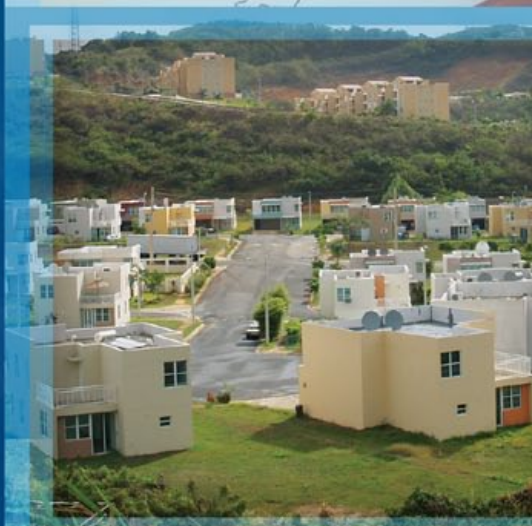
EL YUNQUE
ECOSYSTEM SERVICES

Participatory Mapping of Land-Cover Change

Tania López-Marrero and L. Annie Hermansen-Báez



Introduction

Forest ecosystems provide services that are essential for human health and well-being. The availability of these ecosystem services is influenced by the type of land cover surrounding forests. Because land-cover change occurs in different places across the landscape, for instance in different neighborhoods and municipalities, changes may go unnoticed by local residents and those who make land-use decisions and design policy regarding their management. Knowledge about the spatial distribution of land-cover changes is important for developing wise land-use policies and management options that minimize the potential effects of these changes on forest ecosystems and their services.

Participants in a recent study identified surrounding urban expansion as one of the main factors affecting El Yunque National Forest (El Yunque) and the services provided by the forest (see "Participatory Listing, Ranking, and Scoring of Ecosystem Services and Drivers of Change", another publication within the "El Yunque Ecosystem Services" series for more information). Participatory sketch mapping was used to further investigate participants' knowledge and perceptions about the geographic distribution of urban expansion around El Yunque, specifically within the eight municipalities having a portion of the forest within their boundaries. People's knowledge (or lack of knowledge) about the spatial distribution of the expansion of urban areas around the forest can affect land-use decision making and policy at different levels. The participatory sketch mapping exercise was conducted with four groups of stakeholders: (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 near El Yunque. The exercise was conducted in small focus groups of 3 to 5 people, and in some cases with individual participants.

This guide provides the step-by-step instructions that we used to conduct participatory sketch mapping. The purpose of the guide is to provide national forest managers, natural resource specialists, and researchers with a tool that can be used to investigate people's understanding of geographic factors affecting forests or natural resources in general. The guide also includes the main findings of this study.

Materials

The materials used for conducting participatory mapping techniques vary in levels of sophistication depending on what is locally available and how much base information participants need to be given so that they can take part in the activity. In our study we used a piece of paper (36 x 24 inches with a group, 8.5 x 11 inches with individuals) with some geographic features and borders of the study area (municipal and neighborhood boundaries; major rivers; the El Yunque boundary; and the proclamation area, which is the area outside the administrative boundaries of El Yunque where the U.S. Forest Service has the authority to purchase land to expand its area for forest conservation purposes) as the base map so that participants could delineate the areas in which they believed urban expansion was occurring around El Yunque. The participants used colored pencils to identify the different areas.

The Process

Participatory sketch mapping is one of the most versatile and innovative adaptations of conventional cartography (the science and art of expressing through maps the natural and social features of the earth). In this project, participatory sketch mapping was used to understand participants' knowledge and perceptions about the geographic distribution of urban expansion around El Yunque. In participatory sketch mapping, geographic and cartographic precision are not as important as identifying, counting, estimating, ranking, comparing, and discussing the spatial distribution of particular features or processes on the land.

The following steps describe the process we used to conduct participatory sketch mapping with groups of stakeholders and individuals.

Participatory Sketch Mapping

1. A facilitator explained the purpose of the mapping exercise to participants, emphasizing that the purpose of the map is to identify known or perceived areas of urban expansion around El Yunque rather than to produce a map with precise geographic features and dimensions.
2. The facilitator then described to participants the base map with reference points and made sure each participant understood where his or her community or work area lies within the mapped study area.

