



United States
Department of
Agriculture



El Yunque
National Forest

Revised Land Management Plan



Forest
Service

Region 8

El Yunque
National Forest

R8-MB 152 A

August
2018

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer and lender.

Revised Land Management Plan

El Yunque National Forest

Responsible Agency: USDA Forest Service

Responsible Official: Sharon Wallace, Forest Supervisor
El Yunque National Forest
HC-01, Box 13490
Rio Grande, PR
00745-9625

For Information Contact: Pedro Rios, Project Leader
El Yunque National Forest
HC-01, Box 13490
Rio Grande, PR
00745-9625
<http://www.fs.usda.gov/elyunque>

This page left intentionally blank

Table of Contents

1	Introduction.....	1
1.1	Plan Purpose.....	1
1.2	Plan Components.....	2
1.3	Forest Plan Structure.....	3
1.4	Location of the Plan Area.....	4
1.5	Plan Relationship to Other Documents.....	6
1.6	Distinctive Roles and Contributions of El Yunque.....	6
1.7	Vision and Management Themes.....	8
	What is Shared Stewardship?.....	9
2	Geographic Management Area Direction.....	11
2.1	Geographic Areas.....	11
2.1.1	El Yunque Region: Current Conditions and Trends.....	11
2.1.2	Benefits of Identifying Geographic Areas for El Yunque Region.....	15
2.1.3	El Yunque National Forest Geographic Areas.....	16
2.1.4	El Yunque National Forest Management Areas.....	21
2.2	Suitability of Lands.....	43
2.3	Suitability for Timber Harvesting.....	44
3	Desired Conditions for El Yunque National Forest.....	47
3.1	Ecological Sustainability and Diversity of Plant and Animal Communities.....	48
3.1.1	Climate Change Response.....	48
3.1.2	Terrestrial Ecosystem: Vegetation.....	48
3.1.3	Functional Wetland.....	51
3.1.4	Aquatic Ecosystems.....	54
3.1.5	Riparian Management Zones.....	54
3.1.6	Air/Resource Quality.....	55
3.1.7	Soils.....	56
3.1.8	Water Resources.....	57
3.1.9	Wildlife and Fisheries.....	58
3.1.10	At-Risk Species: Fauna.....	59
3.1.11	At-Risk Species: Flora.....	61
3.2	Social and Economic Sustainability and Multiple Use.....	62
3.2.1	Socio-economics.....	62
3.2.2	Broader Landscape and Lands.....	64
3.2.3	Environmental Education.....	65
3.3	Multiple Uses.....	67
3.3.1	Ecosystem Services.....	67
3.3.2	Recreation.....	68
3.3.3	Forest Products.....	75
3.3.4	Watershed.....	77
3.3.5	Special Uses.....	78
3.3.6	Scenic Character.....	79
3.3.7	Cultural and Historic Resources.....	83
3.3.8	Facilities and Transportation.....	86
3.3.9	Minerals.....	88
3.3.10	Large-scale Disturbances.....	88
4	Monitoring and Evaluation.....	91
4.1	Focal Species for Monitoring.....	92

4.2 Monitoring Questions, Indicators and Adaptive Management Strategies..... 95

5 References Cited 113

Appendix A: Management Situations for the Elfin-woods Warbler in the New Land Management Plan for El Yunque National Forest..... 117

 Introduction 117

Appendix B: Forest Products within the Community Interface Resource Management Area 121

 Silvicultural Products 121

 Methodology..... 121

 Forest Yield 122

 Timber Suitability and Sustained Yield..... 122

 Planned Wood Product Sale Program..... 123

 Sustained Yield Limit 124

 Estimated Vegetation Management Practices..... 125

 Special Forest Products (Non-Timber)..... 125

 Special Forest Product Strategic Goals 126

Appendix C: Priority Watersheds 127

Appendix D: Forest Designation Area Map 130

Appendix E: List of At-Risk Species..... 131

List of Tables

Table 2-1. Total area and national forest area in El Yunque Region..... 12

Table 2-2. Forest Plan geographic areas 16

Table 2-3. Geographic area collaborative groups and their relationship to the Forest 17

Table 2-4. Forest Plan management areas 24

Table 2-5. Management area acreage 25

Table 2-6. Wild, scenic, and recreation rivers (designated December 2002) 37

Table 2-7. Timber production suitability classification 45

Table 3-1. Description of management situations, sensitivity levels and guidelines..... 61

Table 4-1. Focal species for El Yunque..... 94

Table 4-2. Monitoring questions and indicators by selected plan components 95

Table 4-3. Monitoring the desired conditions for wildlife and fisheries resources..... 100

Table 4-4. Monitoring desired conditions..... 101

Table A- 1. Description of management situations, sensitivity levels, and guidelines..... 118

Table A- 2. Summary of the Elfin-woods warbler management situation concept 119

Table B- 1. Diameter at breast height (1.4 meters) periodic annual increments by Holdridge life zone with number of trees measured, standard error of the mean (SE), standard deviation of the mean (SD), and maximum observed periodic annual increment increase from Puerto Rico forest inventory data in centimeters per year* 122

Table B- 2. Timber production suitability classification 123

Table B- 3. Planned timber sale program; decadal volume outputs for the first and second decade..... 124

Table B- 4. Estimated vegetation management practices, annual average per decade (acres) 125

Table C- 1. Watershed condition classes and management strategies 128

Table E- 1. Species of conservation concern 131

Table E- 2. Threatened and endangered species 132

List of Maps

Map 1-1. El Yunque National Forest and vicinity	5
Map 2-1. Geographic area map	13
Map 2-2. Forest Plan management areas	23
Map 3-1. Existing forest types of El Yunque National Forest.....	52
Map 3-2. Functional wetland at the 1,969-foot elevation (600 meters).....	53
Map 3-3. Recreation opportunity spectrum (ROS) classes found in El Yunque	70
Map 3-4. Scenic classes within El Yunque National Forest	82
Map C- 1. Watershed condition classification	129
Map D- 1. All designated areas.....	130

This page left intentionally blank

1 Introduction

The Forest Service has developed this land management plan (also referred to as the “Forest Plan” or “the Plan”) to guide the general management direction of El Yunque National Forest during the next 15 years. This document, developed under the 2012 Planning Regulations outlined in the 36 CFR 291 2012 planning rule, is a revision of the existing Forest Plan that was prepared in 1997 under the National Forest Management Act (NFMA).

In 1997 the Forest Service developed a management plan that considered several issues and management needs. The 1997 management concept focused on conservation, particularly to protect the unique ecological resources. The planning strategy was to develop solutions to nine issues using a “plan components” approach. The idea was to obtain a formal designation for research natural areas, wild and scenic rivers, and wilderness. In addition, mature forest was protected through a series of plan components. The plan addressed the utilization of water, wildlife, and research. Social needs were addressed through recreation and access initiatives.

This Plan revision incorporates new information, addresses evolving issues and trends, accounts for changes in national policy and direction, and includes updated views from the public. The revised Forest Plan is the result of a multi-year planning process and collaboration with the public and other Federal agencies and State and local government. This Plan differs from the previous plan by focusing on an integrated vision of ecological, social, and economic sustainability and connecting to local communities. The Plan describes how we want the National Forest to look and function in the future rather than how individual projects would be implemented.

This Plan adopts an adaptive approach to land and resource management that emphasizes the importance of monitoring and learning from management effects and outcomes. Adaptive management is enhanced by partnerships with scientists, practitioners, decision-makers, and other stakeholders who learn and work together to support a management system resilient to changes in social, economic, and ecological conditions.

1.1 Plan Purpose

The purpose of this Plan is to guide future projects, practices, uses, and protection measures to ensure sustainable multiple-use management of El Yunque. This Plan describes activities that would likely be implemented, as well as the resulting public benefits and long-term improved condition of El Yunque. Per direction in CFR 219.2:

A plan does not authorize projects or activities or commit the Forest Service to take action. A plan may constrain the Agency from authorizing or carrying out projects and activities, or the manner in which they may occur. Projects and activities must be consistent with the plan (CFR 219.15). A plan does not regulate uses by the public, but a project or activity decision that regulates a use by the public under 36 CFR Part 261, Subpart B, may be made contemporaneously with the approval of a plan, plan amendment, or plan revision... The supervisor or district ranger is the responsible official for project and activity decisions, unless a higher-level official acts as the responsible official.

As required by NFMA, all projects and activities that would be authorized by the Forest Service, after the record of decision for the revised Plan, must be consistent with the Forest Plan (16 U.S.C. 1604 (i)) and its applicable plan components, as described at 36 CFR 219.15.

When a proposed project or activity is not consistent with the applicable plan components, the responsible official shall take one of the following steps, subject to valid existing rights:

- Modify the proposed project or activity to make it consistent with the applicable plan components.
- Reject the proposal or terminate the project or activity.
- Amend the plan so that the project or activity will be consistent with the plan as amended.
- Amend the plan contemporaneously with the approval of the project or activity so that the project or activity will be consistent with the plan as amended (36 CFR 219.15(c)).

1.2 Plan Components

A land management plan must include components, which provide a strategic and practical framework for managing the plan area. Plan components are applicable to the resources and issues of the plan area, and should reflect the unit's distinctive roles and contributions.

The required components of a forest plan (hereafter referred to as “plan components”) are the following:

- Desired conditions
- Objectives
- Standards
- Guidelines
- Management areas
- Geographic areas
- Suitability of National Forest lands for timber production and for various other uses

These components are defined as follows:

Desired Conditions: A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be specific enough to measure progress toward their achievement, but do not include completion dates. As noted above, desired conditions do not commit the Forest Service to take action.

Objectives: An objective is a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable financial considerations. Specific objectives and management strategies outlined in this Plan describe our approach for moving El Yunque's resources toward the desired conditions—they are stepping stones of achievement. Objectives do not commit the Forest Service to take action. Site-specific decisions to implement the Forest Plan are required.

Standards: A standard is a mandatory constraint on project and activity decision-making established to help achieve or maintain desired conditions to avoid or mitigate undesirable effects or to meet applicable legal requirements.

Guidelines: A guideline is a constraint on project and activity decision-making that allows for departure from its terms, as long as the purpose of the guideline is met.

Suitability of Lands: Specific lands within a plan area are identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. The plan identifies lands as not suitable for uses that are not compatible with desired conditions for those lands. Suitability

determinations are not made for all uses, but by law, there must be a determination of the lands that are suitable and not suitable for timber production. Lands are considered suitable for a use or uses is not a commitment to authorize such use.

Management Areas or Geographic Area: The plan identifies whether the plan components apply to the entire plan area, to specific management areas or geographic areas, or other areas identified in the plan.

In addition to requiring plan components, the 2012 planning rule requires that a plan have “other required content” (36 CFR 219.7(f)(1)) addressing priority watersheds, the distinctive roles and contributions of the plan area, a plan monitoring program, and proposed and possible actions.

Optional content in this Plan includes:

- Elfin-woods Warbler Management Approach
- Forest Products, Shared Stewardship Activities for the Community Interface Resource Management Area (CIRMA)
- Priority Watersheds
- Forest Designation Area Maps
- List of At-Risk Species

This Plan includes additional information about management strategies and partnership opportunities that can be used to coordinate the achievement of desired conditions and objectives. Management strategies describe how the Forest Service intends to move the Forest’s resources toward desired conditions, including objectives and management approaches to implementation.

1.3 Forest Plan Structure

The Plan is organized as follows:

1. Introduction. The section provides an overview of El Yunque and describes the purpose and structure of this revised land management plan. This section also describes distinctive roles and contributions of the Plan area, as well as themes generated from public involvement. Finally, it presents the Plan’s vision and general management strategies.

2. Geographic Management Area Direction. This section outlines the desired conditions and objectives for the geographic areas, management areas, and associated standard and guidelines. The suitability of various uses are also described.

3. Desired Conditions for El Yunque National Forest. This section provides the Forest-wide desired conditions and objectives, along with the Forest-wide standards and guidelines that establish sideboards for management activities and ensuring resource protection as the agency implements projects that move the Forest toward desired conditions. This section points to existing management direction (for example, public laws, regulations, Forest Service manuals and handbooks, and Federal policies) that is generally not restated in this Plan.

4. Monitoring and Evaluation. This section describes the Plan’s adaptive management strategy and monitoring program that will provide information to determine whether programs and projects are meeting Forest Plan direction, whether the Plan should be amended or revised, or if monitoring program is providing the information needed.

5. References. This section includes a list of external and internal documents relevant to understanding the plan.

Appendices. Appended materials include:

- Management Situations for the Elfin-woods Warbler in the New Land Management Plan for El Yunque National Forest
- Timber Suitability, Sustained Yield, and Forest Products within the Community Interface Resource Management Area
- Priority Watersheds
- Forest Designation Area Maps
- List of At-Risk Species

1.4 Location of the Plan Area

El Yunque National Forest (referred to as *El Yunque* or the *Forest*) is located in the rugged Sierra de Luquillo Mountains, 25 miles southeast of San Juan, Puerto Rico. The Luquillo Mountains rise abruptly from sea level at Las Cabezas de San Juan on the northeastern tip of Puerto Rico to 3,524 feet in elevation at El Toro Peak. The Forest contains 29,000 acres. Elevation ranges from about 330 to 3,533 feet above sea level. Topography is rugged, with 24 percent of the Forest exhibiting 60 percent slope or steeper.



Map 1-1. El Yunque National Forest and vicinity

The three geographic scales considered are municipal, regional, and Island wide. In Puerto Rico, a municipality is the smallest division of administrative and electoral government, similar to a county in the U.S. El Yunque is surrounded by nine municipalities in Eastern Puerto Rico: Canóvanas, Ceiba, Fajardo, Juncos, Luquillo, Naguabo, Río Grande, Las Piedras, and Humacao. These comprise more than 220,000 acres (about 347 square miles), which is about 10 percent of the Island's total area. Stretching over 29,000 acres, the National Forest covers about 15 percent of the total area of the Region.

El Yunque is the only tropical forest in the National Forest System. It is administered by a Forest Supervisor and staff. Offices are located at Headquarters and El Portal Visitor Center on PR Route 191, kilometer 4.4, south of Palmer, Río Grande. El Yunque has dual designation as El Yunque National Forest and the Luquillo Experimental Forest. Research within the Luquillo Experimental Forest is overseen and conducted by the International Institute of Tropical Forestry (IITF or the Institute). The Institute is administered by a director and staffed with research scientists, professionals, and technicians. The Institute's offices are located on the grounds of the University of Puerto Rico's Botanical Garden in Río Piedras, Puerto Rico, and the Sabana Field Research Station in Luquillo, Puerto Rico.

1.5 Plan Relationship to Other Documents

This Plan relates to a series of documents that provide strategic, local government, or regulatory guidance:

- USDA Forest Service Strategic Plan
- Puerto Rican Parrot Recovery Plan
- Flora and Fauna Recovery Plans
- El Yunque National Forest Comprehensive River Management Plan
- Municipal Zoning Plans
- Puerto Rico Department of Natural Resources Wildlife Management Strategic Plan
- Puerto Rico Water Management Plan
- Protected Areas Management Plans
- IITF Research Work Unit Description
- Designation of "Corredor Ecológico del Noreste" Natural Reserve

1.6 Distinctive Roles and Contributions of El Yunque

The Forest provides environmental, social, and economic benefits to local and regional communities, as well as to people across the Nation, making El Yunque an important and unique part of Puerto Rico.

The unique roles and contribution include:

1. The Luquillo Mountains are a major source of water for the Island. There are 34 water intakes withdrawing over 46 million gallons per day from the Forest. The mountains supply more than 20 percent of the Island's municipal water each year, with El Yunque providing an average of 9.7×10^9 cubic feet of water per year for municipal uses (Scatena and Johnson 2001).
2. The Forest represents innumerable and invaluable economic, social, and cultural contributions to local communities and beyond. The Forest contributes an estimated \$25 million in water production per year and more than \$3 million per year in wildlife viewing activities. El Yunque directly contributes over \$3.5 million to local economies through employment, expenditures, and payments

from revenue sharing and in-lieu of taxes. The Forest is located in a major touristic region, while being surrounded by resorts and natural protected areas.

3. The Forest provides opportunities for local residents and visitors to connect with the land, with each other, and with Puerto Rican history and culture. El Yunque contributes to human health and well-being, offering unique opportunities for recreation, relaxation, exercise, solitude, stewardship, spirituality, community, and many other socioeconomic and cultural benefits and beneficial experiences.
4. The major ecosystem services provided by El Yunque National Forest identified by all stakeholder groups include: clean water, habitat for flora and fauna, air purification, recreation, and scenic value.
5. People experience the unique natural setting of El Yunque through recreation and tourism. Lush and dense tropical vegetation, steep slopes, cascading streams and rivers, wildlife, varying bird diversity and hundreds of tree species make El Yunque an outstanding recreation setting for people seeking outdoor pleasure and adventure. These features make the Forest a special destination.
6. El Yunque is the only tropical rain forest in the National Forest System and is renowned for its natural scenic beauty. There are cascades, pools, and waterfalls throughout the landscape. Immensely diverse vegetation and steep landforms of El Yunque combine to make a distinctive landscape. The water, landform, and vegetation attributes provide for unique and outstanding scenic quality with a variety and vividness provided by lush and diverse vegetation.
7. Popular recreation activities include viewing scenery, nature photography, driving for pleasure, hiking, picnicking, and water play. About 80 percent of visitors participated in viewing natural features or scenery.
8. The Forest has a dual designation as the Luquillo Experimental Forest and El Yunque National Forest. The Luquillo Mountains provide an excellent natural research laboratory because they represent five subtropical life zones: Wet Forest, Rain Forest, Lower Montane Wet Forest, Lower Montane Rain Forest, and Moist Forest Life Zone (Ewel and Whitmore 1973). The Forest has a region with a rich tradition of forestry research unique among tropical forests; scientists have been active there since the end of the 19th century.
9. The Forest also contains the largest block of tropical forest essentially unchanged by human intervention in Puerto Rico.
10. El Yunque provides habitat for over 180 fauna species, of which five are federally listed species: the Puerto Rican parrot, Puerto Rican broad-winged and sharp-shinned hawks, Puerto Rican boa, and Elfin-woods warbler.
11. The Forest provides habitat for species of conservation concern, which includes 10 species of tree frogs (coquies), 2 species of anole lizards, 1 bat species, 2 bird species, 1 snail species, 5 species of fishes, and 2 species of freshwater shrimp.
12. El Yunque provides habitat for 830 native plant species. The Forest provides habitat for 8 federally listed plants species: *Callicarpa ampla*, *Eugenia haematocarpa*, *Ilex sintenisii*, *Lepanthes eltoroensis*, *Pleodendron macranthum*, *Styrax portoricensis*, *Ternstroemia luquillensis*, and *Ternstroemia subsessilis*. Within the plants species, 39 are considered species of conservation concern.

1.7 Vision and Management Themes

A vision for the Forest Plan was developed through a collaborative process with the public, stakeholders, and Forest employees. The vision on which internal and external stakeholders can rally around and reflect the uniqueness of the Forest is:

Maintain a healthy, accessible, and sustainable forest that integrates multiple uses; provides economic, ecological, and social opportunities; promotes education, environmental justice, cultural and environmental identity and awareness for the conservation of its natural resources; and adaptive forest management that is inclusive and collaborative.



What do we do?

- ◆ Help to improve and maintain the quality of life of the Forest and surrounding communities.
- ◆ Provide and promote access to the Forest and the sustainability of its resources in collaboration with the multiple socioeconomic sectors of the public that benefit from it.
- ◆ Ensure access to scientific and interpretive information available about the Forest, including its cultural resources and Forest services and products.

How will we do this?

- ◆ Collaborating in sustainable socioeconomic development and community activities that help in conserving and improving the Forest and its resources.

- ◆ Developing sustainable and collaborative projects with the public and private sectors and society at large.
- ◆ Conserving, preserving, and restoring Forest habitats and ecosystems through strategic adaptive planning, research, monitoring, and education.
- ◆ Promoting and strengthening the shared stewardship and the social and ecological identity and connectivity of the region through improved public participation and involvement in decision-making.
- ◆ Using the best science and local knowledge.

For whom will we do this?

- ◆ For the welfare of nature and society based on a local focus and global perspectives.

What is Shared Stewardship?

The concept of shared stewardship is a key factor for collaboration within El Yunque National Forest. This concept arose through conversations with the public and stakeholders. The idea of shared stewardship is culturally developed as a process of collaboration between the Forest Service (as an agency) and the public (as stakeholders and key partners). Shared stewardship takes partnerships a step further into a collaborating process, where the public contributes to land management. Shared stewardship is the strategic and site-specific engagement of Forest Service and active partners working together in general forest operations, conservation and restoration activities with a practical sense of shared responsibilities to achieve the Mission. It is important that the public and stakeholders are clear that this concept does not mean that the Forest Service has delegated its authority to make decisions on land management, but welcomes the public to contribute to identifying how the land management plan is implemented. For example, a community-based shared stewardship approach is a form of collaboration between the Forest and the community when developing a specific project. This means that when the Forest and the community develop the project together, they do so in compliance with the Forest Plan and under Forest Service authority.

In order to implement the vision, the following five core management themes were developed.

1. Promote a stronger regional identity in and around the Forest using an “all-lands approach policy.”

- Consider the ecological, social, and economic needs of the broader landscape. An area of community interface for management of resources at the lower elevations of the Forest is sustainably managed in accessible locations suitable for multiple-use management and provides for forest products.

2. Provide for healthy ecosystems.

- Conserve and restore ecosystems. Protect and conserve the functional wetlands and primary forest and maintain or improve watershed conditions on the Forest while monitoring, adapting, and mitigating the effects of climate change.

3. Incorporate collaborative adaptive management at the Plan and site-specific levels.

- Sustain and develop partnerships. Continue current regional collaboration efforts engaged in conservation, management, land use and research in a sustainable manner while continuing to

explore opportunities for further partnership efforts. Shift priorities from primarily a Forest Service-driven-management to a more collaborative management. Partnership opportunities and collaboration arrangements support the achievement of desired conditions and objectives of the Plan.

- Integrate Commonwealth, Municipal and Federal agencies and stakeholders in conservation efforts. Facilitate and coordinate a collaboration framework by integrating agencies and concerned citizens of the region in processes to request support or funds for programs and promote outreach for incentive programs available for private landowners in the areas adjacent to the Forest.
- Provide opportunities for research. Develop initiatives with agencies and stakeholders such as Government agencies, non-governmental organizations, academic institutions, and citizen science groups.

4. Define a recreation, access, and tourism system.

- Provide for sustainable recreation. The Forest provides sustainable recreation opportunities that are in harmony with the natural setting and where people enjoy and value its unique tropical ecosystem. It also includes the protection and maintenance of historical and cultural resources. Future demands and limited agency resources will require public support and new partnerships to improve recreation facilities and services on the Forest, as well as the capacity to support recreation usage without causing damage to the environment.

5. Increase regional environmental literacy and educating local communities.

- Connect the surrounding communities to the Forest's natural landscapes. Assist in developing community capacity for participation in various management activities in areas such as interpretation, education, recreation, economic development, conservation, restoration, research, and monitoring. Identify and overcome barriers that inhibit these populations from connecting socially, culturally, and economically to the natural landscapes within and surrounding the Forest.

2 Geographic Management Area Direction

The Planning Rule requires the development of plan components that provide a strategic, practical, and integrated framework for managing the plan area and its array of ecological, economic, and social resources and issues. These plan components guide decisions and activities in and around the Forest and may apply to the entire plan area; to specific parcel(s) of land; and/or to specific land covers, uses, or characteristics. Land management plans must indicate where each plan component applies through the identification of management areas or geographic areas, or both. A management area is “a land area identified within the planning area that has the same set of applicable plan components [but] does not have to be spatially contiguous” (36 CFR 219). A geographic area is “a spatially contiguous land area identified within the planning area [and] may overlap with a management area” (36 CFR 219). Both types of planning tools are proposed for El Yunque.

2.1 Geographic Areas

Geographic areas typically represent large portions of the planning area that encompass desired conditions that can span a range of resource management emphases. They allow for the place-based development of a long-range vision for that portion of the planning area, which can be adapted to internal and external changes over time.

Given the distinct characteristics of the planning area and the surrounding landscape, geographic areas are identified to permit the development of integrated management strategies that recognize the distinct ecological, economic, and social conditions that exist at the sub-regional level around the Forest. For El Yunque, these geographic areas will facilitate an “all-lands approach” to planning and management that supports cross-boundary work with neighboring and nearby landowners and communities, as well as with State, Federal, and other land management and governmental agencies. Moreover, the management direction for these geographic areas can be tiered to the differentiated roles that the Forest serves in its interactions with local communities and their economies, cultures, and ecological services, particularly in terms of tourism, recreation, and environmental education.

The geographic areas proposed for the Forest were identified through an interdisciplinary process that considered the range in ecological, economic, and social conditions and trends at the sub-regional level. Input on the development of geographic areas was collected through participatory planning meetings with local communities, protected area managers, recreation outfitters, municipal governments, business representatives, and professional groups. This input was analyzed, alongside information from the planning area assessment and other sources, by the interdisciplinary team in the determination and mapping of three geographic areas of El Yunque.

