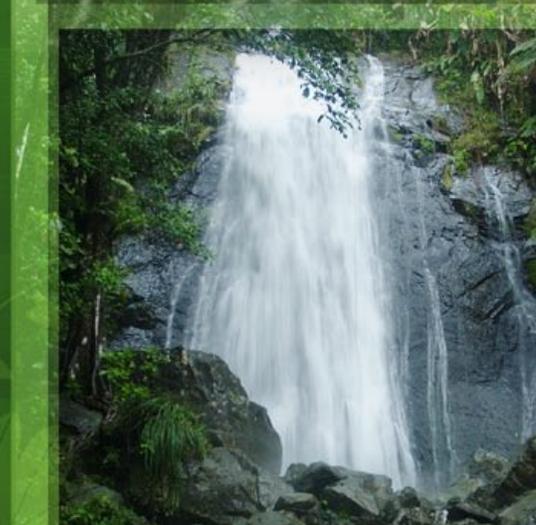




# Participatory Listing, Ranking, and Scoring of Ecosystem Services and Drivers of Change

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## Introduction

Promoting participatory and collaborative natural resource management is important for the conservation and management of ecosystems and the services they provide. For effective participation, it is important for natural resource managers to understand people's perceptions and knowledge about ecosystem services and the factors affecting them. This knowledge can help initiate dialogue among stakeholders, identify information needs, and engage people in the conservation of ecosystems and their services.

Land-use policies around El Yunque National Forest (El Yunque) have had only limited success due to top-down institutional approaches and poor enforcement (Lugo and others 2004). Rapid land-use changes surrounding the forest have occurred as a result. Developing strategies that bring different groups of stakeholders to share, think, learn, and act together can provide an alternative approach to conservation of ecosystems around El Yunque. In this study, we used a participatory approach that included focus groups and interviews with different stakeholders to document and compare their knowledge and perceptions about El Yunque's ecosystem services and the factors influencing the provision of such services to society. The stakeholders participating in the project included (1) scientists who work in El Yunque, (2) El Yunque forest managers, (3) municipal planners from the municipalities in which El Yunque is located, and (4) community leaders and groups living near El Yunque.

This step-by-step guide provides instructions for three participatory techniques that we used in the focus groups and interviews: listing, ranking, and scoring. These are easy-to-implement techniques that can be used to identify people's knowledge, perceptions, and opinions about a particular topic. The techniques presented in this guide can be used by natural resource managers and specialists on other national and state forests to better collect data about stakeholders' knowledge regarding natural resources. The ultimate goal of these techniques is to identify ways to enhance such knowledge, and to promote collective actions and participatory management. The guide also provides the main findings of the study.

## Materials

The materials used to conduct the activities in this project included letter-size paper (8.5 x 11), large size paper (about 36 x 24 in.), pencils, and markers.

## The Process

### Listing

Participatory listing was used to identify stakeholder knowledge and perceptions about (1) ecosystem services provided by El Yunque and (2) factors driving ecosystem change (and hence influencing ecosystem services). The steps for this process were as follows:

1. A facilitator explained to the participants the purpose of the exercise and the definition of "ecosystem services" that was used in the project. Participants were told that ecosystem services could fall into one of four service categories: provisioning, regulating, socio-cultural, and supporting (Box 1).
2. Each participant was asked to make a list of ecosystem services provided by El Yunque (Figure 1).
3. After completing their lists, the participants were asked to break into small groups of 3 to 5 people to discuss their individual lists and to generate a group list.
4. One member of each small group was designated to present the findings to the whole group.
5. The facilitator generated a list of ecosystem services on a large sheet of paper for the whole group to see and comment on.
6. The participants further refined the list on the large sheet of paper by adding missing ecosystem services or eliminating questionable ones.

This same process was used to develop the list of drivers of change (Box 1), both those that influence El Yunque's ecosystem services positively and those that do not.



Photo Credit: Tania López Marrero

**FIGURE 1.** As part of the participatory listing process, participants generated individual lists of El Yunque's ecosystem services.

## Box 1. Key terms and definitions

**Ecosystem services** are the benefits that the functions of ecosystems provide to people and other organisms. These services have been classified into four groups of benefits: provisioning, regulating, socio-cultural, and supporting.

- **Provisioning services** are the products and goods produced by ecosystems and obtained directly from them. These are the most tangible benefits derived from ecosystems.
- **Regulating services** are the benefits obtained through the natural regulation of ecosystem processes.
- **Socio-cultural services** are the benefits to human well-being that are received from ecosystems. Most of these benefits are non-material and sometimes they are intangible.
- **Supporting services** are the ecosystem processes that are necessary for the production and delivery of all other ecosystem services. Their benefits are indirect and play out through the capacity of ecosystems to supply all other services.