Photo: Tania López Marrero

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FIGURE 1. Participants drew the boundaries of where they perceived that urban expansion is occurring around El Yunque, either in groups (1A) or individually (1B).

3. Participants were then given colored pencils and asked to draw the boundaries of the areas where they perceived that urban expansion was occurring around El Yunque. Participants were asked to take turns to mark the areas of urban expansion on the map. Participants were allowed to circle areas even if they had already been circled by previous participants (Figure 1).
4. After all participants had marked the areas on the map, they were asked to collectively study the map and comment on each other's identified areas. They could change, delete, or add new areas until all of them agreed on a final map.

Comparison of Participatory Maps

1. After compiling all the participatory maps, a specialist in Geographic Information Systems (GIS) digitized all the maps into GIS (Figure 2).
2. Using GIS, all the maps from each individual stakeholder group (e.g., community members) were combined to create a "composite map" for that group (Figure 3). This permitted comparison of the maps between groups, and thus comparison of stakeholders' knowledge about urban expansion around the forest.

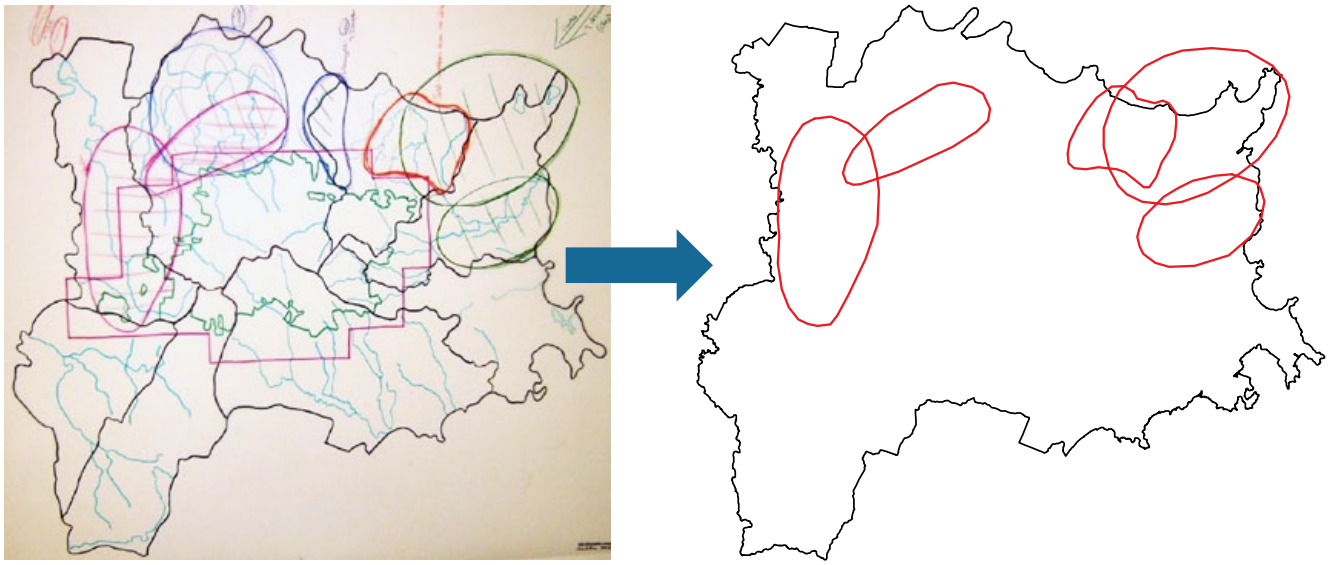

FIGURE 2. An example of a participatory map developed by one group of participants (left) and the subsequent digitized GIS version of areas of urban expansion (right). Only the areas identified as experiencing urban expansion were digitized into GIS.