2.1.1 *El Yunque Region: Current Conditions and Trends*

The region surrounding El Yunque is delineated by nine municipalities: Canóvanas, Ceiba, Fajardo, Humacao, Juncos, Las Piedras, Luquillo, Naguabo and Río Grande (map 2-1). Within this region, there is a broad range in community characteristics, environmental conditions, and land ownerships that are well suited for an “all-lands approach” to resource management and collaboration (map 2-1). Together, these nine municipalities extend over 347 square miles (about 220,000 acres), which is about 10 percent of Puerto Rico’s total area (table 2-1). Eight of the nine municipalities have some of their land base within the boundaries of the Forest, ranging from less than 1 percent in Juncos to more than 33 percent in Río

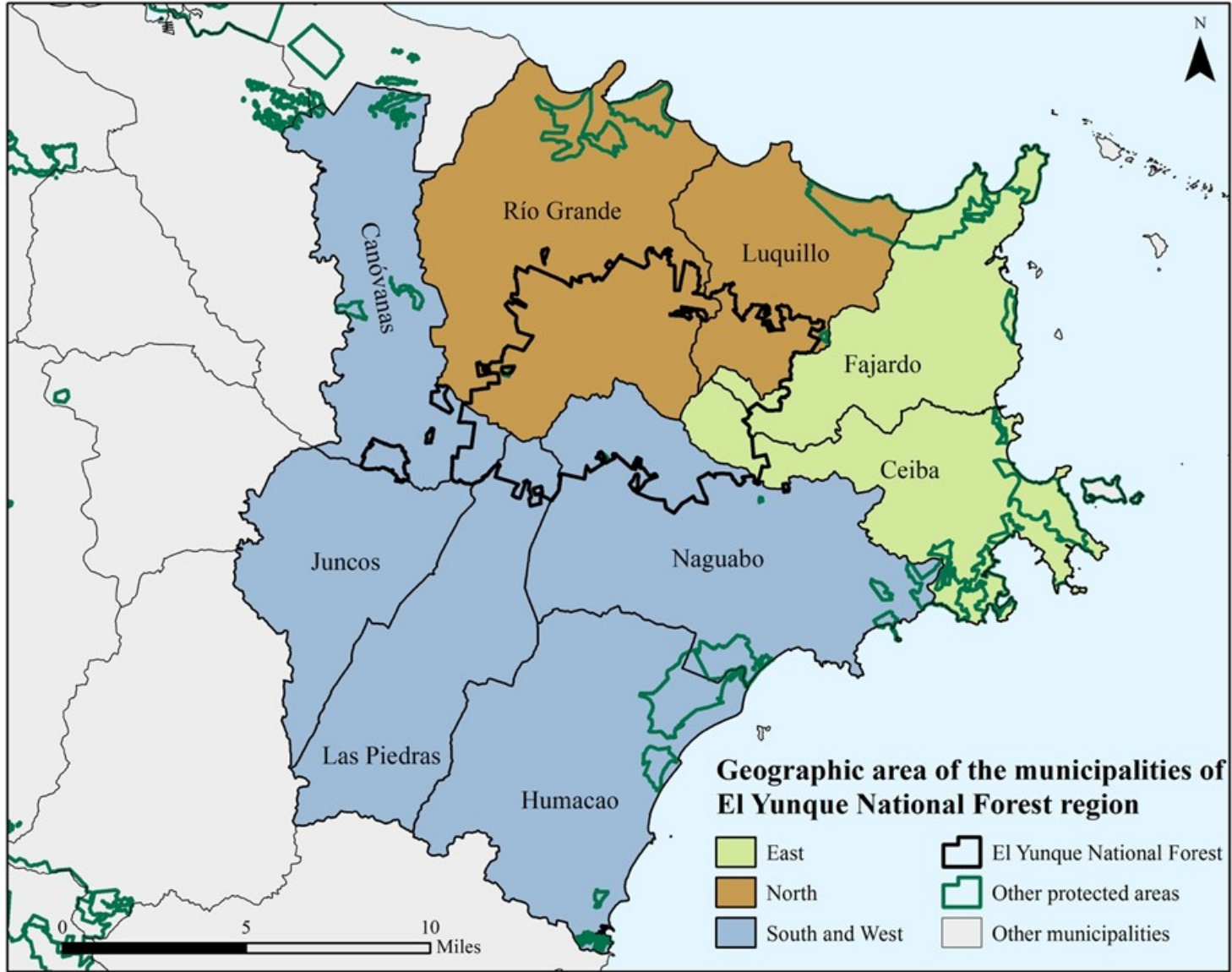
Grande. Humacao is the only municipality in the region without land within the Forest boundary, but is included in the region for landscape connectivity.

Table 2-1. Total area and National Forest area in El Yunque Region

	Total Area (square miles)	Total Area (acres)	National Forest Area (square miles)	National Forest Area (acres)	National Forest Acreage (percent)
Canóvanas	33.00	21,121	3.19	2,042	9.7
Ceiba	29.26	18,729	3.34	2,135	11.5
Fajardo	30.23	19,348	0.95	608	3.2
Humacao	55.46	35,494	0	0	0
Juncos	26.59	17,017	0.03	21	0.1
Las Piedras	33.89	21,692	1.98	1,268	5.8
Luquillo	25.79	16,503	5.62	3,599	21.6
Naguabo	51.78	33,141	8.38	5,360	16.1
Río Grande	60.85	38,943	20.26	12,969	33.2
Region	346.86	221,988	43.75	28,002	12.6
Puerto Rico*	3,515.00	2,249,600	43.75	28,002	1.2

*includes off-shore islands

Of the municipalities surrounding El Yunque, Humacao is the largest in terms of area (55.5 square miles). Río Grande encompasses the largest area of National Forest System land within its borders (20.26 square miles; 33.2 percent of its total land base). Juncos is the smallest of the region’s municipalities and encompasses the smallest area of National Forest System land (0.03 square miles, 0.1 percent of municipality).



Map 2-1. Geographic area map

El Yunque Region comprises coastline, plains, hills, and mountains within a complex matrix of land covers and uses (Gould et al. 2012). In 2010, the forest was the most abundant land cover type in the region (43 percent), followed by pasture, including agricultural lands (36 percent), and urban/built-up areas (10 percent) (López-Marrero and Hermansen-Báez 2011a).¹ At the sub-regional level, forested land cover ranged from 55 percent in Luquillo to 26 percent in Juncos (López-Marrero and Hermansen-Báez 2011a). Pasture and agricultural land cover were most dominant in Las Piedras (54 percent) and urban/built-up land cover was most dominant in Fajardo (16 percent) (López-Marrero and Hermansen-Báez 2011a). From 1998 to 2010, urban/built-up land cover increased by more than 3,000 acres (21 percent) in the eight municipalities adjacent to El Yunque (López-Marrero and Hermansen-Báez 2011b). Juncos and Canóvanas experienced the greatest increase in the percent of urban/built-up area, while Ceiba experienced the smallest increase in this land cover type (López-Marrero and Hermansen-Báez 2011b).

In 2014, nearly 330,000 people lived in the nine municipalities comprising El Yunque Region (U.S. Census Bureau 2015). The density of the regional population was about 978 persons per square mile, ranging from 470 persons per square mile in Ceiba to 1,521 persons per square mile in Juncos (U.S. Census Bureau 2015). The region accommodated a growing population and an increasing percent of Puerto Rico's total population through the early 2000s. This led to some of the highest population density rates in the world; extensive expansion in housing, infrastructure, and other built-up areas; and ultimately, more than 95 percent of the regional population being classified as 'urban' by the U.S. Census Bureau (2015). Nevertheless, following the Island wide trend that began in the mid-2000s, it is estimated that El Yunque Region also is experiencing a decline in population. Between 2010 and 2014, the regional population is estimated to have decreased by 2.65 percent (0.67 percent decrease per year) (U.S. Census Bureau 2015). Fajardo and Ceiba experienced the highest rates of population loss in this time period (1.99, 1.88 percent drop per year, respectively) (U.S. Census Bureau 2015). The shift from population growth to decline is attributed mainly to emigration from the region spurred by ongoing economic issues, in combination with longer-term declining birth rates.

The age structure of the regional population also demonstrates recent measurable changes. The regional median age has been increasing slowly over the past several decades, ranging from 34.3 to 37.7 years in 2014 (Naguabo, Ceiba, respectively) (U.S. Census Bureau 2015). Through the end of the 20th century, the municipalities surrounding the Forest demonstrated a pyramidal age structure, which is associated with moderate population growth (that is, proportionally more of the population is found in the younger age brackets). However, by 2014 the age structure of the regional population had shifted to a more conical shape, indicating very limited to no growth as the proportion of individuals in each age group is within a small range of variation.

The regional economy is fairly diverse, with the majority of jobs in the education, health, and social services sector (21 percent), followed by retail trade (13 percent), manufacturing (12 percent), and arts, entertainment, recreation, and accommodations (10 percent). The agricultural sector provides slightly less than 1 percent of the jobs in the region, ranging from 0.45 percent in Canóvanas to 2.04 percent in Las Piedras. While the economy is fairly diverse, it has been significantly impacted as the economic crisis affecting Puerto Rico since the mid-2000s continues under increasing government debt and the high costs of doing business on the island (Cohn et al. 2014; Federal Reserve Bank of New York 2012).

Per capita and family incomes in the region have risen over the past several decades, but only modestly outpacing inflation. The unemployment rate in the region was 16.8 percent in 2010, ranging from 11.7 percent in Ceiba to 21.0 percent in Luquillo. Poverty rates in the region were high as well, with about

¹ These statistics refer to all of the municipalities in El Yunque Region, with the exception of Humacao, which was not part of the study cited.

44.2 percent of the regional population living below the poverty level as defined by the U.S. Census Bureau in 2013. Children represent a disproportionate share of the poor, with 56 percent of children living below the poverty level in 2013, ranging intra-regionally from 49.7 percent in Rio Grande to 67.5 percent in Naguabo (U.S. Census Bureau 2015).

The region surrounding El Yunque is culturally diverse and dynamic. This is reflected in the human values associated with the Forest and its resources and services, which include water conservation, soil protection, recreation, research opportunities, and scenic quality (López-Marrero et al. 2011b). The Forest itself has long-standing, deep, and significant social and cultural meaning for local inhabitants, San Juan residents, and visitors from around the world (Weaver 2012). With the Forest at its center, El Yunque Region offers unique and wide-ranging opportunities for recreation, relaxation, exercise, solitude, stewardship, spirituality, community, and many other benefits and beneficial experiences that are critical considerations for land management planning and practice.

2.1.2 Benefits of Identifying Geographic Areas for El Yunque Region

As described above, El Yunque Region represents a broad range in ecological, economic, and social conditions and trends suitable for the identification of geographic areas within the Forest. These geographic areas permit the development of specific desired conditions, objectives, goals, and other plan components conducive to effective planning and management that fit the sub-regional context. The management direction for these geographic areas is designed to promote human health and well-being and community-based economic interests at a sub-regional level.

Planning Themes of the Geographic Areas

Connecting with Communities through Recreation

The communities surrounding the Forest represent a broad range in recreation needs and demands. Not all recreation opportunities are readily accessible to all communities. For example, recreation facilities are concentrated along the PR Route 191 North corridor, deep within the Forest boundary, and at a distance from most local communities. Identifying geographic areas in line with the recreational settings available outside the Forest boundary permits increased integration of access, recreation, and tourism aspects at the sub-regional level. This also provides opportunities to better connect urban areas and rural communities to the scenic attractions, historic places, and recreation opportunities located in the lower elevations of the Forest and nearby areas. Moreover, this enables recreation planning and management that consider changes in sub-regional populations and visitation patterns at the local level. Geographic areas also allow for targeted community interaction and assistance, as well as opportunities for collaborative management.

Increasing Environmental Literacy and Education

While the regional population has a fairly high level of education, there is a measured gap in knowledge regarding Forest planning and management among neighboring and nearby communities, and among the youth, in particular. Identification of geographic areas at the sub-regional level provides opportunities to increase environmental literacy and education and ultimately, to improve the public's capacity to participate locally in forest conservation and sustainable management. This also allows for the expansion of traditional Forest Service programs by integrating schools and municipal governments in planning and projects, and adapting educational and interpretation materials to the local context. Additionally, identifying geographic areas permits the identification of and support for targeted volunteer and partnership opportunities related to environmental literacy and education.

Enhancing Landscape-Scale Conservation Efforts

Forested areas represent the largest portion of land cover in El Yunque Region and forested cover has increased over the past several decades. Although hurricanes continuously alter forest cover, there is constant natural regeneration and forested areas continue to be the dominant land cover type at El Yunque. Nonetheless, urbanization is increasing at a much more rapid pace, resulting in landscape fragmentation and negative effects on the Forest and other natural areas in the region. Moreover, many of the negative effects of urbanization are likely to be compounded in the context of global climate change. Identifying geographic areas permits the promotion of landscape scale conservation. In particular, existing collaborative arrangements and partnerships can be maintained and new opportunities for land acquisition and conservation across Forest boundaries can be pursued at the sub-regional level by working with adjacent and interested public and private land managers, landowners, and other stakeholders. The identification of geographic areas also provides opportunities for targeted conservation initiatives, such as for stream corridors, riparian areas, wild and scenic river corridors, connections to the Corredor Ecológico del Noreste Natural Reserve; and integration with conservation easements, donations, and private lands.

Strengthening Relationships and Adaptive, Collaborative Management Approaches

Although El Yunque has engaged with stakeholders and partners on many successful projects and partnerships for quite some time, large-scale and long-term public participation efforts have been limited. Identification of geographic areas allows the Forest to increase its engagement with local community stakeholders and Forest users as prescribed in the new planning rule. Moreover, it allows the Forest to maintain and build on the rich and extensive collaborative arrangements that have evolved with key stakeholders, local communities, and other actors as part of the land management planning process to date. Identifying geographic areas allows the Forest and its partners to maintain and extend open and safe spaces that promote problem-solving, creative solutions, constructive dialogue and deliberation. They can be designed to support a collaborative and adaptive approach to management, which is essential to enhanced interpretation, recreation, economic development, conservation, restoration, research, and monitoring within and beyond the Forest.

2.1.3 El Yunque National Forest Geographic Areas

The Plan contains three geographic areas for El Yunque. Table 2-2 identifies the Forest geographic areas, and highlights the key management principles for each one, while table 2-3 lists the collaborative groups by geographic area with their interests and relationships to the Forest.

Table 2-2. Forest Plan geographic areas

Name	Acreage	Description	Management Principles for the Area
El Norte	16,563	Sub-regional landscape covering the municipalities of Rio Grande and Luquillo	<ul style="list-style-type: none"> ▪ Provide access to highly developed recreation settings and connect to a regional trail system.
El Oeste y El Sur	8,691	Sub-regional landscape covering the western and southern municipalities of Canóvanas, Juncos, Las Piedras, Naguabo, and Humacao	<ul style="list-style-type: none"> ▪ Community-based land use with emphasis on environmental education and community-based enterprises.
El Este	2,745	Sub-regional landscape covering the eastern municipalities of Fajardo and Ceiba	<ul style="list-style-type: none"> ▪ Watershed management focused on quantity, restoration, and improvement. ▪ Promote “Open Space” Conservation. ▪ Collaborate with youth groups.

Table 2-3. Geographic area collaborative groups and their relationship to the Forest

Geographic Area	Collaborative Groups	Relationships
North: Rio Grande and Luquillo	Coalición Pro Corredor Ecológico del Noreste (CEN)	Protection of the Northeast Ecological Corridor of Puerto Rico
	IDS: Iniciativa de Desarrollo Sustentable	Protection of the Northeast Ecological Corridor of Puerto Rico
	Bahia Beach	Rio Espíritu Santo Watershed Council
	Río Espíritu Santo Natural Reserve Las Picuas Reserve	Rio Espíritu Biological Corridor
	Rio Grande Municipal Planner	Recreation, gateway community, scenic byway
	Luquillo Municipal Planner	Regional trail, all lands recreation
	Geoambiente	Scenery, all lands conservation, and environmental literacy
South and West: Canóvanas, Juncos, Las Piedras, Naguabo, and Humacao	La Mina Community Emergency Response Team (CERT)	Shared Stewardship Río Sabana
	Humacao Natural Reserve	Regional trail
	Extension Agrícola Las Piedras	Environmental literacy and resource protection
	'Producir'	Recreation
	Canóvanas Municipal Planner	Scenic byway, all lands recreation
East: Fajardo and Ceiba	Las Cabezas de San Juan: Fidecomiso de Conservación	Regional trail
	La Monserrate Public Park Seven Seas Natural Reserve: Fajardo	Protected area management
	Bosque Estatal de Ceiba	Watershed management
	Fajardo Municipal Planner	Watershed management
	Ceiba Municipal Planner	All lands and forest management
	Centro para la Conservación del Paisaje (CCP) Interamerican University of Puerto Rico, Fajardo	Proyecto de Liderazgo Ambiental Comunitario (PLAC)

Geographic Area: El Norte/North

What is El Norte?

The El Norte (North) Geographic Area is delineated by the portion of the Forest within the boundaries of Rio Grande and Luquillo. Together, these two municipalities encompass 86.64 square miles, including 25.88 square miles of El Yunque, which is about 30 percent of their combined total area and 59 percent of the total Forest area. Fifty-four percent of their combined area is classified as forest cover, followed by pasture (including agricultural lands) at 28 percent and urban/built-up at 9 percent (López-Marrero and Hermansen-Báez 2011). This sub-region has the highest proportion of forest cover of the three sub-regions and encompasses the largest area and proportion of National Forest System area.

El Yunque has a long historical relationship with its northern municipalities. Río Grande and Luquillo are the municipalities with the main accesses to the Forest and its recreation sites. The direct linkage to the municipality of Río Grande, and this municipality being called “City of El Yunque”, shows its close connection with the Forest both for tourism and for land use management, since it is the municipality with the largest amount of forestlands within its borders.

Luquillo also serves as a main access to the Forest. Its historic scientific relationship with the Forest is vast. The Forest is also known as the Luquillo Experimental Forest, with a research site within the Forest inside Luquillo’s municipal borders. Luquillo is also a municipality known for the many environmental organizations and stakeholders that uphold a strong connection with the forest management.

These historical bonds create the need to continue working with these municipalities and their communities as major stakeholders in land use in and surrounding the Forest.

Desired Conditions

DC1 The prevailing road access systems and a regional trail system facilitate and provide access to El Yunque through the Río Grande and Luquillo municipalities.

Goals

GO1 Provide sustainable access to the highly developed recreation settings of the Forest through the existing roads in the geographic area.

GO2 Integrate trail systems that facilitate alternative access from the municipalities of Río Grande and Luquillo to the recreational settings of the Forest.

GO3 Incorporate appealing features of the cultural and natural resources of the municipalities of Río Grande and Luquillo to the experience of accessing the Forest through this geographic region.

GO4 Develop projects that will benefit the economic and social wellness of Palmer, Río Grande, and Barrio Sabana, Luquillo.

GO5 Maintain the scenic forest landscape of the El Norte area.

Objectives

O1 Identify a trail system that will connect to a regional trail system during the first 5 years of the Plan for the areas of Río Grande, Luquillo, and the Northeast Ecological Corridor.

Management Strategies

MS1 Develop collaborative conservation and interpretation initiatives with the municipalities, residents, and organized regional groups through the plan duration.

MS2 Work with partners and/or other agencies to establish environmental flow ranges² based on an empirical water budget of El Yunque for the watersheds that drain toward the Northeast Ecological Corridor.

² Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems.

- MS3 Work with partners and/or other agencies to apply land conservation programs in forested areas of the El Norte Region that include conservation agreements, State and private forestlands as “auxiliary forests,” and land acquisition or conservation easement strategies.
- MS4 Expand use of Project Learning Tree: a Forest planning module for middle and high schools. Project Learning Tree is an environmental education program for teachers and other educators, including community leaders, to work with youth from preschool through grade 12.
- MS5 Work with the communities in developing recreational alternatives outside the Forest and bordering the Community Interface Resource Management Area (MA 4).
- MS6 Establish collaborative watershed management strategies with the communities and municipalities of the geographic area.
- MS7 Develop collaborative initiatives with the municipalities, residents, and organized regional groups for conservation and interpretation in the geographic region, with emphasis in educational activities of the region through the plan duration.

Geographic Area: El Oeste y Sur/Southwest

What is El Oeste y Sur?

El Oeste y Sur (West and South) Geographic Area is delineated by the portion of the Forest within the boundaries of Canóvanas, Juncos, Las Piedras, Naguabo, and Humacao. Together, these five municipalities encompass 200.72 square miles, including 13.58 square miles of El Yunque, which is about 6.8 percent of their combined total area and 31 percent of the total Forest area. Forty-four percent of Canóvanas, Juncos, Las Piedras, y Naguabo is classified as pasture (including agricultural lands)—the highest of the three sub-regions, followed by forest at 38 percent and urban/built-up at 10 percent (López-Marrero and Hermansen-Báez 2011b).

While these municipalities have fewer roads to access the Forest, the recently developing relationships with different stakeholders from the area have the great potential of creating an impact on the concept of broader landscape perspective and fostering more connections with the communities within these municipalities. Canóvanas has access to the Forest through the PR Route 186, which connects to the Rio Grande municipality and hence the Forest. This road connection is being further developed by local municipalities and State agencies, which see a potential touristic access to the Forest. Municipalities in the southwest, like Naguabo, Humacao, Juncos and Las Piedras, have identified the Forest as an important and valued scenic element of their daily life. The connections with environmental land-use initiatives in municipalities and their connection to the Forests’ broader landscape perspective are relevant.

Desired Conditions

- DC1 Community-based use of the Forest focuses on environmental education and community-based enterprises in the western and southern municipalities of Canóvanas, Juncos, Las Piedras, Naguabo and Humacao.

Goals

- GO1 Provide the opportunity to develop community-based enterprises associated (see appendix B) with the goods and services available from National Forest System lands in this geographic area.

- GO2 Integrate trail systems that facilitate alternative access and community-based enterprises in the western and southern municipalities.
- GO3 Incorporate the appealing features of the cultural and natural resources with environmental education and community-based enterprises in this region.
- GO4 Support economic and social wellness of municipalities of the area through collaboratively identified projects.
- GO5 Maintain the scenic forest landscape of the El Oeste y Sur area.

Objectives

- O1 Develop collaborative initiatives with the municipalities, residents, and organized regional groups for conservation and interpretation in the geographic region, with emphasis on educational activities of the region through the plan duration.
- O2 Identify a Forest trail system that will connect to other areas of interest and other trails within the geographic region in the first 3 years of the plan.

Management Strategies

- MS1 Assist community-based enterprises associated with recreational opportunities.
- MS2 Assist community-based enterprises associated with forestry opportunities in the geographic area.
- MS3 Work with partners and agencies to develop environmental flow ranges based on a water budget, to protect aquatic life.
- MS4 Work with partners and other agencies to establish land conservation programs in forested areas that include conservation contracts, special State conservation initiatives in private forest lands as “auxiliary forests,” and potential land acquisition or conservation easement strategies.
- MS5 Expand use of the Project Learning Tree planning module among middle and high schools.
- MS6 Work with the communities in developing recreational alternatives outside the Forest and bordering the Community Interface Resource Management Area. Share educational tools in order to identify potential recreational opportunities on adjacent lands.
- MS7 Establish collaborative watershed management strategies with the communities and municipalities of the geographic region.

Geographic Area: El Este

What is El Este?

The El Este (East) Geographic Area is delineated by the portion of the Forest within the boundaries of Fajardo and Ceiba. Together, these two municipalities encompass 59.49 square miles, including 4.29 square miles of El Yunque, which is about 7.2 percent of their combined total area and 10 percent of the total Forest area. Forty-two percent of Fajardo and Ceiba is classified as forest cover, followed by pasture (including agricultural lands) at 28 percent and urban/built-up at 13 percent (López-Marrero and Hermansen-Báez 2011b).

The municipal government planners for the municipalities of Ceiba and Fajardo on the eastern area of the Forest have started a dialog with the Forest to better understand the land use practices that are being implemented in the region. The Forest is also working on projects, such as the Rio Fajardo Watershed Restoration programs, which have created more alliances between the Forest and other major stakeholders in this geographic region.

Desired Conditions

DC1 The geographic area is a model for integrated watershed management in the eastern municipalities of Fajardo and Ceiba.

Goals

GO1 Maintain the scenic forest landscape of the El Este area.

GO2 Maintain the watershed connections from the higher elevations of the Forest to the coastal areas of the geographic region to produce environmental sustainability throughout the region.

GO3 Conserve the appealing features of the cultural and natural resources within this geographic region.

Objectives

O1 Engage community-based enterprises, groups, and other organizations (e.g., see table 2-3) for river, floodplain, and riparian restoration and conservation efforts.

Management Strategies

MS1 Coordinate with other land conservation efforts that include conservation contracts, special State conservation initiatives in private forest lands as “auxiliary forests,” and potential land acquisition or conservation easement strategies.

MS2 Work with the communities in developing recreational alternatives outside the Forest and bordering the Community Interface Resource Management Area. Share public outreach and education tools to help identify potential recreational opportunities on adjacent lands.

MS3 Establish collaborative watershed management strategies with the communities and municipalities of the geographic region.

MS4 Expand use of the Project Learning Tree planning module among middle and high schools.

MS5 Explore the possibilities of parking areas on private lands and the potential mobilization of trail users as part of municipality and community initiatives (example: El Toro Trail with community group “Producir Inc.” from Canóvanas).

MS6 Develop management strategies that include environmental flow ranges based on a water budget through the plan duration.

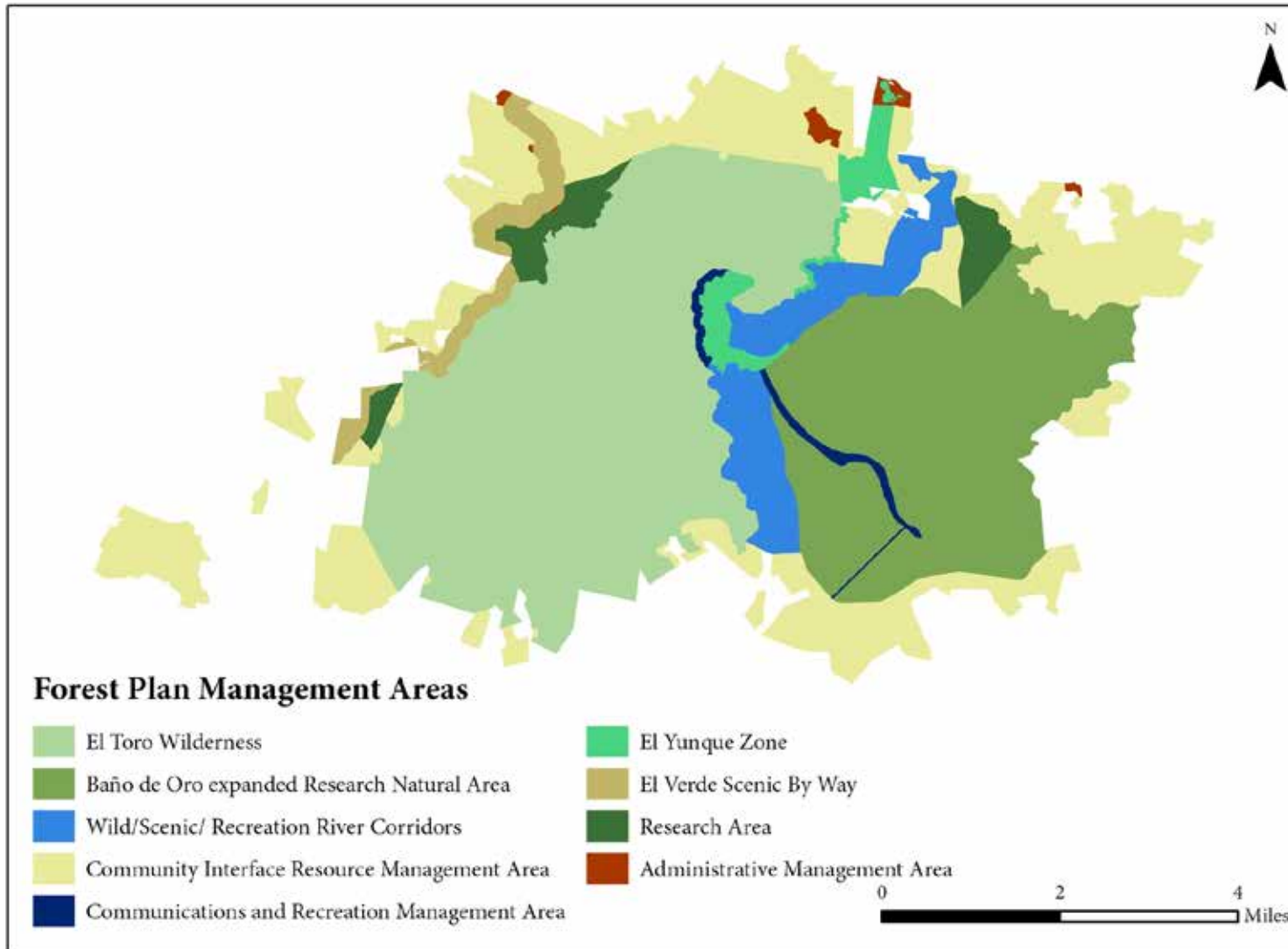
2.1.4 El Yunque National Forest Management Areas

El Yunque has delineated nine management areas that extend throughout its land cover. The management areas consist of:

- Management Area 1 as an Administrative Management Area;

- Management Area 2 as El Yunque Recreation Zone;
- Management Area 3 as Communication and Recreation;
- Management Area 4 as Community Interface Resource Management Area;
- Management Area 5 as El Toro Wilderness;
- Management Area 6 as Research;
- Management Area 7 as Baño de Oro Research Natural Area;
- Management Area 8 as Wild and Scenic Rivers; and
- Management Area 9 as Scenic Byway Management Area (PR Route 186).

