified northern areas of El Yunque as experiencing urban growth, but they did not identify areas to the south that are also being altered by urban expansion.

Natural resource managers, specialists, and researchers can use this tool to investigate people's understanding of geographic factors affecting forests or natural resources in general. (For more information about this technique, see "Participatory Mapping of Land Cover Change," another publication within the "El Yunque Ecosystem Services" series.²)

Multi-criteria evaluation analysis and Geographic Information Systems

The availability and use of geographic digital data and decision-making tools have increased the development of geographic analyses that can assist in decision making and land-use planning. Multi-criteria evaluation (MCE) analysis is the implementation of decision-making rules to identify and enable the combination of many criteria, in the form of Geographic Information Systems (GIS) layers, into a single map. Multi-criteria evaluation and GIS are two examples of tools that aid in the development of geographic data and maps for different purposes, such as conserving land for forestry or agricultural uses.

In this project, MCE analysis and GIS tools were used to develop a map that shows areas in which protection against urban expansion would help to ensure the continued provision of the forest's ecosystem services. The process of generating the map involved two general phases: (1) selecting and prioritizing the criteria used to develop the map; and (2) the technical process of creating a GIS data set about the criteria and conducting the GIS analysis. In this project we had input from stakeholders (scientists and forest managers) in selecting and prioritizing the criteria to be used in the GIS analysis; the analysis to produce the final map was conducted by a GIS specialist. (For more information about this technique, see "Multi-Criteria Evaluation and Geographic Information Systems for Land-Use Planning and Decision Making," another publication within the "El Yunque Ecosystem Services" series.³) The map was developed for the area covered by the eight municipalities that have a portion of El Yunque within their boundaries. The map can assist land-use planners, forest managers, and natural resources specialists, among others, in making land-use decisions around El Yunque. The map should not be used, however, as a stand-alone tool for decision making. Instead,

² Available at <http://www.interfacesouth.org/projects/el-yunque/guides/El%20Yunque%20HTG2%20English.pdf>.

³ Available at <http://www.interfacesouth.org/projects/el-yunque/guides/El%20Yunque%20HTG3%20English.pdf>.

this mapping process can be one among many tools, such as those outlined in this case study, that are available to aid in the decision-making process regarding land use.

Interviews

Interviews were used to assess landowner attitudes toward incentive-based land conservation programs, including easements, land donations, and land purchases, as well as the willingness of the landowners to take part in them. The study found that a lack of information about the programs, distrust of government programs, and insecure land tenure were serious hindrances to participation in the programs. However, the study also found that landowners value the ecosystem services provided by El Yunque and some would be willing to learn more about the programs. (For more information, see “Landowner Incentives for Conservation around El Yunque National Forest,” another publication within the “El Yunque Ecosystem Services” series.⁴) This finding highlights the potential value of outreach to the surrounding communities in order to build trust and provide information about the benefits of incentive-based conservation programs.

Outreach and Education Efforts

Natural resource professionals can play a role in land-use planning by increasing awareness of the services that forests and other ecosystems provide to humans and linking those services to the goals and needs of specialists and agencies in the planning process.

In this study, the results from the participatory tools and spatial analysis are useful as starting points for designing educational materials and resources targeted to planners or other stakeholder groups. They can also be useful for identifying potential topics for promoting mutual learning, developing collaborative

projects, and promoting actions across multiple scales (for instance, municipalities, state and federal agencies, communities) that encourage the wise use of resources and minimize potential effects on ecosystem services.

Fact sheets and guides

The results of the study and information about the processes for the different techniques are included in a variety of materials and resources. These can be used not only for decision making and land-use planning by stakeholders in Puerto Rico, but also by natural resource managers, specialists, and researchers of other national and state forests who seek to have a better understanding of peoples’ knowledge and awareness of ecosystem services and the factors affecting these services.

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. Additionally 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.

Workshops

As part of this project, a workshop was conducted with municipal planners to present the findings of the study. The importance of protecting critical areas in and around El Yunque to ensure the continued provision of ecosystem services, especially services of concern to planners, such as water quality and flood and soil erosion mitigation, was stressed. The land-use GIS data was also made available to the planners so that they could perform their own analyses in developing municipal and

⁴Available at <http://www.interfacesouth.org/projects/el-yunque/fact-sheets/El%20Yunque%20FS4%20English.pdf>.

regional plans, or sustaining existing ones. Additionally, each participant was presented with the main findings of the project and given the fact sheets and the guides. During the workshop, municipal planners talked about other potential uses of the findings, and the data and products generated from this project.

Probably most importantly the workshop provided an opportunity for dialogue between planners and researchers, and between municipal planners from different municipalities, some of whom did not know each other. All of the workshop participants had the opportunity to express other concerns and limitations regarding land-use planning at the municipal and regional levels, topics that we expect to continue discussing in future workshops. Ultimately, the workshop promoted social learning—learning to enhance common knowledge, awareness, and skills by engaging multiple participants, sharing diverse perspectives, and thinking and acting together.

Summary

Natural resource professionals often have unique perspectives and information to bring to the land-use planning process. However, to aid them most effectively in the planning process, information regarding ecosystems and ecosystem services should be presented clearly in a format that can be interpreted and integrated easily into existing planning discussions. This study demonstrates that providing the information directly or indirectly with links to other concerns held by policymakers, planners, and other stakeholders is most effective.

Participatory approaches such as the mapping exercise and listing, ranking, and scoring are valuable techniques for the land-use planning process. Forest managers, natural resource specialists, and others can use these techniques to

- understand stakeholder perceptions and knowledge regarding different environmental or natural resource management topics,
- identify gaps in information, misunderstandings, and information needs,
- determine what actions and interventions are required to improve the understanding of ecosystems and how human actions influence them, and
- identify common knowledge and topics between groups that can be used to foster dialogue.

By combining this information with more quantitative types of data, such as land-cover change data and spatial analysis, natural resource professionals can contribute to and influence the land-use planning process more strategically.

To learn more about this project and to view the El Yunque ecosystem services fact sheets, how-to guides, and other products visit www.interfacesouth.org/projects/el-yunque.

References

- López-Marrero, T. and Villanueva-Colón, N. 2006. Atlas Ambiental de Puerto Rico. Río Piedras: Editorial de la Universidad de Puerto Rico. 160 pp. In Spanish.
- Lugo, A. E.; López-Marrero, T.; Ramos-González, O. M.; et al. 2004. Urbanización de los terrenos en la periferia de El Yunque (Gen. Tech. Rep. WO-66). Washington DC: U.S. Department of Agriculture Forest Service. 29 p. In Spanish.

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