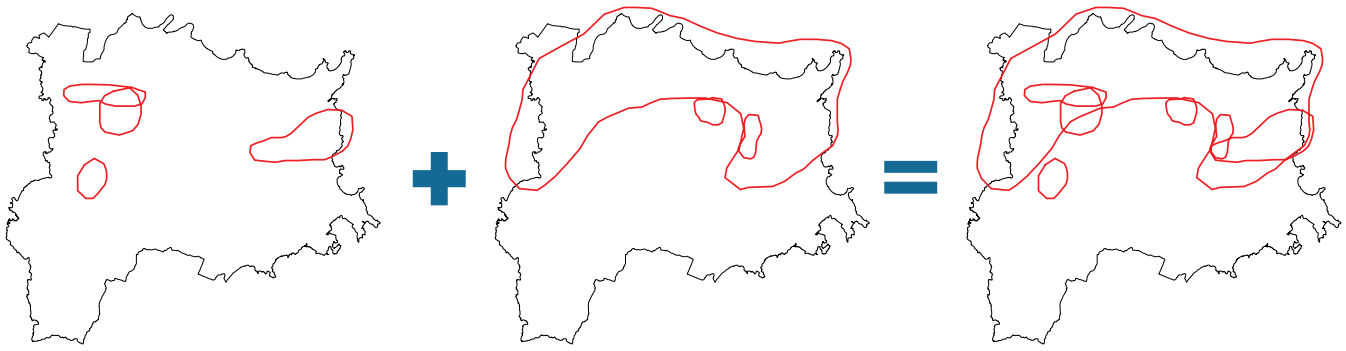

FIGURE 3. An example of the procedure that was used to create a "composite map" of perceived areas of urban expansion for a group of stakeholders. Digitized participatory maps were developed for two focus groups of the same stakeholder group (left) and then combined to create the "composite map" for that group (right).

3. The composite maps from each stakeholder group were then combined into an "overall map" using GIS (Figure 4). This allowed for comparison of the map created with information from all the stakeholder groups to the map that showed actual urban expansion. This comparison can help determine the gap in knowledge between where urban expansion is perceived to be occurring and where it is actually occurring.

Comparison of Perceived and Actual Urban Expansion

1. A GIS specialist analyzed the information about actual urban expansion using aerial photographs from 1998 and 2010. The specialist analyzed the aerial photographs to create urban land-cover layers for each year, and to determine the changes that occurred between 1998 and 2010 (See "Expansion of Urban Land Cover around El Yunque National Forest", another publication within the "El Yunque Ecosystem Services" series for more information).
2. To compare perceived versus actual occurrence of urban expansion, the "overall map" created by the stakeholders was then superposed on top of the actual map containing information about the occurrence of urban expansion around El Yunque.

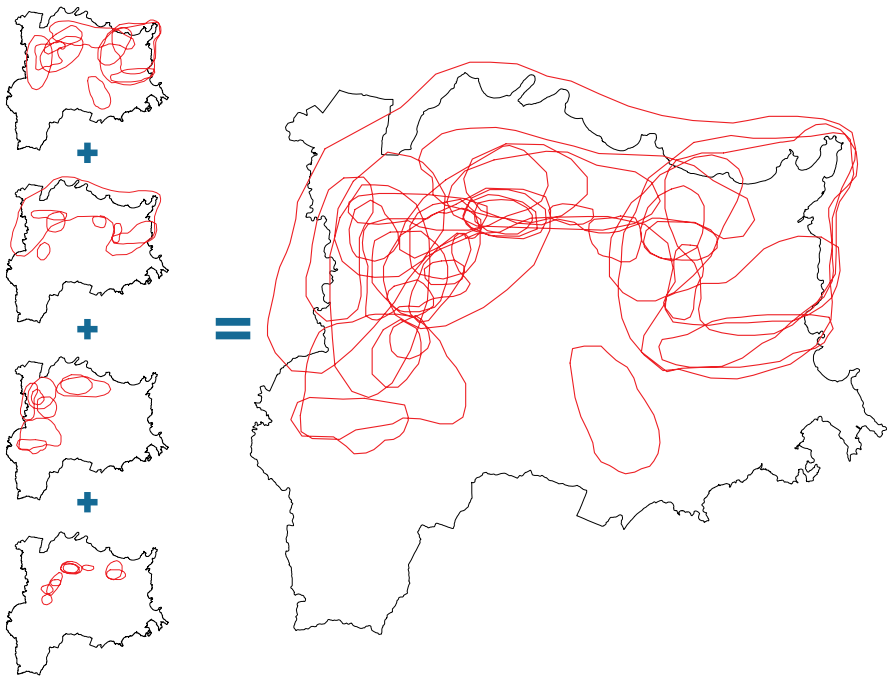

FIGURE 4. An example of the procedure used to create the "overall map" of perceived areas of urban expansion from all four stakeholders' composite maps.