These management areas were developed to seek social, economic, and ecological sustainability within the Forest lands, while considering human uses. The management areas are organized in accordance to proposed uses as well as the sustainability needs of the Forest. Each management area has different uses and plan components such as desired conditions, objectives, goals, standards and guidelines and management strategies.



Map 2-2. Forest Plan management areas

Table 2-4. Forest Plan management areas

Management Area Number	Name	Acreage	Description	Management emphasis for the Management Area
MA 1	Administrative Management Area	141	Areas occupied by El Portal Forest Center, Catalina Work Station, and other Forest Service administrative facilities.	<ul style="list-style-type: none"> Emphasis is placed on transitioning to green buildings, recycling, use of alternative energy and reducing carbon footprint. Facilities are shared with partners.
MA 2	El Yunque Recreation Zone	844	El Yunque Zone covers El Yunque Trail, Mount Britton Trail, Forest Service Road 10, and Big Tree Trail.	<ul style="list-style-type: none"> Area where emphasis is on use of existing developed recreation sites managed by capacity with strong emphasis on sustainability.
MA 3	Communication and Recreation Sites	241	Areas on El Yunque Peak and Pico del Este used for communication facilities, access roads to the communications sites, electrical powerlines and recreation sites.	<ul style="list-style-type: none"> Communication facility footprint is reduced and facilities are energy efficient. Access to recreational settings that provide unique scenic and natural experience is maintained.
MA 4	Community Interface Resource Management Area	7,187	This consolidation of lands under one management area provides sections of the Forest where an assortment of resource management practices could be applied to encourage tropical forest management initiatives in the broader landscape of El Yunque.	<ul style="list-style-type: none"> Management focuses on community-based collaborative management, and improves access to lower lands through improved existing roads and trails.
MA 5	El Toro Wilderness	10,352	Designated area on the southwestern portion of the Forest.	<ul style="list-style-type: none"> Manage the area to maintain wilderness characteristics.
MA 6	Research	789	Research, including long-term watershed studies and treatment/ control studies, is emphasized.	<ul style="list-style-type: none"> Facilitate tropical ecosystem studies at the landscape scale.
MA 7	Baño de Oro Expanded Research Natural Area	6,441	Existing and proposed expansion of research natural area. The existing Baño de Oro Research Natural Area is expanded to encompass all of the primary forest area in east half of the Forest.	<ul style="list-style-type: none"> Use for research and development, study, observation, monitoring, and educational activities that do not modify the conditions for which the research natural area was established. Manage the area for natural conditions and maintain the unique features that the RNA was established to protect.
MA 8	Wild Scenic Recreation River Corridors	1,531	Corridor along the Icacos, Mameyes, La Mina, and Upper Mameyes designated as wild and scenic rivers	<ul style="list-style-type: none"> Protection of these rivers' outstanding characteristic is emphasized.
MA 9	El Verde-Scenic Byway Management Area	697	A 0.37 mile band of the PR Route 186 right-of-way from the Community Interface Resource Management Area.	<ul style="list-style-type: none"> Protect scenery and develop PR Route 186 as a scenic byway.

Table 2-5. Management area acreage

Management Area	Puerto Rico Conservation Trust ¹	Not Recorded ²	Recorded ³	Undetermined ⁴	Grand Total
Administrative Management Area	0	0	140.8	0	141
Baño de Oro expanded Research Natural Area	0	0	6,440.8	0	6,441
Communications and Recreation Management Area	0	0	241.0	0	241
Community Interface Resource Management Area	0	0	7,187.1	0	7,187
El Toro Wilderness	0	0	10,351.8	0	10,352
El Verde Scenic Byway	20	13.9	697.3	0	731
El Yunque Recreation Zone	0	0	844.2	0	844
Research Area	0	0	789.1	0	789
Wild/Scenic/ Recreation River Corridors	0	0	1,530.8	0	1,531
Additional Tracts	35.4	305.8	0	435.5	777
Grand Total	55.4	319.7	28,223.0	435.5	29,034

1 - Lands owned by Puerto Rico Conservation Trust to be transferred to El Yunque National Forest

2 - Lands acquired by USDA Forest Service but still not registered

3 - Lands part of the Land Status Atlas

4 - Recent acquisitions

Management Area 1: Administrative

Desired Conditions

- DC1 Facilities are attractive, clean, safe, well maintained, and provide universal access.
- DC2 Administrative facilities support high quality resource protection and public service.
- DC3 Interpretive and information services provide visitors accurate information, resources, and products that enable enjoyment and develop conservation ethics for Puerto Rico and tropical forests worldwide. Highly trained, equipped, and visible Forest personnel ensure that visitors have a safe, enjoyable, and enriching experience.
- DC4 The needs of people who come to visit and use the Forest are met with services and facilities, which recognize and respect Puerto Rico's unique character and tradition of hospitality. Visitors feel a connection to their public resources and welcomed by the services they receive.
- DC5 Facilities are resilient and adapted for extreme climate events.

Objectives

- O1 Within 4 years of the Plan's approval facilities use alternative sources of energy.
- O2 Within 2 years of the Plan's approval facilities are assessed to recommend adjustments and improvements toward their resiliency and adaptation for extreme climate events.

Standards and Guidelines

- G1 Maintain or enhance habitats for cavity-associated wildlife, when habitat trees, buildings or artificial structures do not compromise the safety of Forest users.

Management Area 2: El Yunque Recreation Zone

Most of the recreation facilities on El Yunque National Forest are concentrated in this management area locally referred to as the PR Route 191 Recreation Corridor. PR Route 191 is a State road that runs north to south through the center of the Forest. The road and most of the recreation sites and trails were constructed during the 1940s by the Civilian Conservation Corps (CCC). There are numerous trailheads, parking areas, and primitive campsites located along the Corridor. There are privately owned businesses which sell food, beverages, and souvenirs to Forest visitors.

The recreation facilities located along the corridor starting at the entrance to the Forest are:

- El Portal Visitor Center
- Las Cabezas Vista Point
- La Coca Falls
- Yokahú Observation Tower
- Palma de Sierra Picnic Area
- Caimitillo Picnic Area
- Palo Colorado Recreation Area
- Baño Grande
- Baño de Oro

- Mt. Britton Observation Tower
- Rio Sabana Picnic Area

This management area provides the public a variety of recreation opportunities in visually appealing and environmentally healthy settings. Concentrated use and areas of high-density recreation activity are found in this management area. Facilities are provided to enhance the quality of the recreational experience and/or mitigate damage to the affected ecosystems.

Desired Conditions

- DC1 Area will be managed to meet the recreational opportunity spectrum setting of “rural and roaded natural.”
- DC2 Constructed facilities are in harmony with the Forest scenery and landscape and when appropriate reflect the historical Civilian Conservation Corps construction of the area. Facilities are appropriate to the recreational opportunity spectrum class.
- DC3 The Forest provides exhibits and general information to help visitors enjoy the Forest and develop a conservation ethic for Puerto Rico and tropical forests worldwide.
- DC4 Historic recreational assets are managed and interpreted.
- DC5 Illegal road parking is eliminated or reduced.

Goals

- GO1 Promote recycling and leaving the Forest clean.
- GO2 El Portal Visitor Center is managed as an enjoyable world-class interpretive and conservation education facility as well as a resource for communities and partners.
- GO3 Provide safe and well-maintained facilities throughout the year.
- GO4 Manage high use during weekends, holidays, and high visitation seasons for public safety and maintaining user expectations.
- GO5 Promote sustainable use.
- GO6 Increase the operational maintenance in the upper zone of this management area.

Objectives

- O1 Facilities for recreation activities such as hiking, camping, and trail systems are restored - especially those affected by hurricane María - during the first 2 years upon plan approval and continuously maintained during plan period.
- O2 Establish and implement “trash-free zones” in appropriate recreation sites within the plan period.
- O3 Interpretive exhibits at the visitor center are revised and updated within the plan period.
- O4 Implement solutions and methods to reduce congestion and hazardous parking along the 191 corridor plan period.

Standards and Guidelines

Note: Refer to section 3.3.2 Recreation, Management Strategies (page 74).

Management Area 3: Communication and Recreation

El Yunque communication and recreation sites are located at the top of El Yunque Peak and Pico del Este mountains. Its key values are radio-electronic communication and scenic recreation, and it possesses cultural resources. Less than 6 acres are subject to development for communication sites use. Both Forest Service roads 10 and 27 function as an access to the communication sites, as well as their use as trail to hike to Pico del Este, and Pico de El Yunque, respectively.

Desired Conditions

- DC1 Communication facilities on El Yunque Peak and Pico del Este serve the needs of the people of Puerto Rico, the U.S. Virgin Islands, national interest and surrounding waters.
- DC2 Opportunities for recreation and research are provided to the extent such uses do not directly conflict with the primary communication facility objective of the management area.
- DC3 The Forest protects and interprets heritage resources in this management area.
- DC4 Facilities are energy efficient.
- DC5 The Forest accommodates communication uses that cannot be met off-Forest; however, communication sites will occupy the same or reduced areas on the peaks.

Goals

- GO1 Administer special-use permits for communication facilities, following direction in communication site plans for El Yunque Peak and Pico del Este.
- GO2 Visual impact of the sites is reduced by consolidating facilities, emphasis on blending facilities' profiles into the natural landscape, camouflaging with neutral colors, and reducing the use of the exterior lighting.

Objectives

- O1 Eliminate unnecessary facilities and re-establish native vegetation where possible within 5 years of Plan approval.
- O2 Complete special-use compliance inspections annually.
- O3 Remove communication facilities to the extent feasible from the east end of El Yunque site and provide for dispersed recreation/vista point uses within 6 years after the Plan's approval.

Standards

- S1 No further building permits for this area will be authorized.
- S2 Permit no additional land clearing beyond areas currently under special-use permit.
- S3 Permit no new road construction in this management area. Reconstruction or relocation of existing roads is permissible when the relocation reduces ecological impacts of the road.
- S4 Do not permit studies which involve manipulation of natural vegetation or soils to extend into Primary Cloud Forest.

Guidelines

- G1 Cooperate with Federal and local law enforcement authorities and private security services to provide for public safety and protection of communication facilities.
- G2 The Forest should reduce the visual impacts of facilities to improve the existing visual quality level.
- G3 Coordinate permission for scientific studies with the International Institute of Tropical Forestry.
- G4 Reduce the visual impact of the communication facilities to improve the visual quality level of the area.
- G5 Implement specific technical and administrative direction provided by El Yunque Peak electronic sites plan. Concentrate similar uses (for example, transmission antennas versus reception antennas) within zones as provided in the site plan.
- G6 Consider the effects on scenic quality when conducting any facility modification.

Management Strategies

- MS1 Use signing and public information efforts to encourage trail access to El Yunque Peak to minimize hazardous foot traffic on Forest Road 10.
- MS2 Develop a plan of technical and administrative direction for the Pico del Este site.

Management Area 4: Community Interface Resource Management Area

The Community Interface Resource Management Area (CIRMA) merges segments of the Forest that were considered for Timber Demonstration, Developed Recreation and Integrated Management in the 1997 plan. This consolidation of lands under one management area serves as a transition to the broader landscape. The CIRMA embodies the most accessible lands for community groups and municipalities.

The CIRMA is composed of the lower elevation areas of the Forest and of areas where plantations for potential timber projects were established in previous management plans. The lack of timber stand improvements in the planted areas and the impact of natural disturbances have created a mosaic of vegetation in these areas where introduced species share the forest composition with native species. The stand dynamics of these forests is different from other mature forest within El Yunque and their succession will create a combination of species identified as an “emerging forest” (Lugo and Helmer 2004; Lugo 2009; Mascaro et al. 2013).

The CIRMA provides opportunities for forest product utilization that can be coordinated with community groups and local residents.

The CIRMA is the best example of the shift from Forest Service-driven management priorities to a more collaborative management, and is the area where sustainable forest practices could be considered with a community-based shared stewardship approach. This means that this management area opens the door to a day-to-day shared stewardship process with local communities, connecting the Forest to the communities in a way that develops educational, recreational, and other opportunities.

Desired Conditions

- DC1 To have a healthy and sustainable forest landscape that contributes to economic and social sustainability.
- DC2 Provide spaces and opportunity to offer new dispersed camping prospects.
- DC3 The public understands and recognizes the links of the region through an all-lands approach and the management strategies applied in the CIRMA.
- DC4 New recreational opportunities provide access to community groups and municipalities.
- DC5 The communities and regional organizations are integrated in the recreation and tourism opportunities.
- DC6 The Forest's regional identity developed through the CIRMA management strategies facilitates the adaptive management initiatives with the participation of community groups that strengthen the monitoring plans at the regional level.
- DC7 Communities are educated on Forest management, making them aware of the goods and services received from the conservation strategies in which they participate.
- DC8 The regrowth of any invasive species is discouraged and efforts are made to promote the regrowth and dominance of native species.
- DC9 Timber removal promotes Forest management treatments that move the forest toward a mature resilient condition dominated by native species.

Goals

- GO1 Work with local communities and community groups to have their participation in the consideration of initiatives and projects.
- GO2 Provide wood products and other forest products to promote local businesses, including local wood products that could be sold by artisans and local artists.
- GO3 Develop regional product labels for projects and products in association with the participants of the initiatives.
- GO4 Establish and maintain social and natural indicators that monitor the environmental and social wellness.

Objectives

- O1 Identify areas in the CIRMA that can be considered for collaborative recreation projects in at least three municipalities in the first 5 years of the Plan.
- O2 Increase recreational opportunities by at least 25 percent with the collaboration or participation of community groups in the region through the Plan period.
- O3 Establish at least two municipal and Forest collaborative initiatives related to recreational activities for the residents.
- O4 Integrate at least one collaborative monitoring strategy by geographic region.

- O5 Use the flora and fauna of the Forest to integrate collaborative management and monitoring with civic groups.
- O6 Develop and integrate environmental literacy initiatives in the region directed to create a network of schools that can share data from monitoring, management, and conservation projects in the region.
- O7 Remove at least 1 abandoned or unused, human created structural barrier within rivers or creeks every 3 years.

Standards

- S1 Apply soil and water conservation best management practices for the proposed projects.
- S2 Do not remove native trees and native vegetation in the riparian zone except at designated crossings, for public or facility safety, or for ecological or stream restoration.
- S3 Vegetation management practices would emphasize removal of invasive species to facilitate better development of native species that already occur corresponding to the available tree spacing. The efforts would be made to promote the regrowth of native species with a healthy stand that support ecosystem functions.

Guidelines

- G1 Conduct enrichment planting strategies in the riparian zone with native species. These are strategies based on planting native species under the existing riparian forest canopy with the possibility of obtaining some economic benefit from the planted trees while at the same time maintaining biodiversity and ecosystem services.
- G2 Retain stumps, standing snags, den trees, and coarse woody debris. Exceptions may be made where necessary to control insects or disease outbreaks or to ensure public and employee safety. In the event of a natural disturbance event, stand evaluations should take place to identify salvageable timber, which could include downed logs, coarse woody debris, snags and stumps.
- G3 Retain dead and downed logs or other woody debris in riparian zones unless removal is considered necessary for the protection of human life and property.
- G4 Forest product projects should maintain forest canopy coverage of the area. If a natural disturbance occurs, forest products projects to salvage timber can occur while promoting natural regeneration and prevent enlarging canopy openings anywhere in the CIRMA.
- G5 If invasive plant species occur in a forest product project area, it will be evaluated to determine the appropriate management strategy to control and/or eradicate, including partial removal of existing canopy coverage.
- G6 Tree cutting will be allowed to: (1) salvage damaged or dead trees of any size, (2) control insect and disease outbreaks, (3) protect human health and safety, (4) protect resources, or (5) move toward the desired conditions. The harvests will focus on improving the stand structure for the enhancement of native species. The selection and use of small-diameter timber (less than 8 inches dbh) should be mainly for poles, posts and carvings; and other forest products from the Community Interface Resource Management Area. However, if a natural disturbance occurs, trees of any size that are down or damaged could be salvaged.

- G7 Consider community and participatory initiatives for the application of management activities in the CIRMA.
- G8 The application of best management practices would emphasize removal of invasive species to facilitate better development of native species that already occur corresponding to the available tree spacing. Efforts would be made to promote the regrowth of native species with a healthy stand that supports ecosystem functions.

Management Strategies

- MS1 Promote a closer working relationship with local communities and encourage Forest Service personnel to ensure the participation of community leaders and stakeholders.
- MS2 Involve community groups to review and prioritize potential projects in the CIRMA. Include regional representatives from commercial stakeholders in discussions regarding the consideration of sustainable initiatives.
- MS3 During trail planning, include discussions and input from other land management agencies, non-profit organizations, special-use permit holders, municipalities, as well as other interested members of the public.
- MS4 Link community and municipal programs with projects in the CIRMA through a collaborative process in which the Forest provides the technical assistance and resources to empower local sustainable projects that could be reproduced throughout the region.
- MS5 Develop projects that encourage Forest management initiatives with special focus on native plant restoration that are applicable to tropical forests.
- MS6 Work with local communities and community groups to identify activities that improve land conditions (stewardship contracting and agreements).
- MS7 Consider increasing the density of native bees and other pollinators in the Forest in areas where this type of practice could benefit forest succession. Develop agreements with communities that could benefit economically from marketing honey.
- MS8 Consider municipal collaboration projects to develop low impact recreational sites and cultural resource interpretation programs.
- MS9 Consider expanding community outreach education using accessible areas of the CIRMA.
- MS10 Develop education initiatives with open classrooms as a part of the “Children’s Forests” initiatives in El Yunque.
- MS11 Coordinate Forest product projects with the interpretation and environmental education programs.
- MS12 Non-timber forest products would be offered through special forest products permits.

Management Area 5: El Toro Wilderness

The Caribbean National Forest Act of 2005 (P.L. 109-118) designated the 10,352 acre El Toro Wilderness Area. It is managed in accordance with P.L. 109-118 and the Wilderness Act.

Desired Conditions

- DC1 El Toro Wilderness exhibits primitive and natural qualities. Opportunities for research, exploration, solitude, risk, challenge, and primitive recreation are widespread. On the trail system, opportunities for solitude are moderate to high, with few human encounters expected.
- DC2 Opportunities for solitude are high when traveling cross-country with almost no human encounters expected. Campsites are limited and are located adjacent to the existing trails. These sites accommodate moderate use and limited group size. Directional and regulatory signs are found at trailheads outside of the wilderness area, with some directional signs at trail junctions. There are several rain shelters located along the trails.
- DC3 Ecosystems are influenced by natural processes with little or no human intervention. Geological and ecological processes operate relatively free from the influence of humans. Any influences upon these processes by humans are intended to protect human life and threatened and endangered plant or animal species or other species of conservation concern. Predominately diverse, native vegetation results from natural succession and disturbance processes; while invasive vegetation is rare and controlled.
- DC4 The majority of the wilderness area will be managed to provide for a “primitive” recreation opportunity setting, except for along the trails, where the management will be to provide for a “semi-primitive non-motorized” setting.
- DC5 Interpret natural, cultural, and historic features of this area outside of the management area (for example locate interpretive signing of wilderness features outside the wilderness).
- DC6 Maintain a scenery management landscape character of “naturally evolving”.
- DC7 Maintain and restore, as needed, the Tradewinds, El Toro, and Rio Sabana Trails.
- DC8 Allow visitors to experience a wilderness environment by not reducing or eliminating personal risk associated with adverse weather conditions, isolation, natural physical hazards, and primitive travel and communications.



The El Toro Wilderness Area

Objectives

- O1 Complete the wilderness plan within 2 years after plan approval.

Standards

- S1 Use only hand tools, natural materials and native species in watershed projects. This is specific to watershed projects because non-natural materials may be used in non-watershed projects – including the parrot artificial nest program, research projects, long-term climate monitoring sites, etc.
- S2 Do not permit salvage of timber.
- S3 Implement and maintain habitat improvements, such as Puerto Rican parrot nest cavities in a manner compatible with the goals and objectives of wilderness as listed in FSM 2320.
- S4 Conduct wildlife and plant habitat and population surveys and monitoring in a manner compatible with the goals and objectives of wilderness.
- S5 Allow the installation and maintenance of hydrologic, meteorologic, climatologic, or atmospheric data collection and remote transmission facilities where it is determined (by the Secretary of Agriculture) that the facilities are essential to the scientific research purposes of the Luquillo Experimental Forest (P.L. 109-118).
- S6 Do not issue forest product permits for collection of plants or plant material in wilderness unless for scientific and educational purposes and approved by the forest biologist, or ecologist.
- S7 Authorize no new special-use permits for facilities (for example, electrical transmission lines) or occupancy, and to the extent practical phase out existing permits. Authorize special-use permits for non-occupancy use (for example, outfitter guides) only to the extent compatible with wilderness character and in the public interest.
- S8 Pending the implementation of a “limits of acceptable change” analysis in the wilderness management plan, manage recreation use within the following limits:
- ◆ Maximum encounters with other groups along established trails is six per day.
 - ◆ Maximum encounters with other groups in trail less areas is one per day.
 - ◆ Limit group size to six people or less, unless otherwise authorized by permit.
- S9 See Forest-wide direction regarding camping.
- S10 Implement appropriate management action responses to achieve the desired results when user impacts are approaching the established limits of acceptable change for the biological resources and social conditions.
- S11 Design, construct, and maintain trails to the appropriate trail standard to meet setting, wilderness standards, and historical features, to minimize or prevent resource damage and protect the safety of the wilderness user. Trails will appear to be part of the wilderness environment.
- S12 Permit only hiking use of trails.
- S13 Do not construct new trails.

- S14 With the exception of necessary regulatory and informational signs within wilderness, locate signs only at trail intersections. Limit the information on such signs to direction and destination.
- S15 Maintain structures, including trails, to appropriate wilderness or historical character.
- S16 Coordinate with researchers to ensure that only observation studies occur in the management area. The “control” facets of treatment studies could occur within the management area, but not the “treatment” facets.
- S17 Use only visually unobtrusive non-permanent plot markers in research surveys.
- S18 The Forest inventories and protects heritage resources in management area 5.
- S19 The Forest provides interpretive materials for these heritage sites, but only outside this management area.

Guidelines

- G1 Use regulatory or informational signs where control of resource damage is needed and other corrective measures have proven unsuccessful.
- G2 Install and maintain interpretive signs or bulletin boards at trailheads to wilderness, which provide information on the significance of wilderness, management practices, rules and regulations, and emergency information.

Management Strategies

- MS1 Establish collaborative working groups to maintain trails and structures.
- MS2 Foster creation of community-based enterprises that provide outfitter services.
- MS3 Collaborate with U.S. Fish and Wildlife Service on parrot recovery programs.

Management Area 6: Research

Desired Conditions

- DC1 Provide opportunities for long-term intensive scientific investigations, including treatment versus control research.
- DC2 Contribute to improving understanding, protection, and management of tropical forests worldwide.
- DC3 Recreation use is associated primarily with developed recreation sites adjacent to the area, existing trails through or near the area, and scenery viewing from roads.

Standards

- S1 Scientific studies do not leave behind residual equipment or persistent chemical or biological changes that detract from future scientific studies or management options.
- S2 Construct only those roads or facilities needed to accomplish research objectives.
- S3 There are no interpretive displays for heritage resources inside this management area.

Guidelines

- G1 Salvage timber is cut for experimental use or from stands damaged by natural disasters only if such salvage does not detract from ongoing or future scientific studies. Priority use of such material is for research.
- G2 Locate studies in the management area to maximize the remaining management area available for future research.

Management Strategies

- MS1 Coordinate with the International Institute of Tropical Forestry and other cooperators to make the best use of the research opportunities provided by the Forest.
- MS2 Coordinate management of recreation use with the International Institute of Tropical Forestry.

Management Area 7: Baño de Oro Research Natural Area

Baño de Oro Research Natural Area was originally established in 1949 as 1,840 acres. This management area includes the proposed expansion of the Baño de Oro Research Natural Area to 6,441 total acres.

Desired Conditions

- DC1 The research natural area is a biological reservoir protecting rare and endemic ecosystems and species, specifically Lower Montane Rain Forest, Montane Thicket, Palm Brake, Elfin Woodland, Puerto Rican parrot, and rapidly flowing rivers and streams.
- DC2 The area provides opportunities for scientific study of Puerto Rico's native forest through non-manipulative research and observation studies.
- DC3 The area is essentially undisturbed by humans and provides a reference area against which human-altered environments in Puerto Rico and elsewhere in the tropics can be compared.
- DC4 The mature forest and functional wetlands within this area are maintained or enhanced to protect the features for which a research natural area is established.
- DC5 Facilities unrelated to research will be removed from the area when feasible to do so.

Objective

- O1 Following approval of the land management plan, complete the required documents for establishing the expansion of the Baño de Oro Research Natural Area to 6,441 total acres. This documentation, along with concurrence from the International Institute of Tropical Forestry Director, will be forwarded to the Regional Forester for approval to formally expand the boundaries of the research natural area to 6,441 total acres.

Standards

- S1 Sign boundaries at entry points.
- S2 Authorize no new special-use permits for facilities (such as, electrical transmission lines) or occupancy.
- S3 Authorize special-use permits for non-occupancy use only for appropriate research purposes in coordination with the International Institute of Tropical Forestry.