**Drivers of change** are natural or human-induced factors that directly or indirectly cause changes in an ecosystem and its services.

Source: Millennium Ecosystem Assessment 2003 and McNeely and others 2009.

## Ranking

Ranking was used to identify the three most important ecosystem services that participants perceived as being provided by El Yunque. We used the following steps for this exercise:

1. The facilitator explained the purpose of the exercise to the participants.
2. The participants reviewed the list of ecosystem services developed during the listing process.
3. The participants were asked to individually select the three most important ecosystem services.
4. The participants were asked to individually rank the three ecosystem services already identified; from 1 (most important) to 3 (least important).

## Scoring

Scoring was used to determine participants' perceptions about the relative effect that each driver of change has on El Yunque and its ecosystem services. The following steps describe the process we used for the scoring exercise:

1. The facilitator explained the purpose of the exercise to the participants and asked them to review the list of drivers of ecosystem change that was developed during the listing exercise.
2. The participants were then asked to individually score the perceived impact that each driver of change has on ecosystem services on a scale of 1 (least impact) to 5 (most impact). Scores were relative to each other, so participants were asked to score one driver first and use that score as a baseline to score the rest of the drivers.
3. After completing the individual scores, the participants were asked to form small groups of 3 to 5 people to discuss their individual scores and to assign an overall score to each driver.
4. Each group was asked to select one person to report back to the larger group regarding the score that was assigned to each driver.
5. The facilitator wrote each driver's score on a large sheet of paper for everyone to see and comment on.
6. The participants reviewed and discussed the list, and then came to a consensus about the final scoring assigned to each driver.

This same process was followed for assigning impact scores for both positive and negative drivers of change.

## Key Findings

### Knowledge of El Yunque's Ecosystem Services

- Many of the ecosystem services provided by El Yunque—such as clean water, habitat for flora and fauna, air purification, recreation, and scenic value—were known by all groups of stakeholders (Figure 2).
- Certain ecosystem services were only identified by scientists and forest managers. These ecosystem services fell under two categories—regulating and supporting—and included carbon sequestration, soil erosion control, nutrient cycling, soil formation, and maintenance of biodiversity (Figure 2).
- Of all the ecosystem services mentioned, water was ranked by the majority of the participants as the most important ecosystem service.

- Habitat for flora and fauna and air purification were considered the second and third most important ecosystem services provided by El Yunque by the majority of participants.

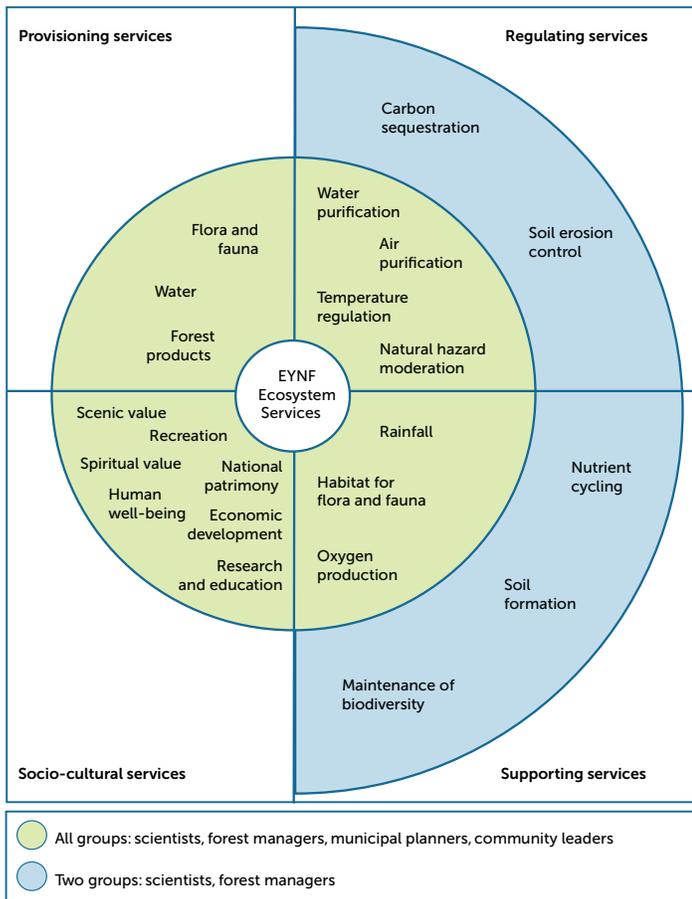


FIGURE 2. El Yunque’s ecosystem services as identified by stakeholders and categorized in terms of provisioning, regulating, socio-cultural, and supporting services. TABLE 1 describes each ecosystem service.