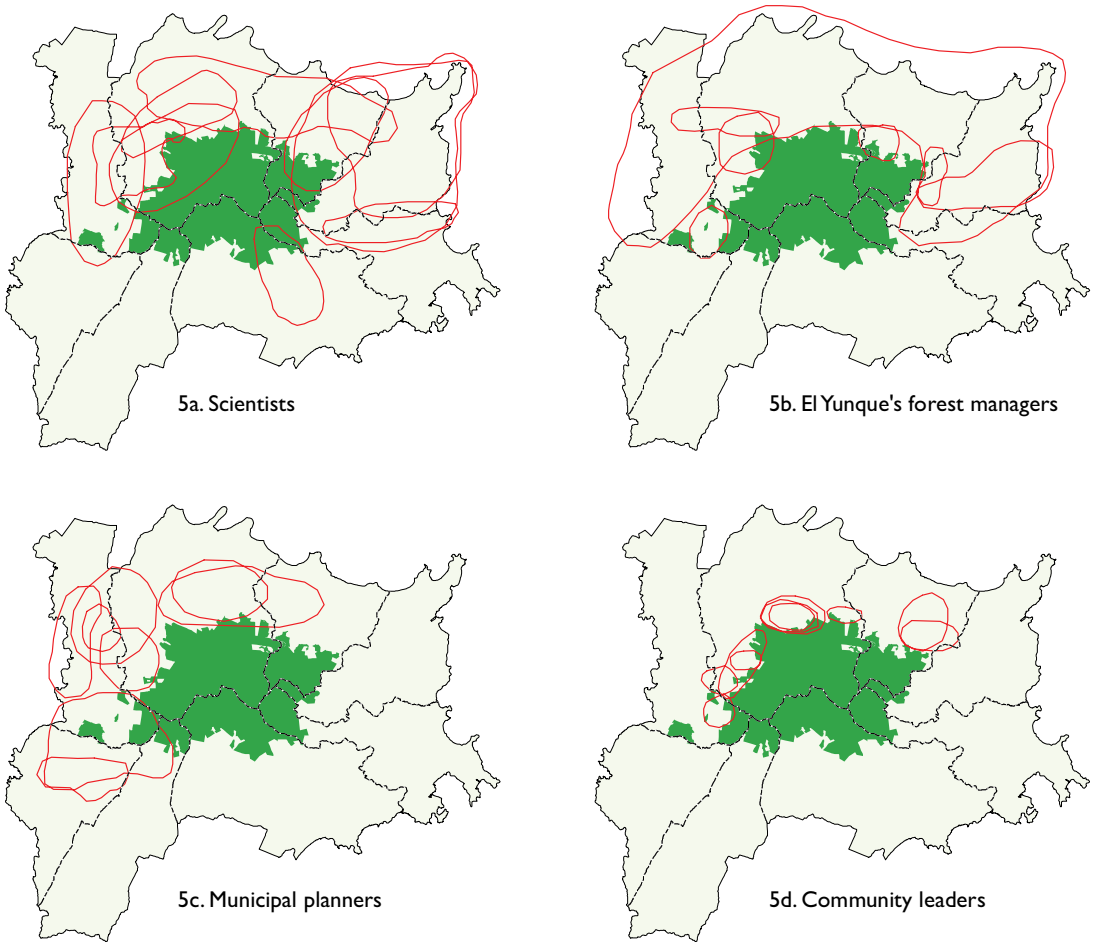

FIGURE 5. Urban expansion around El Yunque as perceived by each group of stakeholders.

Key Findings

Perceptions of Urban Expansion around El Yunque

- Scientists and forest managers identified broader areas of urban expansion than other stakeholder groups (Figures 5a and 5b). Most stakeholders identified areas west, north, and east of El Yunque as the areas where most urban expansion is occurring. Only one group of scientists identified an area southeast of the forest as an area experiencing growth.
- Municipal planners identified areas of urban expansion farther north and farther west of El Yunque (Figure 5c).
- Community leaders naturally identified areas of urban expansion closer to their own communities. Emphasis was given to areas west and north of El Yunque, close to the forest boundary (Figure 5d).
- There was a general perception among stakeholders that urban expansion is taking place mostly in areas farther west, north, and east of El Yunque, while areas south of the forest were not perceived to be experiencing much expansion (Figure 6).