- S4 Allow installation of temporary structures, such as a tower for collecting weather data, necessary to accomplish research objective.
- S5 Construct and maintain only those administrative trails needed to accomplish ecological research management objectives.
- S6 Construct no new permanent facilities.
- S7 Interpretive signs for heritage resources will only occur outside the management area.
- S8 Scientific studies are for research and development, study, observation, monitoring, and educational activities and do not modify the conditions for which the research natural area was established.
- S9 Implement only those soil and water improvements necessary to meet the objectives of the research natural area, which should be in exceptional circumstances.
- S10 Coordinate with the International Institute of Tropical Forestry to ensure that only non-manipulative research and observation studies occur in the management area. The “control” facet of treatment versus controlled research studies could occur within the management area, but not the “treatment” facets.

Guidelines

- G1 Discourage recreation use by limiting access.
- G2 Implement and maintain habitat improvements, such as Puerto Rican parrot nest cavities, in a manner compatible with the desired conditions of the research natural areas.
- G3 Some environmental manipulation may be needed in order to maintain the unique features that the research natural area was established to protect, such as eradicating invasive species.
- G4 Phase out existing permits that interfere with protecting features for which research natural area is established.

Management Area 8: Wild and Scenic Rivers

The wild and scenic river segments on El Yunque National Forest were designated by Congress in the Caribbean National Forest Wild and Scenic River Act, December 2002. Management direction for the three rivers comes from the National Wild and Scenic Rivers Act, the designating legislation, the Caribbean National Forest Comprehensive River Management Plan, and all other applicable Federal laws, regulations, and plans.

Table 2-6. Wild, scenic, and recreation rivers (designated December 2002)

River	Classifications	Length (miles)
Río Mameyes	Wild	1.6
	Scenic	1.4
	Recreation	1.0
Río de la Mina	Scenic	1.2
	Recreation	0.9
Río Icacos	Scenic	2.3

Desired Conditions

- DC1 These river segments will be managed to preserve their outstanding remarkable values and free-flowing conditions.
- DC2 River segments designated “wild,” “scenic,” or “recreation” rivers for the Rio Mameyes, Rio de la Mina, and Rio Icaos Rivers are protected.
- DC3 All rivers will remain free of impoundments within the existing Forest boundary.
- DC4 Opportunities for treatment-versus-control research will be provided, as long as such use does not detract from “wild,” “scenic,” or “recreation” river qualities.
- DC5 Access points, such as trailheads and parking lots, are strategically located in the corridor and watershed to help disperse recreation use.
- DC6 Interpretation of the outstandingly remarkable values of the rivers will be available in various forms to the public, from low-key, off-site interpretive materials and technologies, to interpretive signs at appropriate locations.
- DC7 Forest management practices maintain the unique characteristics and scenic values of the river corridors. Generally, allow natural processes to determine the composition and distribution of plant species. High-priority invasive plants and species and wildlife will be controlled. Streams will be managed for mountain mullet, river shrimp, and goby where conditions are favorable.

Desired Conditions: Wild River Segment

The Rio Mameyes has the only “wild” segment. Management of the “wild” segment of the river corridor will be focused on protecting and preserving natural processes with minimal human influence, and will have limited access. Some research trails will be found in this natural area. Management of the “wild” segment will limit access to persons doing research, and all research will need to be properly permitted. The area will be managed to retain its general undeveloped nature. Access is limited via Forest Service Road 27 (Pico del Este Road) which is outside of the river corridor. The limited access and activity in this area will basically allow nature to run its course without human intervention or interaction.

Standards: Wild River Segment

- S1 All water supply dams and diversions are prohibited.
- S2 Development of Hydroelectric power facilities are prohibited.
- S3 Flood control dams, levees, or erosion control work are prohibited.
- S4 No roads or other provisions for overland motorized travel are permitted within 0.25 mile of the riverbank.
- S5 Major public-use areas, such as large picnic areas, interpretive centers, or administrative headquarters, are located outside the “wild” rivers area. Recreation developments are limited to trails and unobtrusive bridges and signs, and improvements necessary for resource protection.
- S6 A few existing structures could be allowed if they are compatible with the essentially primitive and natural values of the river and its corridor. New structures are not allowed except in rare instances to achieve management objectives (such as structures and activities associated with fisheries enhancement programs).

- S7 Hunting or fishing is prohibited.
- S8 Mining and rock extraction are prohibited.
- S9 Manage historic sites consistent with Forest-wide standards. Stabilize and protect existing sites.

Guidelines: Wild River Segments

- G1 Management activities should meet the meet the Scenic Integrity Objective of High.
- G2 Use native plant species where possible when restoring impacted sites.
- G3 Allow woody debris to accumulate along river and shorelines to maintain the natural character of river.
- G4 Cutting trees is not permitted except when compatible with primitive recreation management (such as clearing trails and protecting users) or to protect the environment (such as control of fire).
- G5 Manage habitat of mountain mullet streams as a first priority.

Desired Conditions for the “Scenic” Segment

The management of the “scenic” segment of the river corridor will be focused on maintaining and enhancing the near-natural environment. Invasive wildlife and plant species will be managed and controlled. Riverbanks will be undeveloped and primitive, but may be accessible in places by trails. Recreation opportunities will be designed to provide a natural-appearing setting. Research activity on or near these segments will be consistent with protecting the rivers free-flowing and scenic values. The Rio Icacos is more diverse than Rio de la Mina and Rio Mameyes because of its length and location. No developed facilities are found near these river corridors. The “scenic” segments are located in isolated areas and are not easily accessible. Their natural setting and isolation make them very attractive to those who are willing to hike through challenging terrain. River-oriented recreation opportunities will emphasize hiking, and viewing wildlife and nature. Use will be managed to provide a level of contact among visitors, and impacts to the outstandingly remarkable values, that are consistent with the river classification. The “limits of acceptable change” concept will be used to monitor levels of use within the river corridor.

Standards: Scenic River Segments

- S1 Water supply dams and major diversions are prohibited anywhere they would have a direct and adverse effect on the values of these designated scenic river segments. Modest diversions are allowed only if there would be no direct and adverse effect on river values.
- S2 Hydroelectric power facilities are prohibited.
- S3 Flood control dams and levees are prohibited. Erosion control treatments can be implemented if they do not detract from river values.
- S4 Roads should generally not be visible from the “scenic” river segments. No new road construction is permitted within 0.25 mile of these rivers.
- S5 Larger-scale, public-use facilities, such as large picnic areas, public information centers, and administrative headquarters, are well screened from view from the designated rivers. Modest and unobtrusive recreation facilities are permitted.

- S6 New structures that would have a direct and adverse effect on river values are not allowed.
- S7 Vegetation management is generally not permitted within 0.25 mile of the designated rivers. Vegetation treatments for wildlife habitat improvement or to control invasive plant species are allowed, provided that such practices do not substantially adversely affect the river and its immediate environment. The river should be maintained in its near-natural environment.
- S8 Mining activity and rock extraction are prohibited.
- S9 No hunting or fishing is allowed.
- S10 Limit land-based permits to groups of no more than 15 (including guides).
- S11 Allow access to La Mina site and Rio de la Mina Trail only to guided tours with a special-use permit.
- S12 Primitive camping at designated areas by permit only.
- S13 No camping within 100 feet of rivers. Evidence of use to be noticeable, but not dominant. No fires or fire rings allowed. Use only commercial cooking apparatus.
- S14 Only hikers permitted on trails. Horses, bikes, or off-highway vehicles are prohibited on trails.
- S15 Tubes and rafts are prohibited in rivers.

Guidelines: Scenic River Segments

- G1 Management activities should meet the meet the Scenic Integrity Objective of High.
- G2 Use native plant species where possible when restoring impacted sites following FSM 2070.
- G3 Allow woody debris to accumulate along river and shorelines to maintain the natural character of river.
- G4 Manage historic sites consistent with Forest-wide direction. Stabilize and protect existing sites.
- G5 Implement “pack-it-in and pack-it-out” and “leave no trace” concepts.

Desired Conditions for the “Recreational” Segment

Management of the “recreational” segment of the river corridor will focus on providing recreation in natural-appearing or culturally-influenced settings. Puente Roto and La Mina Falls are heavily visited during holidays and summer weekends. Parking areas should be delineated at Puente Roto and Angelito trailheads to establish and manage capacity at these areas. Invasive species will be controlled and eradicated. River-oriented recreation opportunities will emphasize hiking, and viewing wildlife and nature. Use will be managed to provide a level of contact among visitors and impacts to the outstanding remarkable values that are consistent with the river classification. The “limits of acceptable change” concept will be used to monitor levels of use within the river corridor. Parking layout and access to the river at Puente Roto should be improved. Access for use and enjoyment of the rivers will be provided, consistent with the river classification at Big Tree Trail, Angelito Trail, La Mina Trail, and La Coca Trail.

Standards: Recreation River Segments

- S1 Vegetation management is generally not permitted within 0.25 mile of the designated rivers. Vegetation treatments for wildlife habitat improvement or to control invasive plant species are

allowed provided that such practices do not substantially adversely affect the river and its immediate environment. Woody debris is allowed to remain along the river bed and its banks.

- S2 Low dams, diversion works, rip rap, and other minor structures are allowed provided the waterway remains generally natural in appearance.
- S3 Hydroelectric power facilities are prohibited.
- S4 Flood control dams and levees are prohibited. Erosion control treatments can be implemented if they do not detract from river values.
- S5 Limit land-based permits to groups of no more than 15 persons (including guides).
- S6 Mining activity and rock extraction are prohibited.
- S7 Allow primitive camping at designated areas by permit only. No camping within 100 feet of rivers. Evidence of use to be noticeable, but not dominant. No fires or fire rings allowed. Use only commercial cooking apparatus.
- S8 Only hikers permitted on trails. Horses, bikes, or off-highway vehicles are prohibited on trails.
- S9 Conduct site condition inventory to determine use patterns and site conditions. Use the site condition inventory results to determine use limits and develop monitoring criteria. Rehabilitate degraded sites and if necessary, relocate or restrict use at those sites.
- S10 Prohibit barbeque grills below the high water line on all river segments.
- S11 Prohibit glass containers below the high water line on all river segments.

Guidelines: Recreation River Segments

- G1 Minimize trash impacts at La Coca and Juan Diego sites.
- G2 Implement “pack-it-in and pack-it-out” and “leave no trace” concept.
- G3 New development, bridge replacements, and landslide reconstruction will be designed to minimize disturbance of riparian areas.
- G4 Focus wildlife interpretation on highly visible species.
- G5 Stabilize dispersed recreation sites that have exposed, compacted, or highly erodible mineral soil.
- G6 Manage trails in corridors only for pedestrian uses compatible with the outstanding remarkable values of the designated rivers.
- G7 Horses, mountain bikes, and off-highway vehicles are prohibited in all river segments.
- G8 Paralleling roads could occur on one side of the river. There can be several bridge crossings and numerous river access points. New road construction is limited to access and parking for developed recreation sites.
- G9 Picnic areas and trails may be in close proximity to the river.
- G10 New structures are allowed for recreation use.

Goals for Río Icacos

- GO1 Improve water quality by reducing sedimentation from landslides and PR Route 191.
- GO2 Maintain ditches and culverts on the section of PR Route 191 closed to public traffic to reduce the concentration of water flow onto slopes prone to landslides.
- GO3 Stabilize areas of exposed soil caused by landslides.

Goals for Río Mameyes

- GO1 Improve recreation opportunities and water quality by providing facilities at Puente Roto.
- GO2 Improve the parking layout at Puente Roto. Implement a segment-wide, trash-free zone.

Goals for Río de la Mina

- GO1 No trash is left by users.

Management Strategies

- MS1 A capacity study to establish maximum capacity during high use periods, particularly at La Mina Falls and Puente Roto.
- MS2 The feasibility of adding other improvements at the Puente Roto recreation area. Improvements could include sanitary facilities, picnic grills, tables, and picnic shelters.
- MS3 Improving public awareness and understanding of the outstanding remarkable values of the three wild and scenic rivers and the National Wild and Scenic River System.

Management Area 9: Scenic Byway Management Area: PR Route 186

PR Route 186 is a designated scenic route within the Forest and State-designated scenic byway outside the Forest.

Desired Conditions

- DC1 This management area will help disperse recreation users in the Forest and reduce traffic along PR Route 191; which in turn will help to improve the adjacent sensitive ecosystems affected by over-use.
- DC2 The Forest maintains a visual experience through the vistas and natural elements, as well as the man-made or historic features within this management area.
- DC3 The Forest manages the environment along the route in as natural a state as possible, including elements such as geological formations, fossils, bodies of water, flora and fauna.
- DC4 The public enjoys the western side of the Forest by accessing it through this Civilian Conservation Corp-era historic route.
- DC5 The historically relevant features and spots are interpreted for the public to educate and provide historic context along the route.
- DC6 The Forest's historic features associated with its cultural heritage are well maintained and properly managed.

- DC7 The route allows the public to access recreation opportunities on the western side of the Forest; this will include activities such as camping, hiking historic trails (Tradewinds), water-play in the rivers and creeks along the route; and other nature-based activities. It will also give the public a scenic drive opportunity to supplement the PR Route 191 scenic drive experience.
- DC8 The route is maintained in a safe and fit condition to allow the use of the public and tour operators.

Goals

- GO1 Partner with the municipal planners and other agencies to promote the official State designation of the PR Route 186 Scenic Byway.
- GO2 Promote the historic significance of the cultural resources within this area.
- GO3 Improve signage along the route.
- GO4 Develop interpretive signage for relevant historic and natural features along the route.
- GO5 Improve and maintain security along the scenic byway.
- GO6 Work collaboratively to promote the development of recreation opportunities along the route of PR Route 186.
- GO7 Improve scenic viewpoints on the PR Route 186 within the Forest such as Quebrada Soñadora, Río Espíritu Santo, Quebrada Grande, Pico El Toro, Rio Grande, Vereda El Toro throughout the planning period.

Objectives

- O1 Improve and maintain the corridor's physical condition within the first 3 years of the Forest Plan's approval.
- O2 Create a working committee that integrates the municipal planners and agencies related to the state designation and road condition in the first year of the Plan to develop and apply the desired future conditions defined in the Plan.

Standards

- S1 All road maintenance and alterations that fall outside the defined categorical exclusions as outlined in the programmatic agreement between the Forest Service and State Historic Preservation Office should follow the stipulations of the State Historic Preservation Office Act and Section 106 Process (36 CFR 800).

2.2 Suitability of Lands

Specific lands within a plan area are identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. The plan will also identify lands within the plan area as unsuitable for uses that are incompatible with desired conditions for those lands.

The suitability of lands need not be identified for every use or activity. Identifying suitable uses may be done after considering historic uses and issues that have arisen in the planning process. Every plan must identify those lands that are unsuitable for timber production (§ 219.11) (36 CFR 219.7(e)(1)(v)).

Lands Identified as Suitable for Certain Uses or Activities. Identifying certain lands as suitable for a type of use in a forest plan is not a commitment to allow such use, but only an indication that the use might be appropriate. A specific use or activity may be approved or may be disapproved in an area identified as suitable for such types of use. Management areas and plan components take into account suitability criteria for recreation, research, water use, communication sites, and general management.

Lands Specified as Not Suitable for Uses or Activities. If a plan identifies certain lands as not suitable for a use, then that use or activity may not be authorized. Public uses for which a special-use authorization is not required, such as biking, camping, and hiking, will not be affected by such a designation in the plan. Such uses can only be restricted by an action such as a closure order (Section 21.8 of the Planning Handbook).

The following uses are not suitable Forest-wide:

- Off-road vehicle use
- Hang-gliding
- Horseback riding
- Cable tram system above canopy
- Hunting
- Military training is addressed in Section 3.3.5, “Special Uses.”

2.3 Suitability for Timber Harvesting

Certain areas within El Yunque are designated as suitable for timber harvest, but limitations or special designations, such as wilderness (which should be left undisturbed by these activities) create limited opportunities for a timber program. In the recent past, the Forest has not maintained a timber harvest program and there has been little demand for timber as a commodity. Some use of dead and down trees and non-wood forest products did provide limited opportunity for timber harvest within the Forest. However, the recent hurricanes in September 2017 caused an increase in dead and down trees, resulting in the development of a timber salvage program to make use of the downed wood. This increase in availability has sparked an interest and a demand for small forest products. As a result, El Yunque National Forest will be issuing personal use and small commercial sales permits so the public can use the downed timber.

There are no congressional restraints on some lands; however, the vegetation types, wildlife, and physical conditions may make some of these lands unsuitable. As shown in table 2-7, lands outside of the wilderness area, but on slopes greater than 30 percent are identified as “not suited for timber production” because these lands are prone to landslides during heavy rains. The lands in category D (where timber production is not compatible with the Plan’s desired conditions) are the lands found within the existing and expanded research natural area. The acres that are identified as “suited for timber production” are those within the Community Interface Resource Management Area (MA 4).

Table 2-7. Timber production suitability classification

Land Classification Category	Acres
A. Total National Forest System lands	28,223
B. Lands not suited for timber production due to legal availability or technical considerations	17,752
Wilderness	10,352
Slopes over 30 percent (outside of wilderness)	7,400
C. Lands that may be suited for timber production (A- B)	10,471
D. Lands not suited for timber production because timber production is not compatible with the desired conditions and objectives established by the Plan	3,284
E. Lands suited for timber production (C- D)	7,187
F. Lands not suited for timber production (B + D)	21,036

It needs to be clarified here that lands classified as “suited for timber production” does not mean that they will be managed as “timber plantations”. An area is classified as “suited for timber production” when it is identified as an area that may be harvested to provide some level of wood products on a regular basis (as opposed to only harvesting trees for salvage following a storm event). The purpose of timber production activities considered in this plan will be to restore native forests by silvicultural prescriptions that remove invasive species and provide wood products for local artisans. Conversely, lands “not suited for timber production” can still have some timber harvesting activities for reasons such as salvage opportunities, or to meet non-timber resource management needs.

This page left intentionally blank

3 Desired Conditions for El Yunque National Forest

It is El Yunque National Forest’s vision to continue improving social, economic, and ecological sustainability and use of El Yunque lands. The new Forest Plan is divided into sections that guide this management vision. The Forest-wide desired conditions, objectives, standards and guidelines provide the framework for management across El Yunque National Forest.

The planning process identified the following needs for the management of the Forest:

1. Maintain the Forest in an ecologically, socially, and economically sustainable manner.
2. Maintain the Forest’s ecology throughout the challenges arising from climate change.
3. Sustain ecological processes.
4. Conserve flora and fauna.
5. Provide opportunities to develop a community-based economy.
6. Have a regionally integrated approach to recreation use and access.
7. Protect, conserve, and recover species of flora and fauna that are federally threatened, endangered, proposed, and species of conservation concern.
8. Maintain the functional wetland and associated vegetation types.
9. Maintain healthy watersheds.
10. Restore riparian areas.
11. Provide recreational opportunities, taking into consideration changes in demographics and visitation patterns during the planning process.
12. Alleviate high visitor use of PR Route 191 by increasing recreational opportunities in the lower elevations of the Forest. Lower parts of the Forest may provide more recreational opportunities and settings.
13. Provide for a scenic route along PR Route 186.
14. Provide clean water resources.
15. Provide sustainable forest products.
16. Maintain functional infrastructure.
17. Reduce the Forest’s ecological footprint by acquiring or protecting more stream corridors.
18. Maintain scenic integrity, which contributes to the economy.
19. Include plan components for invasive species management that allow activities beyond road right-of-ways, recreation areas, and threatened or endangered species habitats, in order to promote management of invasive species and to restore landscape-level conditions.
20. Air is clean and contributes to a healthy and functional environment.

3.1 Ecological Sustainability and Diversity of Plant and Animal Communities

3.1.1 Climate Change Response

Desired Conditions

- DC1 The Forest resources and operational management are resilient to the influences of a changing climate.
- DC2 Management activities reduce the susceptibility of resources to multiple threats, including drought, invasive species, disease, and wildfire.
- DC3 The immediate and long-term resilience of the Forest will be improved by:
- ◆ Responding to changes in visitor behavior and mitigating any seasonal increases in use;
 - ◆ Enhancing landscape connectivity by maintaining natural migration corridors between lowland and upland forests to allow species to move up-slope into cooler environments as climate warms;
 - ◆ Maintaining piles of natural woody debris and promoting wetlands and ponds in areas of high amphibian diversity to supplement habitats that retain cool, moist conditions.

Management Strategy

- MS1 Collaborate with the International Institute of Tropical Forestry, State and Private Forestry, external partners and surrounding land managers to coordinate management and monitoring efforts related to visitor use, ecological connectivity and flows, and invasive species.

3.1.2 Terrestrial Ecosystem: Vegetation

Desired Conditions

- DC1 The Forest landscape shall continue to be dominated by a closed canopy of native species.
- DC2 Structure, composition and function of mature forests is maintained within the range of natural variation.
- DC3 Plant biodiversity, ecosystem processes and function will be conserved, maintained, and if needed, restored.
- DC4 Disturbed and altered areas are restored through natural succession and managed revegetation practices.
- DC5 Conserve the native species present in all plantation/secondary montane and submontane forest types while controlling, and if possible, eradicating invasive species.
- DC6 Manage to achieve and maintain the characteristics of the mature tabonuco montane wet and rain forests, including: canopy height of approximately 30 meters; the dominance of ferns in the understory; and the dominance of characteristic species such as *Dacryodes excelsa* (tabonuco),

Sloanea berteriana (motillo), *Tabebuia heterophylla*, *Manilkara bidentata* (ausubo), *Guarea guidonia* (guaraguao), *Buchenavia capitata* (granadillo), and *Ocotea leucoxylon* (laurel geo).

- DC7 Manage to achieve and maintain the characteristics of the mature palo colorado montane rain and wet cloud forest types including the dominance of *Cyrilla racemiflora* and high stem density of *Prestoea montana*, *Micropholis garciniifolia*, and *Calycogonium squamulosum*.
- DC8 Mature sierra palm montane wet and Mature sierra palm montane wet and rain cloud forest types will continue to be dominated by *Prestoea montana*, with high stem density of *Croton poecilanthus*, *Micropholis crysophylloides*, and *Eugenia eggersii* and high aboveground biomass of *Magnolia splendens* and *Sloanea berteriana*.
- DC9 In mature *Tabebuia/Eugenia* woodland montane wet and rain cloud forests, the high abundance of bryophytes and epiphytes will continue, especially the bromeliad *Werahuia sintenisii*. The tree fern *Cyathea bryophylla*, and tree species such as *Ocotea spathulata*, *Eugenia borinquensis* and *Tabebuia rigida*.
- DC10 The Forest maintains a high diversity of native plants in areas visited by the public, by landscaping developed recreation areas and visitor centers with native, endemic and at-risk species.
- DC11 Tabonuco montane rain and wet forests will be conserved in lowland forest communities between 200 and 600 meters in elevation.
- DC12 The historical distribution and composition of mature sierra palm montane, wet forest, and rain cloud forests will be conserved in both palm brakes and palm floodplain ecosystems.
- DC13 Conserve the unique structure and composition of mature *Tabebuia/Eugenia* woodland montane rain and wet cloud forests, including the abundance of epiphytes, liverworts and mosses.
- DC14 Conserve the historical distribution of mature palo colorado montane rain and wet cloud forest types characterized by late successional plant species.
- DC15 Control high-priority invasive plant species using mechanical, manual, or other nonmechanical techniques and replace them with native plant species.
- DC16 Secondary forests have a similar composition and structure of mid-successional forests. Secondary forests have regenerated naturally after complete forest clearing caused by natural or anthropogenic disturbance and are different in composition and structure from nearby mature forests. Mid-successional forests have similar structure and composition of mature forests but retain certain species characteristics of early successional forests.

Goals

- GO1 Evaluate vegetation composition, structure and ecological functions of all secondary forests types by inventorying and mapping, and applying the appropriate management strategy.
- GO2 Provide for small forest products within the Community Interface Resource Area (CIRMA).
- GO3 If a significant natural disturbance occurs, then *Dacryodes excelsa* abundance increases in montane rain and wet forest communities.

Objective

- O1 At least one collaborative conservation education effort should be conducted that highlights the ecological importance of one forest type every 2 years.

Standards

- S1 Limit alteration of the vegetation, such as from recreation facility construction and sustainable forest product uses, in areas where native, endemic and at-risk species may be adversely affected.
- S2 Require permits for the collection of any plants or plant material except for Forest Service personnel collecting plants or plant material for research purposes.
- S3 Require a permit for small-scale timber salvage and small forest products for experimental or sustainable uses, or where there is damage by natural causes, only where such use does not conflict with specific management goals and objectives of any particular area.
- S4 Use only native vegetation in wetland restoration and soils conservation projects.
- S5 Control invasive plant species using mechanical, manual, or other nonmechanical techniques and replace them with native plant species.

Guidelines

- G1 The use of genetically appropriate native plant species will receive primary consideration for revegetation, restoration, and rehabilitation. Use of non-native plants is allowed only when in compliance with Forest Service native plant policy (FSM 2070).
- G2 Passive forest restoration, or natural forest regeneration, should be preferred over active restoration (tree planting, soil erosion control, enrichment planting, etc.) to restore any forest type if it can achieve similar species composition and vegetation structure of mid-successional or mature forests. Active restoration should be performed to rehabilitate the habitat of targeted at-risk species.

Management Strategies

- MS1 Perform an inventory of the riparian vegetation.
- MS2 Fill the information gap of the historical vegetation for all plantation/secondary forest types and the natural range of variation and ecological processes of these altered systems.
- MS3 Develop collaborations with universities, non-government conservation organizations, the Puerto Rico Department of Natural and Environmental Resources and U.S. Fish and Wildlife Service to establish monitoring plots in each forest type for surveying species composition and vegetation structure.
- MS4 Conduct collaborative efforts with non-government conservation organizations to control, and if possible, eradicate plant invasive species and replace them with native species.
- MS5 Maintain a map of the forest coverage at different scales to assure the Forest continues to offer an impression of tropical forest vastness. Recommended scales are:
- ◆ Designated areas

- ◆ Proclamation region
- ◆ Regional management area
- ◆ Forest type

MS6 Work with partners to recover natural migration corridors outside the Plan area, starting with riparian management zones (see section 3.1.5) and working outward to cover other vegetation types for a broader spectrum of wildlife.

3.1.3 *Functional Wetland*

Desired Conditions

- DC1 The functional wetland within El Yunque National Forest is protected and preserved.
- DC2 Functional wetlands remain forested, predominantly with native species. The biodiversity and ecosystem processes are maintained. Viable populations of native plants are maintained or achieved.
- DC3 The Forest continues to supply the benefits and ecological services delivered by the wetlands to surrounding lands, particularly lowland wetlands connected through the management region.
- DC4 Maintain or conserve 13,335 acres of functional wetlands during the Plan period.

Goals

- GO1 Wetlands are identified and administered in accordance with appropriate management requirements related to Federal legislation and regulations that apply to Puerto Rico.