### Negative Drivers Affecting El Yunque and Its Ecosystem Services

- Land-cover change, lack of knowledge about El Yunque’s ecosystem services and how human actions affect the ecosystem’s capacity to provide such services, institutional factors (such as forest management, regulations, and decision making at different scales), poor land-use plan enforcement, and inadequate waste disposal were the top factors perceived by all groups of stakeholders as negative drivers affecting El Yunque and its ecosystem services (Table 2).
- The lack of comprehensive regional and updated land-use plans was mentioned exclusively by scientists as a factor negatively affecting El Yunque and its ecosystem services, while the presence of telecommunication towers in El

- Yunque was identified exclusively by community leaders (Figure 3, Table 3).
- Climate change and the change of rivers’ natural paths (hydromodification) were identified exclusively by scientists and forest managers as negatively affecting the forest and its services (Table 3).
  - Scientific research was perceived by community leaders and municipal planners as negatively influencing El Yunque and its ecosystem services. This perception was mostly related to research practices conducted in the past, such as the testing of radioactive effects on the forest, and the unknown effects, if any, such activities can still have in the forest and on the people who live nearby (Table 3).

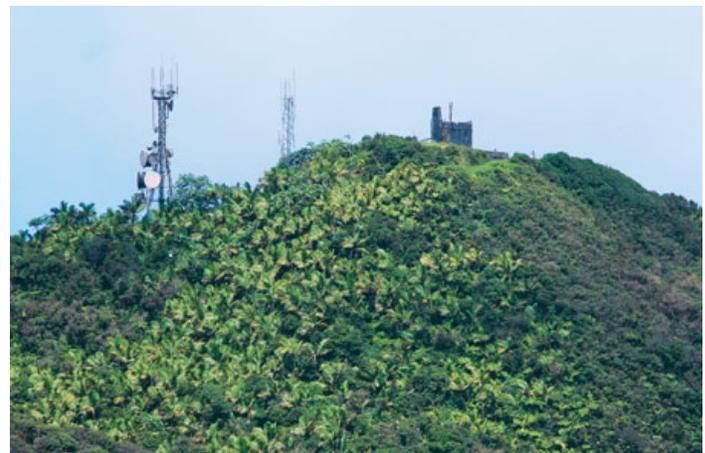


Photo Credit: Antonio González Toro

FIGURE 3. Telecommunication towers are one of the factors that community leaders perceived to be negatively affecting the forest’s ecosystem services.

### Positive Drivers Affecting El Yunque and Its Ecosystem Services

- Six out of nine positive drivers were mentioned by all groups of stakeholders. Some examples include the protection status of El Yunque, forest visiting and recreation, and community participation in the development of management plans, public hearings, and cleaning campaigns (Table 2).
- The protective status of El Yunque and forest visiting and recreation were perceived as having the most positive effects on the forest and its ecosystem services by all stakeholder groups (Figure 4, Table 2).
- Current educational efforts had among the lowest perceived positive effects. Though education was considered important by all stakeholders, participants did not perceive education to be having a positive effect on the forest because little education and awareness building is currently occurring around the forest (Table 2).

TABLE 1. Categorization and description of El Yunque ecosystem services.

ECOSYSTEM SERVICE GROUP	ECOSYSTEM SERVICE	DESCRIPTION*
<b>Provisioning</b>	Water	Water from rivers and streams for human consumption and recreation
	Flora and fauna	Animals and vegetation that live in the forest, including endemic, endangered, and vulnerable species
	Forest products	Forest and plant products, including wood, fiber, seeds, vines, ornamental plants, medicinal plants, and food (e.g., fruit, vegetables, fisheries)
<b>Regulating</b>	Water purification	Cleaning and purification of water through sediment reduction and water pollutants filtration
	Air purification	Filtering and absorption of air pollutants
	Temperature regulation	Shade, cool air, reduction of temperature
	Natural hazard moderation	Protection against, and damage reduction from, natural hazards, including tropical storms, flooding, and landslides
	Carbon sequestration	Capture and storage of carbon dioxide and their role in reducing climate warming and change
	Soil erosion control	Soil retention and prevention of soil loss due to rain and wind
<b>Socio-cultural</b>	Scenic value	Natural beauty, pleasing landscapes, beautiful views
	Spiritual value	Religious practices and beliefs associated with the forest; a place to pray, meditate, seek spiritual fulfillment
	Human well-being	Mental and physical health, including therapy, tranquility, relaxation, peace, contact with nature, space for sociability, physical exercise
	Recreation	Passive and active recreation, including hiking, camping, water play, bird watching, tours, picnics, family get-togethers
	National patrimony	Forest as a national symbol, historic importance, cultural identity, sense of place, folklore, artistic expression
	Research and education	Advance of scientific knowledge and knowledge transfer; forest use for educational activities, learning about nature; "natural" laboratory, hands-on activities
	Economic development	Direct and indirect income-generating activities, including tourism, guided tours, art, craft, and food selling
<b>Supporting</b>	Rainfall	Production and regulation of precipitation, humidity, and evapotranspiration
	Oxygen production	Production of air; named by some as "the lung" of the region
	Soil formation	Soil production through the weathering of parental material and decomposition of organic matter
	Nutrient cycling	Flow and recycling of nutrients through processes such as decomposition and absorption
	Habitat for flora and fauna	Plant and animal habitat, refuge, shelter, and reserve for species protection
	Maintenance of biodiversity	Processes that support the diversity of plants and animals, such as reforestation, restoration, natural succession, pollination, genetic variability, evolution, migration, and ecological interaction