Perceived and Actual Urban Expansion around El Yunque

- Participants correctly identified areas north of El Yunque as areas that experienced urban expansion. These changes, however, mostly occur farther away from the forest boundary, in lower and flatter lands, and not as close to the forest boundary as generally perceived (Figure 7).
- Most stakeholders did not identify areas of urban expansion that took place south of El Yunque. Municipal planners identified some of this urban expansion to the south of El Yunque and one group of scientists identified a portion on the southeastern part as well. However, actual changes are occurring in areas farther from the forest boundary than the changes perceived by these participants (Figure 7).

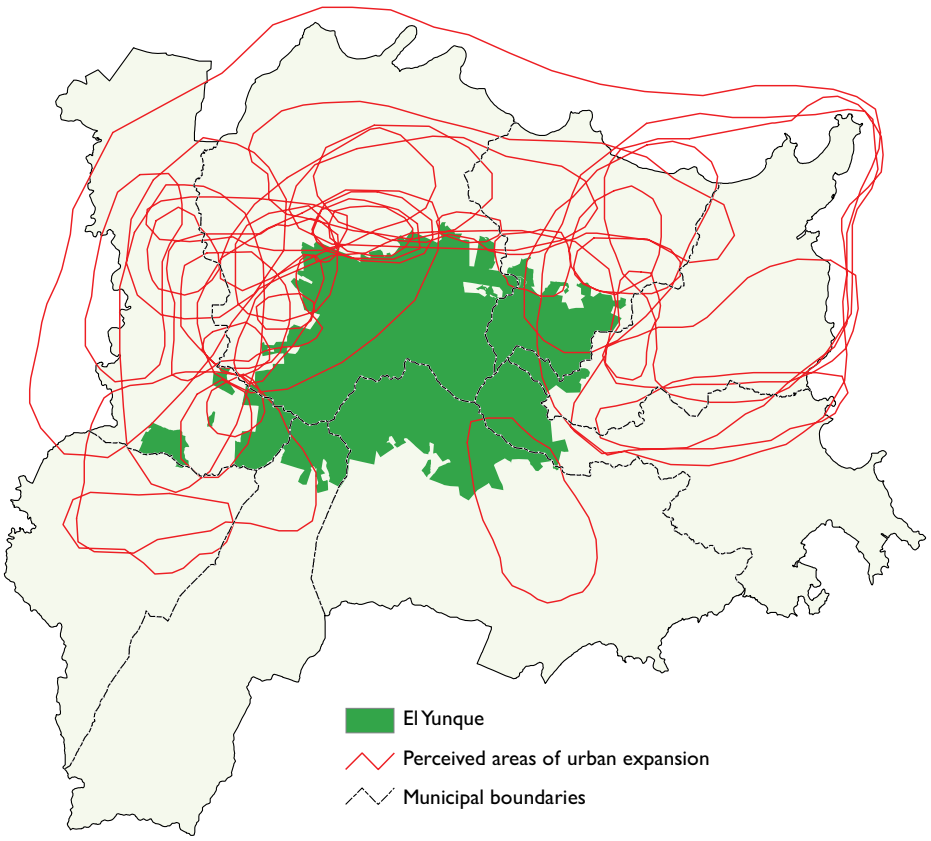

FIGURE 6. An overall map showing participants' perception of urban expansion around El Yunque.