Objectives

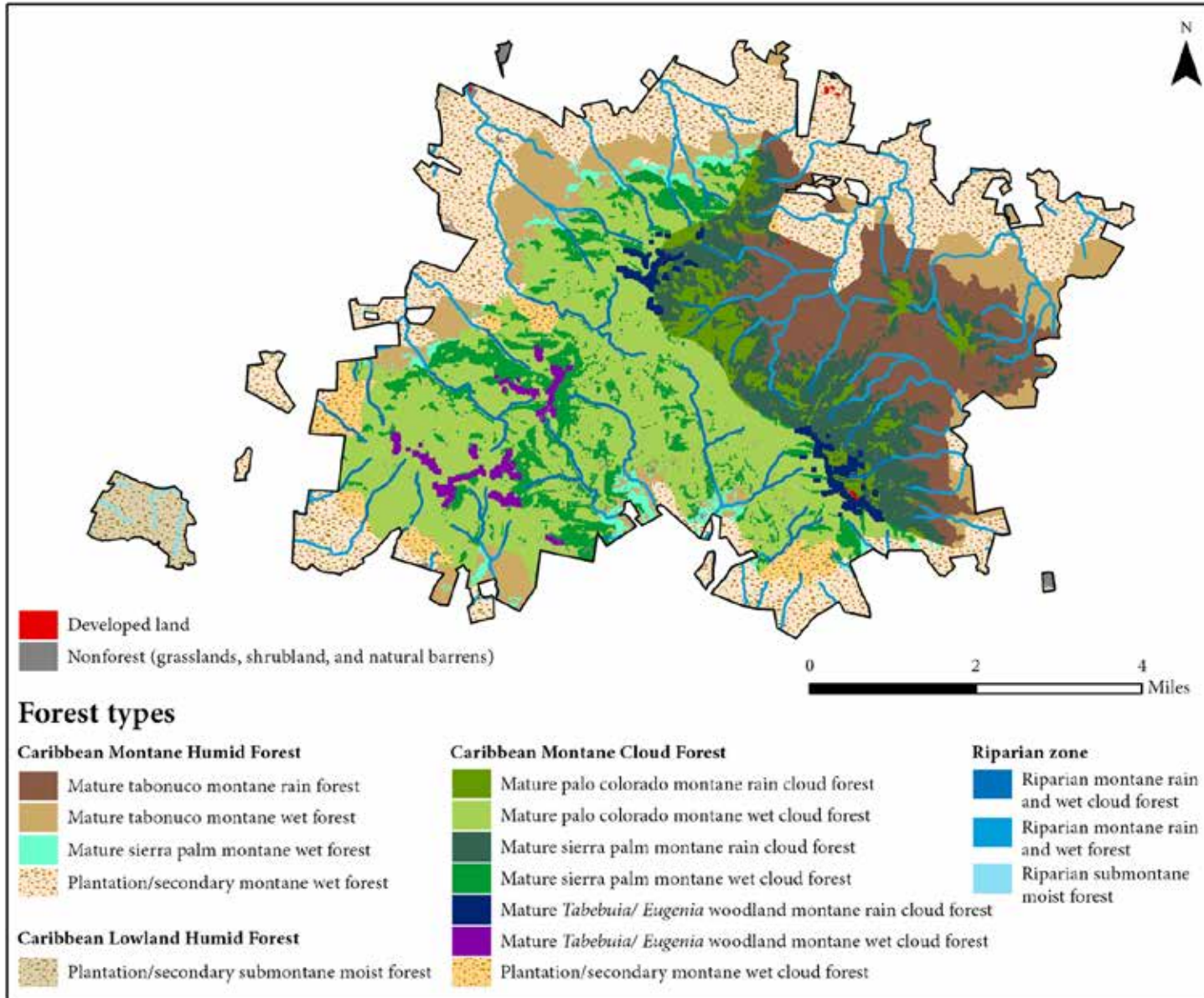
- O1 Propose including the Palustrine Montane Wetland of El Yunque in the National Wetlands Inventory in cooperation with the U.S. Fish and Wildlife Service 4 years after Plan signature.

Guidelines

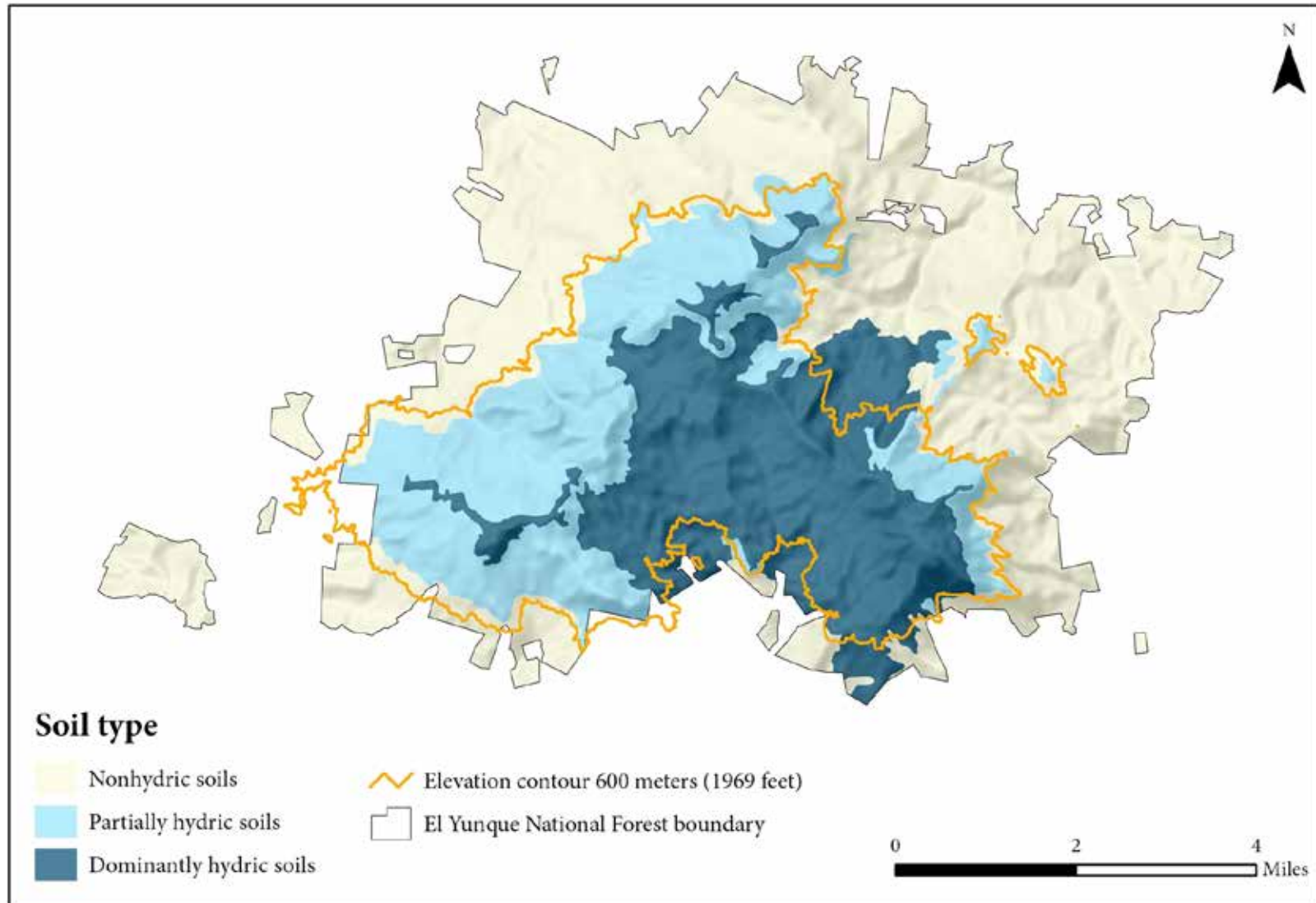
- G1 The Forest should delineate wetlands during site-specific projects.

Management Strategies

- MS1 Survey lands to identify the wetland vegetation.
- MS2 Develop collaborative agreements with surrounding, protected areas or agencies to establish permanent plots in order to monitor environmental change and its effect on El Yunque wetlands and the broader landscape.
- MS3 Include El Yunque wetland values in the interpretation and education programs.
- MS4 Maintain communication with International Institute of Tropical Forestry regarding monitoring and research of the cloud formation level within the Forest, apply the information provided on updates and changes of these conditions, and adjust management practices as needed.



Map 3-1. Existing forest types of El Yunque National Forest



Map 3-2. Functional wetland at the 1,969-foot elevation (600 meters)

3.1.4 Aquatic Ecosystems

Desired Conditions

- DC1 High quality ecosystem services and biodiversity of aquatic ecosystems of El Yunque National Forest are maintained or restored.
- DC2 Provide healthy habitats to aquatic fauna, especially those whose life cycles are interconnected with the surrounding ocean.
- DC3 Ensure ecologically sustainable human use of water does not adversely affect the ecosystem's long-term functional capacity.

Standards and Guidelines

Note: For aquatic ecosystems, please refer to the standard and guidelines section titled “Fish and Other Aquatic Species Standards” on page 59.

Management Strategies

- MS1 Work with partners and other agencies to develop a water flow average and range for each watershed along with a water budget that describes how much water each watershed needs for adequate aquatic ecosystem function throughout the year.
- MS2 Provide collaborative approaches for conservation education regarding aquatic ecosystems or a related ecosystem component for at least one priority watershed every 2 years to improve public awareness and create opportunities to better understand scientific land management.
- MS3 Through collaboration, better understand the resiliency of aquatic ecosystems and their carrying capacity for aquatic-dependent fauna species in relation to climate change.

3.1.5 Riparian Management Zones

Riparian management zones are defined as a 100-foot zone inland from each edge of a river or stream (defined as bank full), unless a site-specific analysis is conducted to identify and delineate the riparian management zone.

Desired Conditions

- DC1 Riparian management zones are maintained or restored.
- DC2 The riparian management zones deliver ecological services to the aquatic ecosystems and watersheds of El Yunque and the surrounding regional lands.
- DC3 Viable populations of native flora and fauna species are maintained or restored.
- DC4 Riparian management zones located inside the primary forest and inside designated areas (El Toro Wilderness, Baño de Oro Expanded Research Natural Area and Wild Scenic Recreation River Corridors) are preserved.
- DC5 Riparian management zones are managed to maintain or restore ecological diversity and function and to keep serving as abiotic and biotic connectors between the Forest and the sea.

- DC6 The bloodroot tree (*Pterocarpus officinalis*) is restored in riparian areas.
- DC7 Riparian management zones are free of invasive species.
- DC8 The riparian management zones maintain their natural range of variation and their ecological processes keep functioning.

Goals

- GO1 Riparian management zones improve their ecological diversity and maintain functional ecological connections throughout the management region.

Objectives

- O1 Survey riparian management zones in areas of high impacts to determine if conservation or restoration is needed.
- O2 Restore riparian areas impacted by recreational activities.

Standards

- S1 No management practice that may; cause detrimental changes in water quality and chemical composition, block the watercourse, or deposit sediment that adversely affects the water conditions and fish habitat; shall be permitted within the riparian management zone.

Guidelines

- G1 Ensure Forest Service soil and water best management practices are implemented when management or maintenance activities are conducted near riparian areas.

Management Strategies

- MS1 Consider lands and associated riparian corridors on major streams for land acquisition initiatives.
- MS2 Evaluate enrichment planting strategies with native species to improve riparian zone vegetation. This initiative could be developed with community groups.
- MS3 Aquatic organisms are monitored for methylmercury loading, and the public is informed where aquatic organisms may be harvested and safely eaten.

3.1.6 *Air/Resource Quality*

Desired Conditions

- DC1 Visitors experience clean air and clear vistas and recognize that the Forest is affected by man-made pollutants originating from sources outside Forest boundaries.
- DC2 Activities on the Forest meet all National Ambient Air Quality Standards designed to protect human health and public welfare.
- DC3 Air is clean and contributes to a healthy and functional environment.
- DC4 The Forest continues to contribute to good air quality through its biological processes.

Standards

- S1 Apply Federal and Commonwealth air quality regulations in the management of facilities.
- S2 Incorporate performance requirements for the protection of air quality in permitted activities and developments.

Guidelines

- G1 El Yunque National Forest will avoid management activities that would adversely impact air quality.
- G2 Consult with the Environmental Protection Agency on any proposed major emitting facility that can adversely impact air quality.

Management Strategies

- MS1 The Forest provides the local community and visiting public information on air quality when it has been impaired by any natural event.
- MS2 Public education and awareness will include air quality.
- MS3 Determine locations of high air pollutant concentrations using existing emissions and air quality monitoring data, personal observations, dispersion modeling, and professional consultation.

3.1.7 Soils

Desired Conditions

- DC1 Protect and maintain the current soil conditions within El Yunque National Forest.
- DC2 Maintain a healthy watershed by maintaining water quality and quantity, and preserving productive soils.
- DC3 Soil, subsoil and water resources are protected from physical, biological, and chemical contaminants.
- DC4 All hydric soils above the 1,969 (600 meters) feet elevational line in El Yunque National Forest are protected.

Goals

- GO1 Soils maintain their functions to sustain the ecological conditions and services of El Yunque.

Standards

- S1 Use native vegetation to revegetate landslides.
- S2 Landslides will be revegetated using mulch and native species soon after occurrence to achieve at least 85 percent groundcover within the first 2 years of the landslide.
- S3 Soil-disturbing activities and soil removal from projects in El Yunque National Forest are not conducted in such a fashion that they cause sedimentation, loss of soil productivity, or cover productive active soils.

Guidelines

- G1 Soil compaction and detrimental impacts to soil productivity are minimized.
- G2 Control the unauthorized use of off-road vehicles that may severely impair soils and may accelerate erosion.
- G3 Evaluate impacts of landslides to wetland condition and develop appropriate restoration activities following those evaluations.
- G4 Use soil and water best management practices to reduce impacts on soils.

Management Strategies

- MS1 Submit information on hydric soils to the National Wetland Inventory.
- MS2 Improve the Forest soil resources data by evaluating the characteristics and conditions of hydric soils in the Forest for inclusion in the National Wetland Inventory.
- MS3 Measure the stage and conditions of the soils in the different vegetation types of the Forest to identify soil formation stages and if they contribute to appropriate ecosystem services.

3.1.8 *Water Resources*

Desired Conditions

- DC1 Clean water flows from the Forest.
- DC2 Use of water for human consumption is balanced with in-stream flow needs for administrative use, recreation, research, and aquatic and terrestrial ecosystem maintenance.
- DC3 Sustain the hydrologic connectivity of the rivers flowing from the Forest to maintain a healthy aquatic fauna.

Objectives

- O1 Determine instream-flow needs for water intakes during the planning period.
- O2 Conserve the aquatic fauna through a healthy and continuous hydrologic network flowing from the Forest during the planning period.

Standards

- S1 New water intakes for consumptive uses are not allowed.
- S2 All proposed projects that contact or interact with the quality or supply of the water resource shall comply with permitting requirements of the responsible Federal and the Puerto Rican Commonwealth agencies.
- S3 Protect surface and subsurface water resources from physical, chemical, and biological pollutants.
- S4 The flow regimes shall not be modified to levels that negatively affect the abiotic and biotic needs of aquatic ecosystems.

- S5 Protect the free-flowing conditions and the outstandingly remarkable values that make the Rio Espiritu Santo, Rio Fajardo, and Rio Sabana rivers eligible for possible designation as Wild and Scenic Rivers.

Guidelines

- G1 Incorporate soil and water best management practices into the design of all projects that have potential to affect water resources.

Management Strategies

- MS1 Improve stream water network information to evaluate the quality and supply parameters of water resources.
- MS2 Promote the value and influence of the water resource in relation to the socioeconomic system or aspects of the region.
- MS3 Develop an initiative for an adoption program for streams that flow from the Forest. The purpose is to connect restoration and conservation projects in the Community Interface Resource Management Area to areas outside the Forest as part of agreements with community and environmental organizations in the region. This initiative should include a participatory monitoring component where community groups assist in implementing the monitoring protocol.

3.1.9 *Wildlife and Fisheries*

Desired Conditions

- DC1 High quality habitats for endemic wildlife and fisheries populations in their existing or historic distributions are enjoyed by the public and scientifically studied in their natural habitats.
- DC2 The Forest's rich biodiversity, including the ecological processes that may improve resilience to climate change, is maintained or restored.
- DC3 Tropical forests and ecosystems services management are improved.

Wildlife Operations Standards

- S1 Special-use permits shall be required for scientific or educational collections of any animal species for any non-Forest Service project.
- S2 Require capping of all open piping.
- S3 When controlling erosion, use wildlife friendly materials and techniques to reduce risk to wildlife.

Wildlife Operations Guidelines

- G1 Maintain the quality and effectiveness of limited, unique, or otherwise important habitat attributes such as cliffs, caves, dead standing trees (snags), wildlife roost sites and reproductive areas during any management, special use, or research activities.
- G2 El Yunque National Forest shall coordinate with the International Institute of Tropical Forestry, the Puerto Rico Department of Natural and Environmental Resources, and U.S. Fish and Wildlife Service in the management of wildlife and fish habitat resources on the Forest.

Fish and Other Aquatic Species Standards

S1 Water withdrawals for human uses shall not reduce flows below naturally occurring low flows.

Fish and Other Aquatic Species Guidelines

- G1 Maintain or enhance fish (especially for the freshwater eel) and freshwater shrimp passages and habitat connectivity in all El Yunque rivers and perennial streams.
- G2 During project-level planning, develop mitigation measures for any ground or surface water-disturbing activities when soil and water best management practices are not specifically developed for those activities. These mitigation measures should be designed to limit impacts to water quality, riparian management zones, and soils.

Management Strategies

- MS1 Collaborate with the Puerto Rico Department of Natural Resources (PRDNER) or a legitimate non-governmental organization³ with appropriate PRDNER permits to establish sustainable use and best management practices for collecting or harvesting endemic game fish species.
- MS2 Geospatially map special or biologically sensitive habitats, such as high-elevation wetlands above 1,969 feet and mature (*Tabebuia/Eugenia*) woodlands to document changes in habitat sizes for associated species.
- MS3 Develop environmental flow ranges for all watersheds in El Yunque at an appropriate time scale to better manage aquatic ecosystems.
- MS4 Develop a collaborative conservation education program focused on El Yunque's unique biological resources, and their relationships with the surrounding ecosystems.
- MS5 Develop opportunities through partnerships for conservation education or public viewing of wildlife in areas where low adverse impacts can be assured.
- MS6 Continue to support projects focused on native pollinators.
- MS7 Focus on improving habitat connectivity for viable freshwater eel populations with other Federal and State partners.

3.1.10 At-Risk Species: Fauna

Desired Conditions

- DC1 Robust populations (and metapopulations) of identified at-risk species (federally threatened, endangered, proposed, and species of conservation concern) are maintained through managing the population-limiting factors and habitats on the Forest that are identified in the U.S. Fish and Wildlife Service 5-year review of the endangered species within the Forest, Species Recovery Plans, and the Ecological Sustainability Evaluation Tool.
- DC2 Habitat (foraging, shelter, and breeding) of at-risk species is rehabilitated to support healthy faunal populations.

³ A legitimate NGO is an NGO that is registered and recognized by the Federal or local government as a non-governmental agency.

- DC3 Public awareness of at-risk species and associated conservation education programs improves long-term interagency recovery efforts and produces positive results.
- DC4 Invasive species are controlled.

Standards

- S1 Protect nest and roost sites for the endangered Puerto Rican parrot, Puerto Rican sharp-shinned and broad-winged hawks:
- ◆ No adverse management activities shall be conducted within 492 feet (150 meters) of an active Puerto Rican parrot, Puerto Rican sharp-shinned hawk or broad-winged hawk nest.
 - ◆ Activities with the potential to disturb raptors during nest selection and breeding season (November to August) shall be avoided.
- S2 Post and enforce area closure notices in any identified at-risk area (such as, Baño de Oro Natural Area and Puerto Rican parrot area closure) as needed, to ensure protection and population viability.
- S3 The use of electronic birdcalls for at-risk bird species is prohibited except for official purposes.
- S4 Within 0.62 mile (1 kilometer) of Puerto Rican Parrot release sites, no standing tress shall be cut down except for hazard trees.
- S5 Within 0.62 mile (1 kilometer) of Puerto Rican Parrot release sites, avoid loud noises of 80 decibels or louder during the critical nesting season of February 1 to June 30.

Guidelines

- G1 Forest management activities and research studies in existing or potential Elfin-woods warbler habitats, follow the guidelines in table 3-1 (see also appendix A for a description of the Elfin-woods warbler management situations).

Management Strategies

- MS1 At least one collaborative conservation education program effort should be conducted that includes at-risk species or their habitat needs every 2 years.
- MS2 By the year 2020 or the second edition of the monitoring report, observed patterns of all federally listed species and any species of conservation concern with strongly declining monitoring trends should be identified and geospatially mapped to share with other Federal and State partners.
- MS3 At least once every fiscal year, El Yunque should meet with other Federal and State partners focusing on population viability of all federally listed at-risk species (threatened, endangered, and proposed). These strategic meetings should identify on-going and future collaborative recovery efforts. Federally listed species such as Puerto Rican parrot, Puerto Rican sharp-shinned and broad-winged hawks, Puerto Rican boa, and the Elfin-woods warbler shall be a priority for management.
- MS4 Collaborate with Federal and Puerto Rican government agencies and legitimate non-governmental organizations to improve habitat connectivity of “at-risk species” beyond the boundaries of El Yunque National Forest.

Table 3-1. Description of management situations, sensitivity levels and guidelines

Situation	Description
	Management Situation 1: Prime Habitat
Guidelines	<p>1. <i>Site disturbances</i>: As a rule, adverse site disturbances will not occur within management situation 1. Project proposals that might result in any form of habitat modification <i>shall</i> also be reported to the U.S. Fish and Wildlife Service and then analyzed through the process required by the National Environmental Policy Act of 1969 (NEPA) and the Endangered Species Act of 1973 as amended for consultation.</p> <p>2. <i>Human disturbances</i>: All projects with potential to disturb Elfin-woods warbler within prime habitats shall also be reported to the U.S. Fish and Wildlife Service. This includes projects that may have acute and high sound amplitude (such as, chainsaws, blastings, aircraft use or other mechanical sources).</p> <p>3. <i>Human disturbances</i>: Should be timed outside of nest selection and the breeding season, to assure the highest level of habitat effectiveness in these ranges.</p>
	Management Situation 2: Potential Habitat
Guidelines	<p>1. <i>Site disturbance</i>: Activities that would result in any adverse physical modification of potential habitats <i>shall</i> be reported to the U.S. Fish and Wildlife Service and then analyzed through the process required by the National Environmental Policy Act of 1969 (NEPA) and the Endangered Species Act of 1973 as amended for consultation.</p> <p>2. <i>Human disturbances</i>: All projects with potential to disturb Elfin-woods warbler within prime habitats shall also be reported to the U.S. Fish and Wildlife Service. This includes projects that may have acute and high sound amplitude (such as, chainsaws, blastings, or other mechanical sources).</p> <p>3. <i>Human disturbances</i>: Should be timed outside of nest selection and the breeding season, to assure the highest level of habitat effectiveness in these ranges.</p>
	Management Situation 3: Limited Value Habitat
Guidelines	<p>1. <i>Site disturbances</i>: Projects within management area 3 should be coordinated through the Forest biologist and evaluated through NEPA.</p> <p>2. <i>Human disturbances</i>: Projects with potential to disturb any possible Elfin-woods warbler should be coordinated through the Forest biologist and evaluated through NEPA.</p> <p>3. No seasonal timing constraint would be indicated unless the amplitude of disturbances could influence the usability of nearby sensitive habitats.</p>

Note: For more information on the management situation description of the Elfin-woods warbler see appendix A.

3.1.11 At-Risk Species: Flora

Desired Conditions

- DC1 Continue to provide the ecological conditions in composition and structure that characterize each vegetation type contributing towards maintaining and restoring the habitat in which at-risk species occur in the Forest.
- DC2 Maintain healthy populations of identified at-risk species (federally threatened, endangered, proposed, and species of conservation concern) by managing population-limiting factors identified in the U.S. Fish and Wildlife 5 year review of the endangered species within the Forest to better adapt to any possible change (can be found in Recovery Plans and Ecological Sustainability Tool [Ecosystem Team, Supervisor’s Office El Yunque National Forest]).
- DC3 Control high-priority invasive plant species using appropriate methods.

Goals

- GO1 Partnerships with cooperators or pertinent agencies are successfully engaged to identify and implement strategies for increasing at-risk species population.
- GO2 The Forest collaborates with the University of Puerto Rico and the Puerto Rico Department of Natural and Environmental Resources to keep botanical vouchers of federally listed species for future references in their herbariums.

Objectives

- O1 Implement surveys to acquire additional information on the population status of at-risk species, with priority given to those federally listed; in compliance with their recovery plan within 2 years of plan's approval.

Standards

- S1 Do not allow collection of orchids, including threatened, endangered, and species of conservation concern, unless approved for scientific and educational purposes.
- S2 Incorporate equipment-cleaning practices into contracts, special-use permits, and Forest activities to prevent the introduction and spread of invasive plant species.
- S3 Control invasive species using appropriate methods.

Guidelines

- G1 Follow recommendations for federally listed plant species recovery developed in the individual recovery plans.
- G2 Forest management activities are consistent with recovery plans.

Management Strategies

- MS1 Collect and share inventory and monitoring information with Puerto Rico Department of Natural and Environmental Resources and U.S. Fish and Wildlife Service; which documents locations, trends, habitat conditions, threats and management responses.
- MS2 Maintain up-to-date digital databases of species occurrences and trends to share with Puerto Rico Department of Natural and Environmental Resources and U.S. Fish and Wildlife Service.
- MS3 Cooperate with U.S. Fish and Wildlife Service in the 5-year review of federally listed plant species present in El Yunque.

3.2 Social and Economic Sustainability and Multiple Use

3.2.1 *Socio-economics*

Desired Conditions

- DC1 In balance with its ecological conditions and resilience, the Forest provides a broad range of social, cultural, and economic benefits to individuals and communities from local to global levels. It serves as a model of an adaptive, sustainable, and resilient social-ecological system to

surrounding communities and beyond, and cultivates sustainable resource- and land-use throughout the region.