\*The description of each ecosystem service is based on how participants described the services, hence the descriptions do not necessarily follow any pre-established definitions.



**TABLE 2. Negative and positive drivers affecting El Yunque and the services it provides listed by all groups\*, from most to least negative or positive effect.**

EFFECT		DRIVER
NEGATIVE	most negative	Land-cover change
	↑	Lack of knowledge
		Institutional factors
		Poor land-use plans enforcement
		Lack of funds
		Inadequate waste disposal
		Forest over use
		Species introduction
		Illegal activities
		Species removal
least negative	Natural disturbances	
POSITIVE	most positive	Protected area
	↑	Recreation
		Community involvement
		Natural disturbances
		Research and Education
		Existing land-use plans
least positive		

\*All groups = Scientists, El Yunque’s forest managers, municipal planners and community leaders

**TABLE 3. Negative and positive drivers affecting El Yunque that were mentioned by individual groups.**

DRIVER		STAKEHOLDER GROUP
NEGATIVE	Lack of land-use plan	Scientists
	Telecommunication towers	Community leaders
	Climate change	Scientists, El Yunque’s forest managers
	Water over use	Scientists, El Yunque’s forest managers, Community leaders
	Hydromodification	Scientists, El Yunque’s forest managers
	Research	Municipal planners, Community leaders
POSITIVE	Interagency collaboration	Scientists, El Yunque’s forest managers
	Reforestation	Scientists
	Land acquisition	Scientists, El Yunque’s forest managers

- Some positive drivers were mentioned just by scientists and forest managers. These included interagency collaboration and land acquisition for conservation (identified by scientists and forest managers), and reforestation around El Yunque (identified by scientists) (Table 3).



Photo Credit: Antonio González Toro

**FIGURE 4. Participants from all stakeholder groups perceived recreation as a factor positively affecting El Yunque and its services.**

## Conclusion

Participatory listing, ranking, and scoring helped identify the stakeholder groups’ varied knowledge of El Yunque’s ecosystem services and drivers of ecosystem change. They also helped to identify the ecosystem services that were perceived as most important by the stakeholders and to highlight gaps in and the need for information. In this study, for example, water was identified by all stakeholder groups as the most important ecosystem service provided by El Yunque. The topic of water can thus be used as a starting point to exchange information, promote learning, and initiate collaborative projects and actions that maximize sustainable water use and minimize factors that adversely affect water. Gaps in information were also identified through the listing of ecosystem services. For example, carbon sequestration and its effect on climate change, and nutrient cycling were only identified by scientists and forest managers. Such gaps help identify new topics that need to be highlighted in future education and awareness-raising efforts, as well as the groups to which these efforts should be targeted (in this case, community members and municipal planners). Land-cover change was consistently identified by all groups of stakeholders as a factor influencing El Yunque, and it scored as one of the most influential factors driving ecosystem change around El Yunque. Hence, increasing knowledge about how land-cover change can influence forest functions and ecosystem

services can help promote participatory actions to influence land-use decision making.

In this project we used participatory listing, ranking, and scoring to identify people's knowledge and perception about the ecosystem services provided by El Yunque and the factors affecting the forest and the services it provides. Forest managers, natural resource specialists, and others can use these techniques to

- understand stakeholder perceptions and knowledge regarding different environmental 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.

Having better information about the elements mentioned above can help forest managers, natural resource managers, and others develop and implement initiatives that promote participatory management and conservation of ecosystem services.

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## Suggested Readings

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