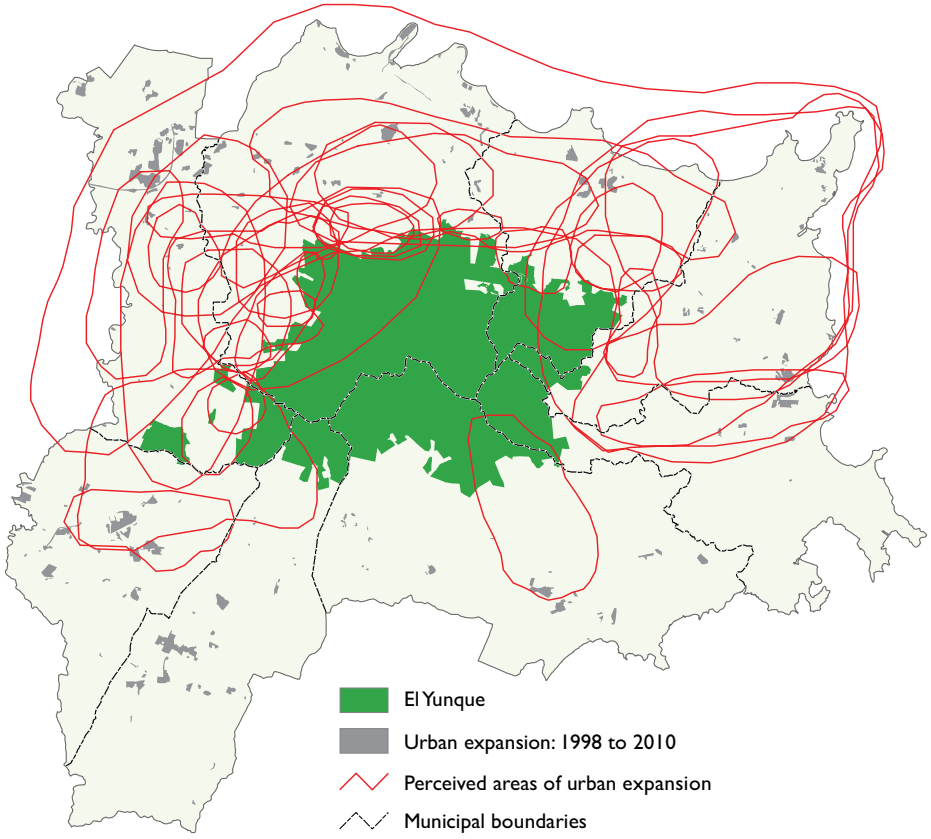

FIGURE 7. Perceived and actual urban expansion between 1998 and 2010 around El Yunque.

Conclusion

Participatory mapping helped determine the knowledge and perceptions that stakeholders have about urban expansion in the areas surrounding El Yunque. The mapping exercise also identified a gap in knowledge about the geographic distribution of urban expansion around the forest. Knowing where urban expansion is actually occurring can help guide effective land-use planning and foster informed land-use policies and management practices that minimize the potential effects of urbanization on El Yunque and the services provided by the forest. For instance, areas southeast of El Yunque are not as urbanized as areas north and northeast of the forest (see "Land Cover Within and Around El Yunque National Forest", another publication within the "El Yunque Ecosystem Services" series for more information), thus providing an opportunity to proactively plan for projects that can protect El Yunque and its services. For example, forest corridors can be created across the landscape—from the mountains to the coast—while it is still connected and open space still exists. But such projects need to be developed and implemented soon because these areas are just starting to experience urban expansion. This was made evident from the analysis of urban land-cover change from 1998 to 2010 (see "Expansion of Urban Land Cover around the El Yunque National Forest" another publication within the "El Yunque Ecosystem Services" series for more information).

Participatory sketch mapping is an easy-to-conduct technique that can generate useful information about how people understand and perceive the occurrence of urban expansion or other processes across the land. Forest managers from other national forests, natural resource specialists, practitioners, and researchers can make use of participatory mapping techniques to investigate people's understandings of an array of spatial processes and factors that are related to natural resources and the services these resources provide.

Suggested Readings about Participatory Mapping

Corberr, J. 2009. Good practices in participatory mapping. rome: international fund for agricultural development. http://www.ifad.org/pub/map/PM_web.pdf [Date accessed: September 4, 2010].

Kumar, S. 2002. Space-related PRA methods: social and resource maps. in: methods for community participation: a complete guide for practitioners. London: Intermediate Technology Publications: 53–79.

Mascarenhas, J.; Kumar, P.D.P. 1991. Participatory mapping and modeling users' notes. RRA Notes. 12: 9–20.

Pretty, J.N.; Guijt, I.; Thompson, J. [and others]. 1995. Exercises for diagramming and visualization: mapping your own town or city. In: Participatory learning and action: a trainer's guide. London: International Institute for Environment and Development: 235–236.

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- Urbanization Trends and Zoning around El Yunque National Forest
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For more information

For more information or if you have questions, contact Annie Hermansen-Báez, 352-376-3271, ahermansen@fs.fed.us