- DC2 The Forest is shaped by, and inextricably linked to, humankind. Humans act as Forest stewards, producers, distributors, and users. Their demands on the Forest do not compromise its integrity or resilience, nor do they exceed the Forest administration's capacity or resources for Forest sustainability.
- DC3 Through its ecological, social, and economic characteristics and conditions and opportunities for recreation, education, spirituality, historical and cultural preservation, wood and non-wood forest products, and other goods and services, the Forest contributes to a healthy sense of place and way of life for nearby residents, neighboring communities, and visitors from near and far.
- DC4 Forest goods and services, including clean air and water, native flora and fauna, recreation, scenic beauty, solitude, and escape from the everyday are utilized by individuals and communities to generate employment and stimulate the economy in and around the Forest.
- DC5 Individuals, communities, and businesses that rely on the goods and services provided by the Forest are resilient and adaptive to changes in climate, land use, the economy, and other conditions. They have the capacity to collectively create and pursue ecological and socioeconomic opportunities in and around the Forest that foster sustainability across the landscape.

Goals

- GO1 Local residents benefit from jobs and income associated with Forest management activities, and local economies benefit from visitors attracted to the wide variety of goods and services that the Forest offers.
- GO2 Businesses at the local level and beyond increasingly offer recreation and other opportunities that benefit the sustainability of the Forest and the landscape in which it is situated.
- GO3 Partnerships and other collaborative arrangements with neighboring communities, special interest groups, State agencies, local governments, and others that support and enhance forest conservation, recreation, restoration, education, and other programs and activities continue to grow and thrive.

Management Strategies

- MS1 Develop multiple-use resource management opportunities, particularly in accessible locations in the lower elevations of the Forest, that consider the ecological, social, and economic conditions of the broader landscape and that provide opportunities for economic development and diversification.
- MS2 Promote increased participation of local landowners, land management agencies, and other key stakeholders in conservation efforts at the landscape scale through an all-lands approach to conservation that identifies key areas for connectivity, multiple uses, and ecosystem services and related opportunities for conservation.
- MS3 Maintain and increase partnerships and other collaborative relationships that support and provide for sustainable recreation in and around the Forest.

- MS4 Maintain and increase partnerships and other collaborative arrangements with local communities, schools, government agencies, and other key stakeholders that enhance environmental education, literacy, and interpretation, and that strengthen the regional identity and capacity for shared stewardship.



Looking down from the upper-elevation forest

3.2.2 Broader Landscape and Lands

Desired Conditions

- DC1 All lands destined for conservation efforts should include conservation easements and other land conservation and restoration programs.
- DC2 Lands dedicated to farming and providing natural environments in the region surrounding El Yunque will increase. Agricultural lands represent an opportunity for conservation, for growing food, providing for wildlife, and providing employment through recreation.
- DC3 Acquire abandoned agricultural lands if there is a willing seller.

Objectives

- O1 Work with existing landowners and organizations to provide incentives or acquire lands that promote conservation initiatives for protecting surrounding hills, stream corridors, riparian areas, wild and scenic river corridors, and connections to the Reserva Natural Corredor Ecológico del Noreste (Northeast Ecological Corridor, Natural Reserve), Rio Espiritu Santo Natural Reserve, Las Picuas Reserve, La Monserrate Public Park, Las Cabezas de San Juan Natural Reserve, Seven

Seas Natural Reserve, Natural Areas in Roosevelt Roads, Ceiba State Park (Bosque Estatal de Ceiba) and Humacao Natural Reserve (Refugio Natural de Vida Silvestre de Humacao) over the planning period.

Goals

- GO1 Develop a land acquisition plan to identify priority tracts where there is a willing seller.
- GO2 Explore opportunities for continued land ownership adjustments giving priority to lands that:
- ◆ Help consolidate large blocks of existing National Forest System lands (as opposed to adding onto small or isolated blocks) and inholdings;
 - ◆ Protect resource values on adjacent, existing National Forest System land;
 - ◆ Contribute to the recovery of threatened or endangered species or aid in the protection of species of conservation concern;
 - ◆ Enhance recreation, public access, and protection of aesthetic values, especially those that provide public access to waterways; and provide for the protection of important cultural resources; and
 - ◆ Complement a designated special area such as a wilderness area or wild and scenic river.
- GO3 Collaborate with municipalities' territorial plan and Puerto Rico land use plans by fostering an all-lands regional perspective.
- GO4 Promote reducing urban expansion around El Yunque.

Standards

- S1 Do not authorize land acquisition of contaminated sites.

Management Strategies

- MS1 Using a landscape approach, promote the maintenance of existing arrangements and the pursuit of new opportunities for land acquisition and conservation across Forest boundaries by working with adjacent and interested public and private land managers, landowners, and other stakeholders during the planning period.
- MS2 Acquire additional lands where there is a willing seller.

3.2.3 *Environmental Education*

Desired Conditions for Interpretation, Environmental Education, and Literacy

- DC1 The Forest has comprehensive and complementary interpretive and educational programs that are relevant to local populations and support the conservation of the Forest, promote ecological and socioeconomic sustainability, increase interest in collaborative resource management, and address the learning needs of a diverse audience.

- DC2 Partnerships are created with local communities, schools, special interest groups, and government agencies to develop and support interpretive and educational efforts and to strengthen regional identity and capacity for shared stewardship.
- DC3 Interpretive and educational efforts and materials contribute to increasing environmental literacy, especially among youth and underserved populations, through the development of environmental thinking, decision-making, and ethical commitment. Programs are interdisciplinary, collaborative, problem-based, and promote research and action in favor of the environment.
- DC4 Environmental education topics include human-environment interactions and sustainability, climate change, ecosystem services and diversity, collaborative and adaptive planning and management, and conservation principles and techniques.

Goals

- GO1 El Yunque National Forest develops and supports interpretation and educational activities in partnership with interested groups and individuals.
- GO2 Recreational sites and facilities, and designated areas, beyond El Portal, are suitable for the integration of community-based interpretive and educational efforts, training, and demonstration in accordance with management area direction.
- GO3 El Portal Tropical Forest Center and El Yunque National Forest's website serve as the main outlets to inform and orient visitors and other customers to the interpretive, environmental education, and recreational opportunities available in the Forest, the surrounding region, and Puerto Rico.
- GO4 El Yunque fosters professional development and skills-based training to staff, volunteers, outfitters, and collaborators who are responsible for providing interpretive and environmental education programs within the Forest.
- GO5 Research on education and interpretation efforts in and around the Forest is promoted and incorporated into the development and implementation of educational and interpretive programs.

Objectives

- O1 Develop an interpretation and environmental education strategy within 2 years of Plan approval to be implemented within a 3- to 5-year timeframe that builds upon current standards and guidelines, and measures the effectiveness of programs and initiatives in partnership with surrounding communities, government agencies, special interest groups and organizations.
- O2 Develop an interpretation and environmental education training plan within 3 years of Forest Plan approval that fosters professional development and enhances employee and volunteer learning opportunities in the areas of interpretation and environmental education. This includes (1) listing existing successful examples and best practices for employees and partners to incorporate into their practices; (2) opportunities such as national training workshops, web-based learning, live broadcasts, and programs offered by partners and universities; and (3) materials to introduce staff to the special opportunities and challenges of interpreting natural, historical, and heritage resources of El Yunque National Forest and its broad landscape.
- O3 Develop a communication strategy to deliver key environmental and interpretive messages to different stakeholders including continued outreach activities and events.

- O4 Develop collaboratively, at least one educational project in each of the municipalities surrounding the Forest each year of the planning period.

Guidelines

- G1 Interpretive and educational materials incorporate local knowledge and perspectives, as well as a variety of current educational and interpretive technologies, theories, and methodologies that consider the broad range of visitors and audiences interested in the Forest.
- G2 Interpretive and educational activities should be designed and implemented in collaboration with a network of partners—such as local schools, planners, scientists, community members, tourism providers, and the general public—and provide for development for Forest personnel and collaborators.
- G3 Interpretive and educational programs and materials are universally accessible through the Forest website.
- G4 Activities and materials provide students and visitors with information on the wise use of the Forest's natural and cultural resources as well as tropical forests in general, and encourage action towards their conservation.
- G5 Interpretive and educational activities are assessed to gather feedback, monitor the effectiveness of programs, and to identify future needs and directions.
- G6 Materials developed for interpretive and educational programs should integrate messages and designs in compliance with Forest Service standards.

3.3 Multiple Uses

3.3.1 *Ecosystem Services*

Desired Conditions

- DC1 El Yunque National Forest provides a collection of goods and services that are critical to human health and livelihood for the region and Puerto Rico.
- DC2 The Forest continues to generate and deliver continuous ecosystem services.
- DC3 The Forest creates a greater understanding and recognition of the goods and services provided by the Forest in the region.
- DC4 The Forest sustains ecosystem services across public lands and coordinates with the private lands in the region.

Goals

- GO1 Maintain and improve, according to the available resources, the level of yield from the ecosystem services of the Forest.
- GO2 Promote research on the economic value of ecosystem services provided by El Yunque National Forest at a regional scale.

- GO3 Develop a monitoring protocol for ecosystem services provided by the Forest, with the potential for implementation by interest groups and stakeholders in the region.
- GO4 Promote and increase knowledge in the community, and with visitors, of the ecosystem services provided by the Forest.
- GO5 Promote research and development of the ecosystem services from the Forest that will create economic benefits now and in the future.

Guidelines

- G1 Minimize impacts of all considered projects and activities within the Forest to maintain ecosystem services.

Management Strategies

MS1 Through ecosystem services, the Forest would encourage natural resource managers to include a broader array of services or values, such as managing for water, wildlife, forest products and recreation, to address the need to sustain “provisioning” services, while also being stewards of regulating, cultural, and supporting services. The benefit to people (that is, the goods and services provided) is what differentiates ecosystem services from the ecosystem itself. The assessment of El Yunque National Forest identifies the following key ecosystem services provided by the Forest:

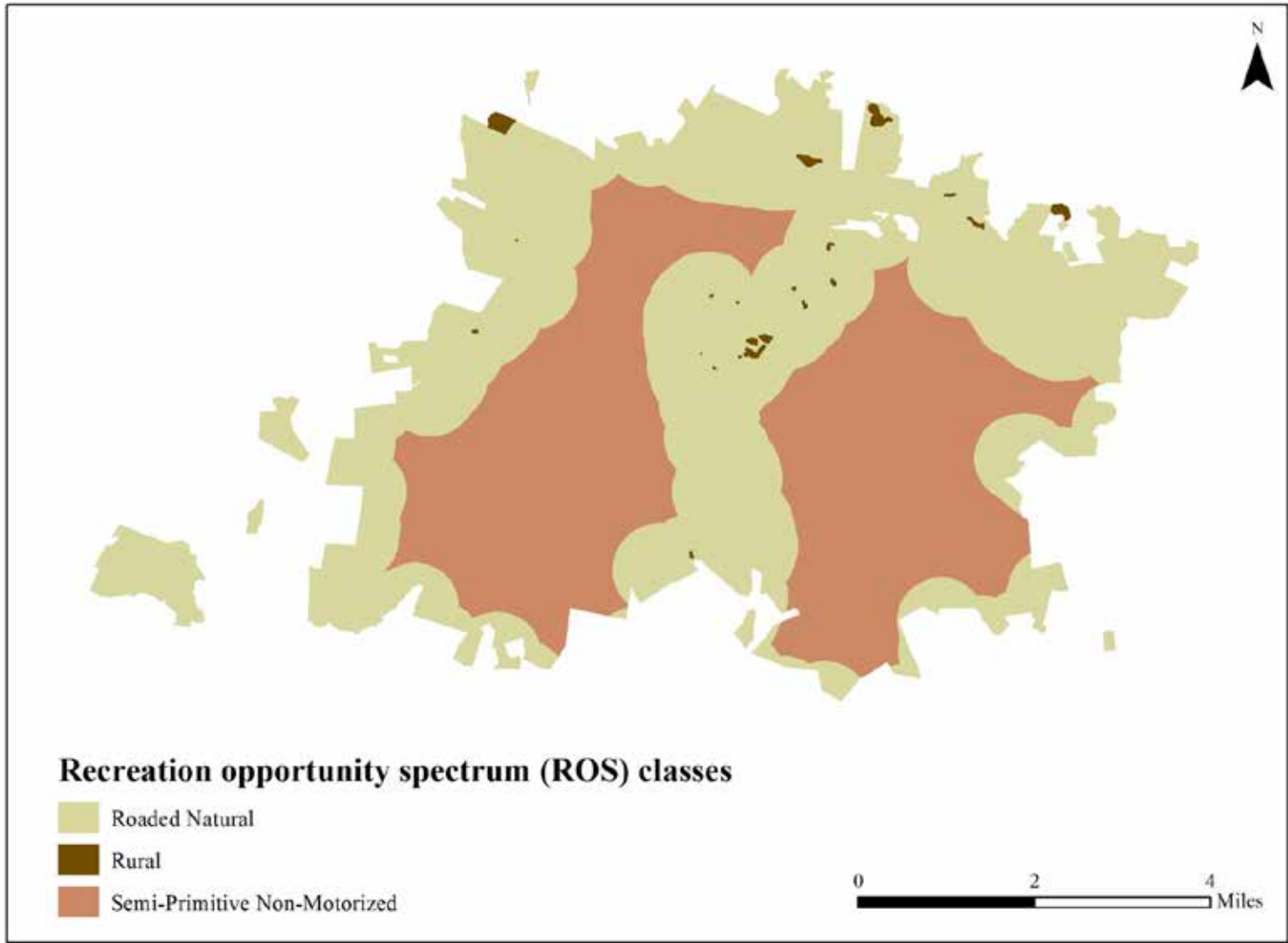
- ◆ Water quality and quantity and flood control
- ◆ Clean air
- ◆ Outdoor recreation
- ◆ Scenery
- ◆ Fish and wildlife (specifically, habitat for these species)
- ◆ Cultural/heritage values, inspiration, spiritual values and solitude
- ◆ Wildlife viewing
- ◆ Research and education
- ◆ Carbon sequestration and climate regulation
- ◆ Forest products such as wood products

3.3.2 *Recreation*

Recreation Opportunities

The recreation opportunity spectrum (ROS) is a means of identifying and determining the diversity of recreation opportunities for a natural area or a group of natural areas, and of subsequently guiding management actions. The recreation opportunity spectrum classifies the natural setting and the management activity that occurs in that management area.

The recreation opportunity spectrum classes that are found in El Yunque are “rural,” “roaded natural,” and “semi-primitive nonmotorized.” Most recreation areas are found in the recreation opportunity spectrum class “rural”. A high percentage of Forest land is classified as “semi-primitive non-motorized” (El Toro Wilderness Area and Baño de Oro Research Natural Area) (see appendix D in the EIS).



Map 3-3. Recreation opportunity spectrum (ROS) classes found in El Yunque

Desired Conditions

- DC1 Recreation opportunities connect visitors to their natural and cultural heritage, which are in harmony with preserving and conserving the Forest ecosystems.
- DC2 The Forest provides a range of locations for opportunities both on the main PR-191 corridor and at lower elevations.
- DC3 Recreation opportunities are managed to promote long-term ecological, cultural and historic, social, and economic sustainability.
- DC4 The Forest provides a variety of recreational opportunities ranging from nonmotorized recreation to water play.
- DC5 The Forest manages recreation opportunities considering the carrying capacity at major Forest recreation destinations in a “roaded natural” setting.
- DC6 The Forest maintains recreational settings ranging from “rural” to “roaded natural” with opportunities for its visitors to enjoy outdoor recreation activities in a tropical forest.
- DC7 The Forest provides recreational settings at remote sites at lower forest elevations along existing roads and trails.
- DC8 Visitor centers and interpretive sites are attractive, clean, safe, well maintained and provide universal access in a rural setting. Adequate signage helps users enjoy and learn about the Forest.
- DC9 Recreation demands are balanced with the ability of the land to sustain use, the capacity of the Forest staff to manage its use, and the resources available to manage recreation opportunities.
- DC10 The Forest protects the scenic integrity and sense of place that make each recreation setting special, especially in “primitive” areas.
- DC11 The Forest maintains recreation settings by considering use and possible impacts to ecology, scenic character values, social encounters and economic sustainability.
- DC12 The Forest maintains the desired recreation settings and opportunities by mitigating the impacts from climate change and unsustainable use.
- DC13 The Forest manages and interprets historic recreational assets.
- DC14 Management of trash throughout the Forest promotes recycling and leaves the Forest clean.

Goals

- GO1 Develop a Forest access strategy and a transportation plan integrated with regional tourism and recreation.
- GO2 Diversify access and alleviate high use on PR 191, without negatively impacting sensitive resources and existing protected areas.
- GO3 Address waste management issues at developed recreation sites as well as along trails and other popular Forest recreation destinations.

- GO4 Improve barrier-free access opportunities.
- GO5 Restore the condition and function of the recreation facilities and settings, expanding and adapting them to reflect the diversity of the culture, the abilities, family structure, and activities of our ever-changing society.
- GO6 Maintain and develop a trail system that is based on demand, safety, administrative operation capacity, maintenance, ecological constraints, and shared stewardship opportunities.
- GO7 Identify existing, abandoned, or segmented trails that can connect into other recreational areas located along the lower elevations of the Forest for future use and management by adjacent community groups.
- GO8 Identify new recreation opportunities at lower Forest elevations and near local communities.
- GO9 The Forest provides updated interpretive exhibits and general information to help visitors enjoy the Forest and develop a conservation ethic for Puerto Rico and tropical forests worldwide.
- GO10 Connect urban areas and rural communities to the scenic attractions, historic places, and recreation opportunities.
- GO11 Evaluate community and State parks, and other Federal and local open-space lands for connections with Forest lands to help meet the outdoor recreation and tourism demands for the region.
- GO12 The Forest implements place-based recreation opportunities using collaborative work with adjacent communities and other outdoor recreation and tourism providers within regional destination areas.
- GO13 Partnerships are created with surrounding Forest communities, special interest groups, and municipal governments to support and enhance recreation programs, considering the broader landscape.
- GO14 Cultivate coalitions of recreation interest groups that will help provide recreational experiences, service activities, and environmental education for youth and adults that promote fitness, appreciation of nature and history, and citizen stewardship.
- GO15 The Forest uses citizen stewardship and partnerships as well as field presence to provide quality recreation experiences while reducing the effects of visitor use on the landscape setting.
- GO16 Evaluate infrastructure investments and program costs. Those costs will be considered alongside available resources such as appropriations, fee revenue, partnerships, volunteers, and other service provider options to seek a sustainable and integrated base for the program.

Objectives

- O1 Establish and implement trash-free zones at high use and isolated undeveloped recreation sites within 1 year following plan approval.
- O2 Establish and implement trash-free zones at dispersed recreation sites along recreation segments of wild and scenic rivers within 1 year following plan approval.

- O3 Complete a new camping area plan to address current demands and practices while protecting Forest resources within 1 year following plan approval.
- O4 Interpretive exhibits at the visitor center are revised and updated within 5 years of the Plan's approval.
- O5 Revitalize recreation areas located along the lower elevations of the Forest that are either not being used or are underutilized, but have a potential for reuse or expanded use within 3 years following Plan approval.
- O6 Reduce the maintenance backlog of historic and iconic structures by 25 percent in the first 3 years following plan approval.
- O7 Complete and implement the Forest carrying capacity study 3 years following plan approval.

Standards

- S1 During high visitation periods the Forest coordinates traffic control with law enforcement, special-use tour guide permittees and private landowners.
- S2 Establish and enforce maximum vehicle capacity within the Forest during high visitation periods.
- S3 Ensure minimal impacts from vehicle capacity during high visitation periods.
- S4 Limit use of trails to hiking, and where appropriate, wheel chairs. Other potential trail uses, such as motorcycles and horseback riding, are not permitted because of the Forest's steep slopes, wetland conditions, and incompatibility with other uses and values.
- S5 Where camping is causing resource damage or conflicts with other uses, implement closure orders to prohibit or limit use.
- S6 Require a permit for camping in the Forest in order to provide users better information, minimize impact to the resources, and promote visitor safety. Include the following information in the camping permit:
 - ◆ Length of stay is limited to 5 days
 - ◆ Group sizes are limited to six persons or fewer per campsite. Groups larger than six persons, but no larger than 18 persons, will only be regularly permitted at the Old Nursery site. Permitted camping may be allowed in other locations upon authorization from the Forest.
 - ◆ Tents must be located at least 30 feet from trails and streams, and at least 50 feet from roads and developed campsites.
 - ◆ Open campfires are not permitted. Build fires only in fire rings or self-contained grills, or use camp stoves.
 - ◆ Cutting of trees, shrubs, branches or other vegetation is not permitted.
 - ◆ Do not wash cooking and eating utensils in streams. Use a bucket or wash pan away from streams.

- ◆ Do not dispose of human waste in streams. Bury waste (“cathole method” 6- to 8-inches deep and 4- to 6-inches wide) and at least 100 feet from streams.
- ◆ Use of audio devices and instruments is highly discouraged. If used it should be kept at a low volume so as not to disturb other Forest visitors in designated primitive campsites.

Guidelines

- G1 The Forest encourages the practice of “pack-it-in and pack-it-out” throughout the Forest and implements Forest trash-free zones on recreation segments of the Forest wild and scenic rivers.
- G2 Incorporate barrier-free access into recreation facility design and construction, where practical.
- G3 Incorporate administrative capacity elements such as bathrooms, parking facilities, carrying capacity, and monitoring in providing for recreational opportunities.
- G4 Reduce environmental footprints and serve as a model for our visitors and other providers by incorporating sustainable travel industry best practices in our operations and using “green technology” for facility and trail construction.
- G5 Reduce noise at communication sites located near observation sites.
- G6 Develop new program improvement criteria and evaluate where the capacity levels are to sustain existing facilities.

Management Strategies

- MS1 Promote outdoor physical activities, especially among youth, due to the trends in demographics, which expect a decrease in the 10 and under age group for total population.
- MS2 Manage and interpret recreational settings in relation to historical sites, archeological assets, and cultural resources.
- MS3 Review the underutilized and abandoned facilities on the Forest to see if any could be suitable as camping areas or other shared stewardship alternatives.
- MS4 Develop two historic/cultural recreation opportunity guides that focus on a specific location or Forest destination with detailed information about their value and importance to the Forest.
- MS5 Develop and implement place-based recreation opportunities using collaborative processes to work with communities and other outdoor recreation and tourism providers within our regional destination areas.
- MS6 Provide local organizations support in creating a regional recreation destination agenda where the Forest is not the only nature attraction.
- MS7 Create shared-stewardship recreation-access opportunities throughout the Forest region.
- MS8 Work with communities and State parks as well as other Federal and local land managers to help meet outdoor recreation and tourism demands for the region.
- MS9 The Forest continues to work with adjacent communities and tourism providers by providing information relevant to their commercial offerings. Meanwhile the adjacent communities and

tourism providers supply the Forest with information on their commercial offerings as well as general information on the Forest they might possess.

- MS10 The Forest encourages regional connection through communities to promote scenic attractions, historic places, and recreation opportunities.
- MS11 Develop citizen stewardship, and create partnerships with existing community groups.
- MS12 The Forest should improve the existing trail system through collaboration and shared stewardship by:
- ◆ Linking existing trails to local communities located at lower elevations adjacent to the Forest boundary.
 - ◆ Improving trail routes, which currently require or encourage users to walk along roads open to vehicle use; through trail construction, relocation, or closures, etc.
 - ◆ Signing trailheads and trail intersections with interpretive environmental and cultural resources information.

3.3.3 *Forest Products*

Forest products include non-timber forest products such as: (1) foods, like wild edible mushrooms, fruits, and nuts; (2) medicinal plants and fungi; (3) floral greenery and horticultural stock; (4) fiber and dye plants, lichens, and fungi; (5) oils, resins, and other chemical extracts from plants; (6) potential food sources like sustainable harvesting of fisheries; and (7) small-diameter wood used for poles, posts, carvings and other biological material that are harvested from within and on the edges of natural, manipulated or disturbed forests. It may also include larger-diameter wood removed as salvage from hurricanes.

Desired Conditions

- DC1 Provide and conserve a continuous supply of forest products in a sustainable manner.
- DC2 Products contribute to social conditions and quality of life of people and communities.
- DC3 Forest products contribute to economic conditions through individual employment, small businesses, and potential demonstration uses.
- DC4 Contribute to economic conditions such as individual employment, small businesses, and personal income, by providing potential financial benefits from the sustainable use of forest products.
- DC5 Protect the structure, native species composition and function of all 15 forest types in El Yunque, in order to protect the many endemic species and mature forest vegetation they contain.

Goals

- GO1 Forest products will be offered sustainably.
- GO2 Promote partnerships of sustainable forest products utilization.
- GO3 Communicate forest product availability, especially to surrounding communities.

Objectives

- O1 Issue forest products permits during the planning period.
- O2 Management and restoration of the forests at lower elevation (below 600 meters) will be a priority during the planning period. If a natural disturbance occurs, then all forest types will be evaluated to assign management and restoration priorities.
- O3 Update the vegetation map to delineate and inventory suitable forest product areas within 2 years of plan signature.

Standards

- S1 Do not authorize vegetation treatments without silvicultural examinations and prescriptions adapted for tropical forests.
- S2 Forest product projects should maintain forest canopy cover. If a natural disturbance occurs, prevent expanding canopy openings in the treatment area and identify downed timber for salvage.
- S3 Remove no more than one-third of total basal area in any one treatment or forest product initiative. In the event of natural disturbance, prevent expanding canopy openings and identify downed timber for salvage.
- S4 Salvage and dead tree extraction will be allowed and considered case by case, and will require a special permit.
- S5 Special forest product permits can only be used for products that can be managed on a sustainable basis, and the amounts offered are limited to the amount that can be harvested annually in perpetuity.
- S6 Forest products free use permits cannot authorize the extraction of forest products in an amount exceeding known sustainable harvest levels.
- S7 No harvest for the purposes of timber production will occur on lands identified as not suited for timber production.
- S8 Any timber removal operations will only occur where soil, slope, or watershed conditions would not be irreversibly damaged.
- S9 Timber harvesting systems will not be selected based on dollar return or output of timber.
- S10 The volume of timber sold will be limited to the quantity equal to or less than the quantity that can be removed annually in perpetuity on a sustained-yield basis (see appendix B).
- S11 Timber will be removed only where there is assurance that such lands can be adequately restocked within 5 years after harvest.
- S12 Enhance traditional native forest products through collaboration with nearby communities.
- S13 Other than responding to salvage operations following natural disasters, uneven-aged forest silvicultural practices will be used in treating acres and in providing wood products.

Guidelines

- G1 Mark boundaries of timber production areas.
- G2 Tree cutting will be allowed to: (1) salvage trees killed or damaged, (2) control insect and disease outbreaks, (3) protect human health and safety, (4) protect resources, or (5) move toward the desired conditions. Any harvestings will be focus in the improvement of the stand structure for the enhancement of native species. The selection and use of small-diameter timber (less than 8 inches dbh) should be mainly for poles, posts, carvings and other small log uses.

Management Strategies

- MS1 Consider as a priority the local needs for the products, but within the limits of what can be offered in a sustainable manner.
- MS2 Identify economic, social, and ecological barriers for special forest products use.
- MS3 The Forest product use programs should be based on a sustainable utilization or harvesting plan.
- MS4 The Forest considers the benefits that the forest products provide to the public and visitors as part of the utilization or harvesting plan.
- MS5 Consider projects that help restore productivity of degraded land and provide food and income to local people.

3.3.4 *Watershed*

Desired Conditions

- DC1 Maintain healthy watershed conditions within the Forest considering water quality, water quantity, soil productivity, and vegetation. Healthy watersheds support important ecological and social services such as productive soils, biological diversity, wildlife habitats, water supplies, and flood control benefits.
- DC2 Waterways are important attractions for tourism, connecting the health of these systems with an important economic influence in the region.
- DC3 Conserve a functional linkage for the aquatic wildlife from inside the Forest to the ocean.
- DC4 Watersheds within the Forest are restored and conserved where needed; with particular attention to the connection between El Yunque and the Rio Fajardo (river).

Goals

- GO1 Protect the watershed systems of the Forest by implementing practices designed to maintain or improve watershed conditions.
- GO2 Apply the Watershed Condition Framework by developing restoration action plans for priority watersheds within the Forest.
- GO3 Use watershed delineations when considering planning and land use.
- GO4 Participate in cooperative and community watershed management activities.

- GO5 Foster the development of an ecological corridor between the mountains and the ocean within the municipality of Rio Grande.

Objectives

- O1 Develop a restoration action plan for Rio Blanco Watershed to improve its condition within 5 years of the Plan's signature.
- O2 Apply best management practices (under Forest Service regulations and the Natural Resource Conservation Service) each year of the planning period.
- O3 Stabilize landslides to minimize soil erosion and stream sedimentation by establishing at least 85 percent ground cover within 2 years of slides.

Standards

- S1 Incorporate best management practices (under Forest Service regulations and the Natural Resource Conservation Service) in the design of all projects that affect watershed resources.
- S2 Ensure that there is no net loss of riparian areas or wetlands on the Forest.

Management Strategies

- MS1 Rio Blanco is the watershed under Forest management with highest priority for improvement according to the Watershed Condition Framework. This watershed will be managed to supply appropriate ecological services.
- MS2 Assess the conditions of watersheds by using the Watershed Condition Framework.

3.3.5 *Special Uses*

Desired Conditions

- DC1 Public lands are easily accessible. The Forest administers special uses that contribute to the public's benefits from the Forest.
- DC2 Permitted outfitter services within the capacity of the resources available on the Forest are maintained.
- DC3 El Yunque National Forest is respected as a tourist and recreation destination for local residents and visitors to Puerto Rico.
- DC4 Local community-based jobs and services are supported.
- DC5 Non-recreation special-use authorizations are administered properly and in accordance with Federal regulations and Agency protocols for the benefit of the people.

Objectives

- O1 Ensure outfitter/guide permit standards continue to address critical issues such as number of permits, quality of information conveyed to guided tourists, safety requirements, and conflicts with other recreational uses of the Forest.

Standards

- S1 Require special-use permits for all commercial use of the Forest.
- S2 Require a special-use permit for any military exercise that is approved. Include the following limitations:
- ◆ Limit group size to 15 persons.
 - ◆ Use only existing roads and trails.
 - ◆ No uniforms, weapons, military vehicles, or chanting.
 - ◆ Avoid interacting with other visitors.
 - ◆ Location will be designated within the permit.
- S3 Authorize only special-use applications that propose a use consistent with: the laws, regulations, orders and policies establishing or governing the Forest; the land management plan; other applicable Federal laws; and with applicable State and local health and sanitation laws.
- S4 Applicable special-use applications will only be approved if they obtain the required State, county, municipality, or other federally required licenses, permits, certificates or other approved documents as outlined on 36 CFR 251.56(a)(2).

Guidelines

- G1 Locate new transportation or utility proposals inside existing corridors and right-of-ways.
- G2 Coordinate with the International Institute of Tropical Forestry on all special-use applications for research activities on the Forest.
- G3 Minimize use of the Forest for military purposes.
- G4 Cooperate with the appropriate Federal and Commonwealth agencies to ensure that oil and gas leasing, exploration, and extraction remain inactive.
- G5 Evaluate special-use permit applications against the following priorities: public safety, health and welfare, and general public benefit associated with National Forest resources.

3.3.6 *Scenic Character*

The Forest's natural scenic beauty is comprised of immensely diverse vegetation, steep landforms, clear streams, and waterfalls. Most Forest roads, trails, and recreation areas provide opportunities for viewing scenery. Mountain slopes and ridges, rugged canyons and ravines, floodplains, stream terraces, and mountain peaks and summits provide a range of topography. Landscapes have lush, continuous canopy, forested mountains with every shade of green imaginable, remarkable rock formations, and picturesque waterfalls. The vegetation mosaic varies across the Forest with towering ancient tabonuco and palo colorado trees, giant tree ferns, diverse palms, and trees stunted by constant rain and cloud cover at the highest elevations. There are many streams and rivers that originate in the upper elevations. The steep gradient of many streams, rocky streambeds with boulders, and high rainfall amounts result in numerous scenic rapids, pools, cascades and waterfalls throughout the Forest.

Currently about 60 percent of the Forest has natural scenic character, and 40 percent has a naturally appearing scenic character. Forest visitors and adjacent landowners are sensitive to noticeable changes in the landscape whether they are human-caused, extreme weather events or the result of natural process.

Scenery is an integral component of all forest settings, and contributes to the quality of the user experience. Providing a natural appearing landscape for these visitors is important since Forest visitors rank scenery and attractiveness of the forest landscape as very important (USDA Forest Service 2012).

Scenic integrity indicates the degree of intactness and wholeness of the landscape character. Human alteration can sometimes raise or maintain integrity. More often, it is lowered depending on the degree of deviation from the character valued for its aesthetic appeal (Handbook for Scenery Management, Agriculture handbook; no. 701).

Desired Conditions

- DC1 The Forest provides high scenic integrity considering the varied elements valued by visitors and nearby communities; and promotes the natural forest.
- DC2 Human-induced alterations to the vegetation or construction of facilities are designed to blend with the characteristic of the landscape.
- DC3 Visitors are drawn to El Yunque for its natural scenic beauty comprised of immensely diverse vegetation, steep landforms, clear streams, and waterfalls.
- DC4 Roads off-forest as well as most Forest roads, trails, and recreation sites, provide a high level of scenic viewing.
- DC5 The natural scenic beauty of the Forest stands out, making it a major local and international recreation destination.
- DC6 Large areas of the Forest consist of naturally evolving landscapes where processes occur with very little human intervention.
- DC7 Communication sites, major utility corridors, and administrative facilities are areas that have a moderately altered scenic character. Activities in these areas dominate the valued scenic character, but borrow from valued attributes such as color, shape, edge effect, pattern of natural openings, vegetative type changes and architectural styles outside the landscape being viewed.
- DC8 Most of the remaining Forest area has a naturally appearing scenic character. Deviations in the scenic character borrow from elements in the landscape. Roads and trails are a part of the naturally appearing landscape, offering opportunities to view scenery. Historic structures, such as Mount Britton or Yokahu Tower, are noticeable, but borrow from landscape elements and are positive cultural elements in the landscape adding to the valued scenic character. Changes to scenic condition across the landscape mostly occur through natural processes such as hurricanes, tropical storms, tree falls, and landslides with naturally evolving landscapes within the Plan period.
- DC9 Evidence of human activities and management is noticeable along roads and trails where administrative facilities and recreation developments such as visitor centers, parking areas, trailheads, and picnic areas are visible, but remain subordinate to the scenic character being viewed. The landscape has a slightly altered scenic character from these activities.

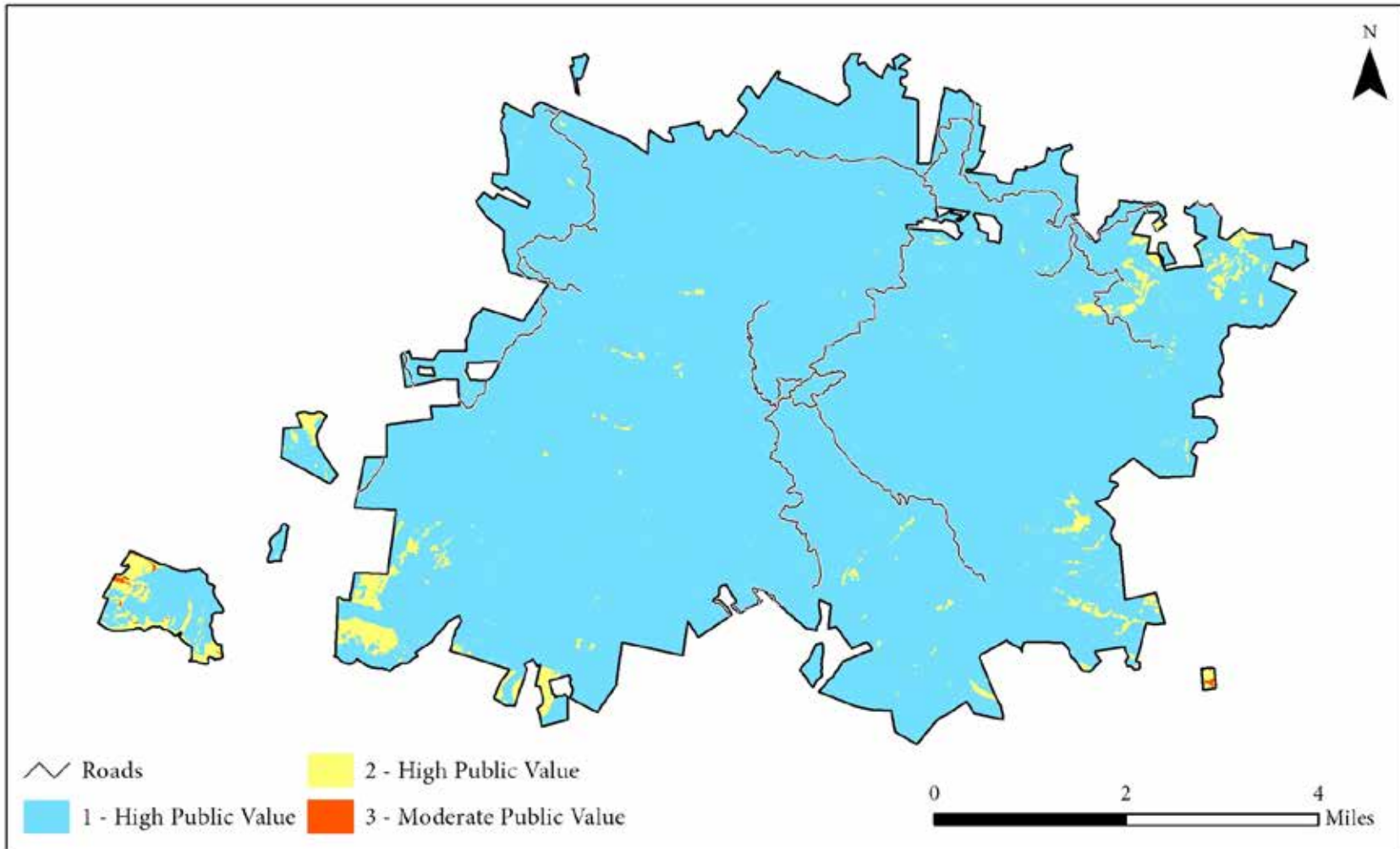
DC10 The landscapes of the Forest have a wide variety of features providing for some of the most spectacular scenery in the world. People are drawn to El Yunque for its diverse vegetation, tranquility, inspiring scenery, and cool, clear water that provides an escape from the tropical heat. The Forest area has a variety of scenic settings; from dense enclosed rain forest picnic areas and trails, to cloud covered peaks and observation towers; which on clear days have vistas of both the Atlantic Ocean and the Caribbean Sea. The Forest also has many prehistoric and historic sites adding richness of character and culture.

Standards

S1 Management activities are designed to meet or exceed the following scenic integrity objectives:

Inventoried Scenic Class	1	2	3
Scenic Integrity Objectives	H	H	M

Note: El Yunque has scenic class 1, 2, and 3 (El Yunque National Forest Scenery Management System Inventory Report, December 2012). "H" is for High Public Value, "M" is for Moderate Public Value.



Map 3-4. Scenic classes within El Yunque National Forest

3.3.7 Cultural and Historic Resources

Desired Conditions

- DC1 Cultural resources are one of the valuable assets managed by the agency, and are fully integrated in the management of the Forest. Proper monitoring, stewardship, and preservation of the cultural resources is carried out in accordance with the best Federal practices and regulations. For the purpose of proper management, a full and effective heritage program is implemented. The program assures effective and efficient care and management of the resources. It fosters the linking of past and present peoples by expanding the knowledge and understanding of history; and also permits scientific and academic engagement with the available resources.
- DC2 Existing predefined protocols and agreements facilitate the process of consultation and implementation of projects in the National Forest.
- DC3 The program supports the proper stewardship and protection of existing historic infrastructure by means of effective management and partnerships. Where feasible, the preservation and reuse of existing historic structures is encouraged and practiced; which reduces the need for the construction of new infrastructure, decreases deferred maintenance costs, and fosters shared stewardship and economic opportunities for the community and economic enterprises.
- DC4 The program provides the public with learning and engagement opportunities with the past. The resulting increase in knowledge and awareness helps highlight the importance of the resources in the public's mind, aiding in the appreciation and enjoyment of the resources. It also helps foster the ideals of protection, preservation, and sustainable use.



Photo of petroglyph on the Forest

Goals

- GO1 Develop broader engagement and understanding of the cultural resources in the Forest via education, interpretation activities, and new offerings.
- GO2 Develop and implement alternatives that reuse historic properties within El Yunque.

Objectives

- O1 Reduce the backlog of “legacy sites” needing formal evaluation by 20 percent within 10 years.
- O2 Evaluate for National Register of Historic Places (NRHP) eligibility at least 35 percent of properties included in the “Puerto Rico Forest Reserves New Deal Multiple Property Study,” and nominate at least half of those deemed eligible within the lifespan of the Plan.
- O3 Evaluate known prehistoric petroglyph sites reported and nominate at least 50 percent of those determined eligible for inclusion to the NRHP within 6 years of Plan implementation.
- O4 Keep monitoring of all “priority heritage assets” up to date for the life of the Plan.
- O5 Within a 3-year period, review and update the Forest cultural resources overview.
- O6 Develop and implement a systematic survey strategy for National Forest System Lands considered likely to contain historic properties per year within 5 years after Plan implementation.
- O7 Revise the existing programmatic agreement with the State Historic Preservation Office by 2020.
- O8 Develop broader educational and interpretive offerings presented to the public that highlight historical and heritage information within 6 years of Plan implementation.
- O9 Reduce the backlog of deferred maintenance needs on “priority heritage assets” by 75 percent within 10 years of Plan implementation.
- O10 Restore and reuse at least two neglected existing historic structures under Forest Service jurisdiction within 10 years of Plan implementation.

Standards

- S1 Any heritage management work carried out in the Forest or under the jurisdiction of the Forest must comply with all Federal laws, regulations, Executive Orders, and Forest Service policy related to the protection of archaeological sites, cultural resources, and historic properties.
- S2 All undertakings in the Forest must comply with NEPA analysis and/or Section 106 consultation (following CFR 36 800), as well as with Finding of Effect letter recommendations or related Memorandum of Agreement and binding documents prior to implementation of the undertaking; except in the cases in which the undertaking falls under one of the previously defined “categorical exclusions” as defined in an active Programmatic Agreement between the Forest Service and State Historic Preservation Office.
- S3 Decision documents (record of decision, decision notice or decision memo) will evidence compliance with the National Historic Preservation Act, 36 CFR 800, and other heritage-related regulations, as appropriate. A project (or undertaking) not in compliance will be suspended by the Forest Supervisor until compliance is documented.

- S4 The development of a survey and inventory plan for the Forest must comply with the stipulations of the National Historic Preservation Act, Forest Service Manual 2300, and Chapter 2360–Heritage Program Management and Forest Service Handbook 2309.12-Heritage Program Management.
- S5 The location, character, and ownership of all historic resources will be kept administratively confidential by the Forest Service. No historic resource location information will be publicly available, in accordance to the stipulations of Section 304 of the National Historic Preservation Act and 36 CFR 296.18.
- S6 Antiquities Act and Archaeological Resources Protection Act permits should only be granted to qualified academic institutions, other organizations, or individuals for the study and research of sites.

Guidelines

- G1 Site protection law enforcement protocols should be in place to prevent damage or loss of cultural resources.
- G2 Cultural resources should be managed according to their Forest Service management use allocation category; including preservation, enhancement-public use, or scientific investigation.
- G3 All priority heritage assets should have condition assessments completed every 5 years or less.
- G4 The Forest should avoid disturbing known cultural resources until they can be evaluated and their significance determined.
- G5 The maintenance of historic properties must be coordinated with the Forest archaeologist to ensure that any management activities are in compliance with cultural resource management regulations and that the activities will not have unmitigated adverse effects on the properties.
- G6 If additional evidence or information regarding a “not significant” property becomes available, it should be re-evaluated.
- G7 Priority heritage resources assets are protected, preserved, and maintained.
- G8 Cultural resources are protected from loss. Significant sites are stabilized, treated, managed, and preserved for their historical research value.
- G9 Heritage sites are managed to preserve the integrity of scientific data that they contain, for the benefit of the public and scientific communities.
- G10 All land use permits, contracts, and other Forest use authorizations should contain adequate stipulations and provisions for protection of significant heritage resources.
- G11 The Heritage Program, public education and outreach should be fostered in agreement with FSM 2360–Heritage Program Management; 2365–Public Education & Outreach and 36 CFR 296.20–Public Awareness Programs stipulations.

Management Strategies

- MS1 Promote a broader engagement of the public with existing cultural resources (outfitters, excursions, religious use, replicas at accessible locations, etc.).

3.3.8 *Facilities and Transportation*

Desired Conditions

- DC1 Public facilities are attractive, harmonizing with the natural and cultural environment, and are clean, safe, well maintained, and provide universal access.
- DC2 The Forest facilities program consists of a variety of structures and associated utilities across the Forest that are used for recreation, administration, research, maintenance, storage, and other general management purposes. They are well maintained for the services offered by the Forest and for the safety of visitors.
- DC3 Administrative facilities reduce their carbon footprint.
- DC4 Traffic and parking are orderly.
- DC5 Roads blend into the landscape and contribute minimal amounts of sediment to streams.
- DC6 Physical access is integrated into the regional context of tourism and recreation.
- DC7 Existing roads and facilities are maintained to a high standard to enhance public service, protect natural resources, and protect capital investments.
- DC8 Recognizing that the Forest has a greater capacity for people (picnicking, hiking, sightseeing, etc.) than it has for private vehicles, the Forest's transportation system facilitates the public's access to the Forest and balances the Forest's heavy visitation with the restricted access due to narrow mountain roads and a sensitive environment.

Goals

- GO1 Reduce the operating and maintenance costs of facilities.
- GO2 Cooperate with the Puerto Rico Department of Transportation and Public Works (PRDOT) to develop a regional transportation plan.
- GO3 Construct only those road segments necessary to service the limited production of forest products and recreation facilities.
- GO4 Maintain the Forest road system in cooperation with the PRDOT.
- GO5 Provide water and sewage systems to meet Federal and Commonwealth clean water and pollution abatement standards.
- GO6 Support the recovery effort for the Puerto Rican parrot by providing facilities to support the Luquillo Aviary.
- GO7 Find alternative uses for vacant facilities which would meet current and future needs and allow the reuse of existing infrastructure.
- GO8 Conduct annual maintenance and safety inspections on major structures on the Forest.
- GO9 Design, construct, and maintain roads to the minimum service level consistent with public safety, resource protection, and intended traffic levels.

Objectives

- O1 Reduce the backlog of facility deferred maintenance, particularly those items associated with health and safety, within the first 5 years of the plan.
- O2 Match the facility inventory with current management needs, including decommissioning and disposing of those facilities that are no longer required, within 2 years.

Standards

- S1 Unauthorized travel ways are decommissioned or left to naturally revegetate.
- S2 Close Soñadora road to public access during parrot breeding season and habitat management periods.
- S3 The following roads are designated for administrative vehicular use only, and closed to general public vehicular use. They are open to foot travel, but if there are safety concerns, pedestrians may be discouraged through signage, and provided alternate trail access.
 - ◆ Soñadora
 - ◆ Bisley
 - ◆ Pico del Este
 - ◆ El Yunque Peak
 - ◆ Forest Road 10
 - ◆ PR 191 between gates at kilometer 13.3 and kilometer 21.0

Guidelines

- G1 Consider the needs of people with disabilities in the design of facilities.
- G2 Design new and renovated facilities following Forest Service image guidelines and cultural and tropical themes.
- G3 Minimize electric power needs and water consumption in new and renovated facilities by using daylighting, natural ventilation, and low-volume plumbing fixtures.
- G4 Select materials with low energy production requirements, and emphasize use of recycled products.
- G5 Use signed gates or other closure devices to implement seasonal or year-round closures as necessary to protect the public, resources, and facilities.
- G6 Tested potable water supplies meet or exceed Federal and Commonwealth standards.
- G7 Coordinate the maintenance of historic facilities with the forest archaeologist.
- G8 Maintain Forest roads open to public motorized use unless there is a specific safety, resource- or facility-protection reason to limit use.

Management Strategies

- MS1 Maintenance priorities include bridge safety, adequate signage, suitable stream crossings and any resurfacing or reconstruction needed to provide an overall road system that is useable and safe.
- MS2 Provide opportunities for private investment and utilization of abandoned facilities.
- MS3 Consider all means of access, including mass transportation systems to best meet customer service needs, limit traffic problems, and minimize environmental effects.

3.3.9 Minerals

Desired Conditions

- DC1 Mineral extraction remains a topic of historical interest rather than a current use.

Goals

- GO1 Cooperate with the appropriate Federal and Commonwealth agencies to ensure that mineral exploration leasing and extraction remain inactive.

Standards

- S1 Use small amounts of salable minerals (soil, sand rock) for administrative purposes only, when such material needs disposal as a result of landslides or facility construction or maintenance. Other than this incidental on-Forest use, dispose of such material off-Forest, in compliance with applicable Federal and Commonwealth regulations. Do not permit removal of salable minerals by the public.

3.3.10 Large-scale Disturbances

Large-scale disturbances, such as hurricanes and landslides shape and define the composition, structure and functions of our Forest landscape. Therefore, this section provides guidance on how the Forest will be managed after a large-scale disturbance in order to reestablish a healthy, functioning Forest landscape, while at the same time reestablishing services to the surrounding communities and visitors in a timely manner.

Desired Conditions

- DC1 Administrative sites are safe, water availability for surrounding communities is ensured, hazards and debris along main roads are removed and trails and recreation facilities are opened to the public in a timely and safe manner.
- DC2 Downed timber and forest products are collected, available and accessible for public use.

Objectives

- O1 After a large-scale natural event, the wildlife program within 12 months will rehabilitate known affected terrestrial areas, improving habitat that may shelter endemic wildlife species and contributing toward desired conditions.
- O2 After a large-scale natural event, rehabilitate at least 25 percent of the known affected terrestrial area in the first 12 months to improve habitat that may provide shelter and forage for at-risk wildlife species and contribute toward desired conditions.

- O3 Implement all federally listed plant monitoring plans to immediately acquire information on the plants' population status (abundance, reproduction, recruitment, etc.), and comply with the species recovery plan within 2 years.
- O4 Within 6 months after storm events, implement conservation efforts to avoid introduced species.

Standards

- S1 No planned timber harvest sales will occur within a riparian management zone. The removal of dead or dying trees following a natural disturbance, however, could occur within a riparian management zone if such activity would not irreversibly damage the riparian resources.
- S2 Measures to restore soil stability for forest health following natural disturbances will only be those needed to protect the features for which the research natural area is established.
- S3 Ensuring water services to the surrounding communities will be a priority.
- S4 The Forest will analyze the social and economic conditions of the surrounding region post-disturbance and will focus development of projects towards improving conditions in the most affected areas.

Guidelines

- G1 Design and execute wildlife habitat improvement (such as artificial structures or agroforestry) or watershed restoration plans for endemic wildlife or fisheries species to rehabilitate areas affected by any significant natural event (such as, hurricanes, tropical storms, massive rain events, and landslides).
- G2 Rehabilitate areas affected by any significant natural occurrence (such as, hurricane, tropical storm, massive rain event, landslides).
- G3 Design and execute a timber salvage plan after a natural disturbance.
- G4 Following natural disturbance events, dead or damaged trees could also be removed on lands identified as "not suited for timber production because timber production is not compatible with the desired conditions".

Management Strategies

- MS1 Cooperate with State agencies and private stakeholders to re-establish access after tropical storms.
- MS2 Utilize the Incident Management System among Forest staff for response and recovery operations.
- MS3 Rapidly detect and eradicate new invasive species and new occurrences of established invasive species following disturbances from hurricane events in high-elevation communities.
- MS4 Facilitate research actions following a natural disturbance to continue long-term ecological research on the Forest.

- MS5 During the first 3 to 6 months following a natural disturbance, improve water quality, protect soils from erosion, assess and provide for species' immediate habitat needs, improve facilities conditions, ensure access, stabilize landslides and road damage.
- MS6 Secure water favorable flows.
- MS7 Reconnect with surrounding communities, assess their needs and determine if projects need to be redesigned or created in order to fulfill any new needs.

4 Monitoring and Evaluation

Monitoring is continuous and provides feedback for the planning cycle by testing relevant questions, tracking relevant conditions over time, and measuring management effectiveness. The purpose of monitoring in an adaptive management framework is to facilitate learning to support determinations on whether changes are needed. The monitoring program consists of a set of questions and associated indicators to evaluate whether plan components are effective and appropriate and whether management is effective in maintaining or achieving progress toward the ecological, social, and economic desired conditions and objectives for the Plan area.

The monitoring program includes plan-level and broader-scale monitoring. The plan-level monitoring program is informed by the assessment phase; created during plan development, plan amendment, or plan revision; and implemented after plan decision.

This monitoring program must contain questions associated with the following:

1. The status of select watershed conditions.
2. The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.
3. The status of focal species to assess the ecological conditions required under 36 CFR 219.9.
4. The status of a select set of the ecological conditions required under 36 CFR 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.
5. The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.
6. Measurable changes in the Plan area related to climate change and other stressors that may be affecting the Plan area.
7. Progress toward meeting the desired conditions and objectives in the Plan, including for providing multiple use opportunities.
8. The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land (16 U.S.C. 1604(g)(3)(C)); 36 CFR 219.12(a)).

Monitoring questions focus on whether Plan components are effective in maintaining or achieving progress toward the desired conditions and objectives for the Plan area.

Indicators are quantitative or qualitative variables that can be measured or described and, when observed periodically, show trends in conditions that are relevant to the associated monitoring questions.

Frequency describes the timing or intervals of evaluating and reporting monitoring results. Reporting and evaluation intervals are determined based on the length of the time needed to discern a measurable change.

Adaptive management strategies are composed of alerts and responses, not all disciplines have this column. When an alert condition is reached, the agency will develop a response based on the causes and the practical implications for moving forward.

Sources are data repositories or information bases for calculating or checking indicators, along with partners who would be involved in providing potential data or information for the monitoring process.

Scale describes the geographic or management area extent at which the monitoring question will be evaluated.

Outside of El Yunque National Forest, consideration and coordination with broad-scale monitoring strategies, multi-party monitoring collaboration, and cooperation with State agencies (where practicable), should increase efficiencies and help track changing conditions beyond the Forest boundaries to improve the effectiveness of the Plan monitoring program. In addition, project and activity monitoring may be used to gather information for the Plan monitoring program if it will provide relevant information to inform adaptive management.

The following monitoring programs are not intended to depict all monitoring and data gathering for activities undertaken on the Forest; nor are they intended to limit monitoring to just the questions and indicators listed in the following tables.

4.1 Focal Species for Monitoring

Under chapter 30 part 32.11 of FSH 1909.12 of the new 2012 planning directives, the Forest Service has been given the opportunity to address uncertainty. An important criterion is thus stated: “if research has shown that the effects of current practices are known, there is no need to select questions and indicators to verify such impacts”. El Yunque National Forest sees this as an opportunity to build a foundation for species occurrence modelling. Through past and present data collection, many species may benefit from the use of these models for answering the why, what, and how survey questions of El Yunque’s adaptive management contributions towards desired conditions.

Key ecosystem characteristics can also be combined in different ways to assess habitat for specific focal species, using species occurrences models and detections based upon Gallardo (2015). Species-specific or group-species habitat models could be used at the project scale to assess potential effects of Forest Plan implementation. For example, project-level monitoring can assess availability of multistoried habitat for future Elfin-woods warbler analysis or assess spatial distribution of known habitat patch size and connectivity within a subwatershed.

The monitoring program includes the monitoring of focal species. As stated in chapter 30 part 32.13c of FSH 1909.12 of the new 2012 planning directives:

The purpose for tracking the status of these focal species over time is that they are indicators of ecological functions and they provide insight into the following:

1. Risk to ecological systems on which focal species depend or influence, as in the case of keystone species of ecological engineers.
2. Effects of management on those ecological systems, their conditions, and risk factors.
3. Effectiveness of the plan components to provide for ecological functions and maintain or restore ecological conditions.
4. Progress towards achieving desired conditions, including population levels and objectives for the plan area.

Focal species are not selected to make inferences about other species. Focal species are selected because they are believed to be responsive to ecological conditions in a way that can inform future plan decisions. Categories of species that could be included under the term “focal species” and could serve this ecological

purpose include indicator species, keystone species, ecological engineers, umbrella species, link species, species of conservation concern, and others (32.13c of FSH 1909.12).

Focal species represent a part of the monitoring requirements for ecological sustainability and diversity of plant and animal communities. “It is not expected that a focal species be selected for every element of ecological conditions” (77 *FR* 21233; April 9, 2012). Monitoring focal species is intended to address situations where they provide more useful information or are more efficiently monitored than monitoring other potential indicators. Focal species are not selected to make inferences about other species. Focal species are selected because they are believed to be indicative of key characteristics of ecological function and are responsive to ecological conditions in a way that can inform plan decisions.

Table 4-1 provides the justification for these species to be considered under the focal species category.

The ecological niches that the focal species comprise in the neo-tropical rainforest exhibit direct relationships that can be interpreted to provide information towards reaching the desired conditions.

The Elfin-woods warbler is both an umbrella and “at risk” species that specifically indicates overall ecological functioning or changes of its preferred Elfin woodland and Palo Colorado habitats. Monitoring should be conducted annually.

Both Puerto Rican broad-winged hawk and Puerto Rican sharp-shinned hawk are “at-risk” raptors (apex predators) known to be affected by new ecological components such as disease. Monitoring should be conducted annually.

All of the coquies species—ground coqui, tree-hole coqui, burrow coqui, and warty coqui—are insular “at-risk” amphibians whose occurrences in the ecosystem directly show changes to biodiversity in their respective preferred habitat and trophic level. Monitoring should be conducted annually.

The spinning basket shrimp is an aquatic keystone species where its presence or absence has conspicuous effects on physical elements of stream conditions. This filter feeder is very common and has been known to directly correlate to water quality conditions. Monitoring should be conducted annually.

The Puerto Rican parrot is another insular “at risk” species that requires special habitats to continue its existence. While new scientific information shows that El Yunque is suboptimal habitat, it still plays an important ecological function within the Palo Colorado habitat type. Monitoring should be conducted annually.

Other species are not included, such as insects, freshwater eels, other birds, bats, and reptiles; because monitoring would require considerable resources from the wildlife and fisheries program. However, it would be beneficial to survey these species in future partnerships with other Federal, State or non-governmental organizations.

Key ecosystem characteristics related to climate change and wildlife is measured at very large scales (not the forest scale), but are important to some wildlife species on El Yunque. Links between particular wildlife species and phenology may also be important (for example, coqui species physical condition in relation with the chytrid fungus and their environment, which is currently being researched).

Table 4-1. Focal species for El Yunque

Scientific Name	Common Name	Group ¹	Southern Region's Ecological Sustainability Evaluation Crosswalk ²	"At Risk" Category
Birds				
<i>Setophaga angelae</i>	Elfin-woods warbler	B, C	2, 3, 4	Yes
<i>Buteo platypterus brunnescens</i>	Puerto Rican broad-winged hawk	B, C	3, 4, 7	Yes
<i>Accipter striatus venator</i>	Puerto Rican sharp-shinned hawk	B, C	3, 4, 7	Yes
Amphibians-Coquies				
<i>Eleutherodactylus richmondi</i>	Ground coqui	C	2, 4	Yes
<i>Eleutherodactylus hedricki</i>	Tree-hole coqui	C	4, 6	Yes
<i>Eleutherodactylus unicolor</i>	Burrow coqui	C	2, 4	Yes
<i>Eleutherodactylus locustus</i>	Warty coqui	C	4, 7	Yes
Aquatic Species				
<i>Atya lanipes</i>	Spinning basket shrimp	D	1	No
Special Endangered Species				
<i>Amazona vittata</i>	Puerto Rican parrot	A, C	Special endangered species recovery, 4	Yes
Invasive species (for management responses)				
<i>Herpestes auropunctatus</i>	Mongoose	N/A	N/A	No
<i>Rattus rattus</i>	Black roof rat	N/A	N/A	No
<i>Canis familiaris</i>	Feral dog	N/A	N/A	No
<i>Felis catus</i>	Feral cat	N/A	N/A	No
<i>Iguana iguana</i>	Iguana	N/A	N/A	No
<i>Mus musculus</i>	House mouse	N/A	N/A	No

1 The following lists those categories that are relevant to El Yunque.

Group:

- A) Specific forest type dynamics
- B) Endemic interior forest birds
- C) Terrestrial ecosystem trophic dynamics
- D) Aquatic ecosystem trophic dynamics

2 Focal species groups that have been identified through El Yunque interdisciplinary team and Southern Region's Ecological Sustainability Evaluation Tool:

- 1) Freshwater crustacean
- 2) Mature *Tabebuia/Eugenia* Woodland associate
- 3) Secondary (forest) associates
- 4) Palo Colorado associates
- 5) Rio Mameyes associates
- 6) Sierra Palm associates
- 7) Tabonuco associates

4.2 Monitoring Questions, Indicators and Adaptive Management Strategies

Table 4-2. Monitoring questions and indicators by selected plan components

Selected Plan Components	Monitoring Questions	Indicators	Source, Scale and Adaptive Management Strategies
Climate Change			
<p>Desired Conditions The Forest resources and operational management are resilient to the influences of a changing climate. Management activities reduce the susceptibility of resources to multiple threats, including drought, invasive species, disease, and wildfire. Promote the immediate and long-term resilience of the Forest to change by:</p> <ul style="list-style-type: none"> ▪ Responding to changes in visitor behavior and mitigate any seasonal increases in use; ▪ Enhance landscape connectivity by maintaining natural migration corridors between lowland and upland forests to allow species to move up-slope into cooler environments as climate changes; ▪ Collaborate with partners and surrounding land managers to coordinate management and monitoring efforts related to visitor use, ecological connectivity and flows, and invasive species. <p>Goals</p> <ul style="list-style-type: none"> ▪ Create collaboration initiatives for monitoring climate change at a broader landscape level, considering partnerships that will be appropriate for such projects. 	<p>Is climate change, including changes in variability, influencing maintenance and restoration of ecosystems? Is climate change influencing the ability to respond to increases in visitor use and associated impacts on ecosystems?</p>	<ul style="list-style-type: none"> ▪ Trends in climate, including extremes, disturbance patterns, cloud-base elevation, and long-term ecological processes Frequency: 6 years ▪ Trends in Forest health status and risk Frequency: 6 years ▪ Focal species conditions Frequency: 6 years 	<p>Source: NOAA – Severe Weather Data Inventory, NOAA – U.S. Climate Extremes Index, NOAA – State of the Climate Reports, Remote Sensing and Climate Change Detection Products, USDA Caribbean Climate Hub, PR Climate Change Council, IITF reports and publications. Scale: Forest Wide, Island wide Adaptive Management Strategies: Forest uses climate change trends reported by partners to develop management practices to protect forest resources affected by climate change. Alert: Cloud base altitude is changing. Response: Evaluate land use alternatives that could reduce local heating in the region and delay or mitigate lift in cloud base. Set to establish partnerships and agreements to work and promote said land use alternatives. Alert: Changes in vegetation structure, composition and density due to changes in hurricane frequency and intensity. Response: Facilitate forest rehabilitation with revegetation activities where necessary. Alert: Changes in temperature and precipitation patterns such as increases in heavy rainfall events along with longer dry periods. Response: Increase awareness among staff and visitors of possible heavy rainfall events that could lead to evacuation of visitors and the Forest closing. Evaluate</p>

Selected Plan Components	Monitoring Questions	Indicators	Source, Scale and Adaptive Management Strategies
			and adjust water use permits considering increase in drier periods.
Status of Select Watershed Conditions			
<p>Desired Condition</p> <ul style="list-style-type: none"> ▪ Maintain healthy watershed conditions within the Forest considering water quality, water quantity, soil productivity, and vegetation. ▪ Improve Río Blanco Watershed. Ensure ecologically sustainable human consumption of water is conducted to not adversely affect the ecosystem's long-term function. <p>Standard</p> <ul style="list-style-type: none"> ▪ Monitor climate change factors to determine supply of water. <p>Guidelines</p> <ul style="list-style-type: none"> ▪ The monitoring protocols provide opportunity to evaluate the connection from headwaters to coastal regions. 	<p>What is the status of the watersheds in relation to ecological and social services?</p> <p>Are the priority watershed conditions functioning properly?</p> <p>Is the Rio Blanco watershed supplying appropriate ecological services?</p> <p>Are riparian buffers providing the expected protection to maintain the appropriate ecological services in the watersheds?</p> <p>Is the functional wetland maintaining its appropriate ecological services?</p> <p>Is the 1,969 feet altitude boundary of the functional wetland sustaining or changing based on climate conditions?</p>	<ul style="list-style-type: none"> ▪ Indicators considered in the Watershed Condition Framework Frequency: 2 years ▪ All Targeted focal species presence or absence through scientific surveys. Frequency: Annual ▪ In-stream flows and water quality parameters Frequency: Annual ▪ Environmental changes produced by climate change or any other environmental stressor. Frequency: Annual ▪ Percentage of or amount of forest cover Frequency: 2 years ▪ Riparian area tree and shrub distribution Frequency: 2 years 	<p>Sources: Watershed Condition Framework Review, Watershed Restoration Action Plan (WRAP), monitoring report, natural resources modules, inventory reports, data and monitoring from IITF, Watershed Classification Tracking Tool (WCATT), Watershed Improvement (WIT), INFRA</p> <p>Scale: Watersheds</p> <p>Adaptive Management Strategies: Evaluate existing water use permits and amounts of water withdrawal.</p> <p>Alert: Focal aquatic species population decline</p> <p>Response: Monitoring results should disclose species decline. The evaluation of the Watershed Restoration Action Plan (WRAP) must be done to review the management practices applied. Collaborative restorative projects should then be developed. If no management activities can be correlated, then recruit assistance from partners.</p> <p>Alert: Desire condition are not being met for water quality, quantity, soil productivity and vegetation.</p> <p>Response: Monitoring results should disclose water parameters that are not met. Review the management activities and practices applied in the watershed that did not met the desire condition. Review or adjust the management practices and intensify the monitoring report frequency.</p> <p>Alert: The priority watershed is not improving its conditions.</p> <p>Response: Review the Watershed Restoration Action Plan to identify adjustments and amendments in the management activities to improve the</p>

Selected Plan Components	Monitoring Questions	Indicators	Source, Scale and Adaptive Management Strategies
			<p>watershed conditions. If no management activities can be correlated, then recruit assistance from partners.</p> <p>Alert: Stream flows are below average</p> <p>Response: Review existing permits</p>
<p>Status of Select Ecological Conditions Including Key Characteristics of Terrestrial Ecosystems</p>			
<p>Desired Condition</p> <ul style="list-style-type: none"> Structure, composition and function of mature forests are maintained within their present characteristics. Disturbed and altered areas are restored through natural succession and managed re-vegetation practices. Conserve the native species present in all plantation/secondary montane and submontane forest types while controlling and if possible, eradicating invasive species. Plant biodiversity, ecosystem processes and function will be conserved, maintained, and if needed, restored. Desired conditions for all forest types <p>Objectives</p> <ul style="list-style-type: none"> Within 6 months after storm events, implement conservation efforts to avoid introduced species. <p>Management Strategies</p> <ul style="list-style-type: none"> Implement a monitoring protocol for native plants for all forest types to record its conservation and management needs. Implement a monitoring protocol for invasive species to record its presence and entrance, and to record any changes in invasive species existing in the Forest that shows any population changes toward an invasive conduct. 	<p>Are mature forests changing in structure, composition and function? Are projects or management actions utilizing native species in their reforestation, restoration and/or mitigation activities? Has the structure and composition of the plantation/secondary montane and submontane forest types been characterized and plots established to monitor its long-term dynamics? Are biodiversity, ecosystem processes and function being affected by natural or anthropogenic disturbances? Are the distribution, structure and composition of the different forest types being altered? How much canopy coverage was lost during the storm? How has the native tree population recovered after two years? Has the composition and structure changed in any of the forest types? Are invasive species present in any of the forest types?</p>	<ul style="list-style-type: none"> Native species abundance, basal area, species density, and % closed canopy Frequency: 2 years Number/abundance of native species in reforestation/restoration mitigations Frequency: Annually Species abundance, stem density, basal area and species density of plantation/secondary forest types Frequency: 2 years Components of distribution, structure and composition of forest types using the National Vegetation Classification System Frequency: 2 years Percent canopy cover, native species abundance after storm Frequency: 6 months after storm Changes in spatial extent, deviation from natural range of variability, percent of native species, and percent of change of the structure and composition of the forest Frequency: Yearly Changes in spatial extent, deviation from natural range of variability, percent of invasive, and percent of change of the structure and composition of the forest 	<p>Source: TESP/IS, GIS, Reports from restoration actions, monitoring after natural disturbances, inventory and monitoring reports from forest surveys.</p> <p>Scale: Forest wide, Regional</p> <p>Adaptive Management Strategy: Have partnerships and collaborations with the University of Puerto Rico, other academic institutions and by Citizen Science Programs so that students and community members can participate in the inventory and monitoring.</p> <p>Implement a monitoring protocol for native plants for all forest types to record its conservation and management needs.</p> <p>Implement a monitoring protocol for invasive species to record its presence and entrance, and to record any changes in invasive species existing in the Forest that shows any population changes toward an invasive conduct</p> <p>Alert: Invasive species are increasing in cover or spatial extent.</p> <p>Response: Implement invasive species control, restore native species.</p> <p>Alert: Structure, composition and function of mature forests is being altered or not maintaining present characteristics.</p> <p>Response: Inventory and monitoring results should reveal if any management action is contributing to alteration of mature forest characteristics. If any</p>

Selected Plan Components	Monitoring Questions	Indicators	Source, Scale and Adaptive Management Strategies
		Frequency: Yearly	<p>alteration occurs, then a collaborative restoration project should be developed.</p> <p>Alert: No information is being gathered for plantation/secondary forest conditions.</p> <p>Response: Develop a working group that includes staff, partners and volunteers from citizen science program to specifically work towards data gathering on plantation/secondary forest types</p> <p>Source (storms): post-survey monitoring.</p> <p>Scale: affected area.</p> <p>Adaptive Management Strategy: suitable restoration techniques adequate to area. Response: native tree population increase.</p> <p>Alert: develop replicable and comparable survey methods for all forest types.</p> <p>Response: Composition and structure parameters established for forest types.</p> <p>Alert: develop control and eradication strategies for each species.</p> <p>Response: Inventory and monitoring results should reveal if control actions are being effective.</p>
<p>Ecological Conditions that Contribute to the Recovery of Federally Listed Plants Species and Flora Species of Conservation Concern</p>			
<p>Desired Condition</p> <ul style="list-style-type: none"> Provide the ecological conditions that contribute towards maintaining and restoring the structure, composition, function and connectivity of the different forest ecosystems in which at-risk species occur on the Forest. 	<p>What is the location and status of populations of plant at-risk species?</p> <p>What is the status of the key ecological conditions that contribute to the recovery of threatened and endangered species?</p> <p>What is the status of the key ecological conditions that help to conserve proposed and candidate species?</p> <p>What is the status of the key ecological conditions that help to that</p>	<ul style="list-style-type: none"> Presence or absence and species abundance of at-risk species through surveys. Frequency: Annually Status and trends of habitat ecological conditions associated to at-risk species Frequency: Annually 	<p>Source: TESP/IS, Partnerships data and information sharing (IITF, USFWS, etc.), GIS, monitoring reports, natural Resources Modules, inventory Reports</p> <p>Scale: Forest wide</p> <p>Adaptive Management Strategies: Survey and inventory at-risk species. Re-establish declining populations.</p> <p>Alert: Population decline of any at-risk species caused by any type of disturbance</p>

Selected Plan Components	Monitoring Questions	Indicators	Source, Scale and Adaptive Management Strategies
	contribute to the recovery of the species of conservation concern?		Response: Assess the survey results to determine the causes of the decline and coordinate with Fish and Wildlife Service.
<i>Status of Select Set of the Ecological Conditions Required to Contribute to the Recovery of Federally Listed Species and Species of Conservation Concern</i>			
Refer to At-risk fauna species section below	<p>Is El Yunque implementing watershed restoration action plans in order to get all watersheds into the class 1 Watershed Condition Framework category?</p> <p>Are ecosystem services being supplied in a sustainable manner?</p> <p>Is El Yunque being conserved, maintained, and restored primarily with native species?</p> <p>Has the Secondary Forest been characterized based on vegetation, structure, and ecological functions?</p>	<ul style="list-style-type: none"> ▪ Developed and implemented Watershed Condition Framework action plan. Frequency: Annual ▪ Assessments of ecological services conditions. Frequency: Annual 	<ul style="list-style-type: none"> ▪ Refer to At-risk fauna species section

Table 4-3. Monitoring the desired conditions for wildlife and fisheries resources

Selected Plan Component	Monitoring Questions	Indicators ¹	Source, Scale and Adaptive Management Strategies
At-risk fauna species			
<p>Desired Conditions</p> <ul style="list-style-type: none"> ▪ Provide high quality habitats for endemic wildlife and fisheries populations in their existing or historic distributions to enjoy and scientifically study in their natural habitats. ▪ Maintain or restore El Yunque National Forest's rich biodiversity, including ecological processes that may improve resilience to change. ▪ Maintain and if possible rehabilitate identified habitats that exhibit special biological characteristics to sustain their current conditions. ▪ Maintain robust populations (and metapopulations) of identified at-risk species (federally threatened, endangered, proposed and species of conservation concern) through managing identified population limiting factors and habitats on El Yunque National Forest to better adapt to any possible change. ▪ Rehabilitate known habitat (foraging, shelter, and breeding) of at-risk species to improve habitat capacities to support healthy populations' needs, to the extent of that habitat's resiliency to change. <p>Desired Conditions (from aquatic ecosystems)</p> <ul style="list-style-type: none"> ▪ Maintain or restore high quality ecosystem services and biodiversity of aquatic ecosystems of El Yunque National Forest. Using best available science to provide benefits of healthy habitats to aquafauna whose life cycles are interconnected with the surrounding ocean. 	<p>Are aquatic habitat conditions highly suitable for aquatic species' biological requirements and their movements?</p> <p>What is the status of the species occupancy within their known habitats and key ecological conditions that contribute to the recovery of threatened and endangered species (Elfin woods warbler, Puerto Rican parrot, Puerto Rican broad-winged & sharp-shinned hawks, Puerto Rican boa)?</p> <p>What is the status of the species occupancy within their known habitats and key ecological conditions that help to maintain or enhance populations of species of conservation concern (4 coqui species)?</p>	<p>All Targeted focal species presence or absence through scientific surveys. Frequency: Annually</p> <ul style="list-style-type: none"> ▪ Status and trends of habitat components associated to all focal species Frequency: Annually ▪ Trends of observed locations displayed through simple visual species occurrences models (on those species focused by the Forest Biologist). Frequency: Annually 	<p>Source: TESP/IS, Partnerships data and information sharing (IITF, USFWS, etc.), GIS, monitoring reports, natural Resources Modules, inventory Reports</p> <p>Scale: Forest wide</p> <p>Adaptive Management Strategies: Restore declining populations.</p> <p>Alert: Declining aquatic species populations are not improving</p> <p>Response: Monitoring results should disclose if any management activities are contributing to species decline. Collaborative restorative projects should then be developed. If no management activities can be correlated, then recruit assistance from USFS International Inst. of Tropical Forestry.</p> <p>Alert: Declining terrestrial species populations are not improving</p> <p>Response: Conduct a review with either an interagency partner, USFS scientist, or academic researcher to assess the reasons why the phenomenon is occurring.</p> <p>Alert: Any significant increase or decrease of vertebrate invasive species.</p> <p>Response: Monitoring results should display the trends and will be notified to Forest leadership team for further plans.</p>

Focal species to select from: All species from Table 4-1. Scale: Plan area wide; except for the Puerto Rican parrot

Table 4-4. Monitoring desired conditions

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Community Interface Resource Management Area			
<p>Desired Conditions</p> <ul style="list-style-type: none"> ▪ To have a healthy and sustainable forest landscape in El Yunque region, with a mosaic of vegetation that contributes to the economic and social wellness without affecting mature forests, through resource management alternatives applicable to the tropical forests in areas below 1,969 feet of elevation. ▪ To have a management area that contributes to the economic and social wellness of the regional geographic scale. ▪ To provide an opportunity to offer new disperse camping opportunities ▪ Communities are educated on Forest management, making them aware of the goods and services received from the conservation strategies in which they participate. <p>Objectives</p> <ul style="list-style-type: none"> ▪ Apply restoration practices promoting collaborative, science-based ecosystem restoration in prospective corridors that could connect the Community Interface Resources Management Areas with natural protected areas identified in the regional geographical scale considered for the Plan. ▪ Maintain a bidirectional working relationship with local communities and community groups considering activities that improve land conditions during the planning period. 	<p>Are the forests in the Community Interface Resource Management Area maintaining the goods and services expected from a healthy and sustainable landscape?</p> <p>Are the projects and activities conducted in the Community Interface Resource Management Area contributing to the economic and regional geographic scale?</p> <p>Is the Forest or the interested stakeholders developing projects that improve desired conditions to develop corridors that promote the ecological connection between the Community Interface Resources Management Area and broad landscape?</p> <p>What activities, projects or initiative are developing or promoting a bidirectional working relationship with local communities to apprise the goods and services received from the conservation strategies in which they participate?</p> <p>Is the Community Interface Resource Management Area providing new recreational opportunities?</p>	<ul style="list-style-type: none"> ▪ Changes in percent of forest canopy coverages. Frequency: 5 years ▪ Instream flow. Frequency: 2 years ▪ Number of projects and activities completed or under an agreement. Frequency: Annually ▪ Number of projects, permits and activities done. Frequency: 2 years ▪ Review data for economic indicators in census. Frequency: 5 years ▪ Area of habitat under management strategies related to the connection of the forest to other natural protected area. Frequency: 5 years ▪ Area under, science-based ecosystem restoration projects with the participation or collaboration of local community groups. Frequency: 5 years ▪ Special Use Permits in the CIRMA: Frequency: Annual 	<p>Sources: Inventory and monitoring surveys, review of permits, agreements and collaborative activities, Forest Observation and documentation of onsite Projects and agreements, SUDS, CENSUS data, INFRA</p> <p>Scale: CIRMA, Regional</p> <p>Adaptive Management Strategies: Continuously engage partners in conservation and restoration projects and agree mutually in restoration priorities.</p> <p>Alert: Desired conditions are not being met for the Management Area.</p> <p>Response: Inventory and monitoring surveys should reveal if the forest activities are affecting its health and coverage. If the forest conditions show a forest coverage reduction, then a review of the activities should be done with a science based restoration to improve forest coverage.</p> <p>Alert: Desire conditions are not being met for the Management Area</p> <p>Response: The review of the permits, agreements and collaborative activities should reveal the activities and recreational events. If the recreational events and collaborative activities are not documented, then a working group should be developed to improve public participation and involvement in decision-making.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Social Economic			
<p>Desired conditions</p> <ul style="list-style-type: none"> ▪ In balance with its ecological conditions, state, and resilience, the Forest provides a broad range of social, cultural, and economic benefits to individuals and communities at local to global levels. ▪ Forest goods and services are utilized by individuals and communities to generate employment and stimulate the economy in and around the Forest. Local residents benefit from jobs and income associated with Forest management activities; local economies benefit from visitors attracted to the wide variety of goods and services that the Forest offers; and local and other businesses increasingly offer recreation and other opportunities that benefit the sustainability of the Forest and the landscape in which it is situated. ▪ Partnerships and other collaborative arrangements with neighboring communities, special interest groups, State agencies, local governments, and others that support and enhance Forest conservation, recreation, restoration, education, and other programs and activities continue to grow and thrive. ▪ Education, interpretive, and information programs and activities connect people to the Forest environment and foster a sense of place and stewardship. 	<p>To what extent is Forest management providing sustainable and predictable levels of goods and services for communities?</p> <p>To what degree does the Forest provide opportunities to connect people, including youth, with nature?</p> <p>To what extent is Forest management contributing towards desired conditions for a stable and functioning local economy?</p> <p>To what degree do communities benefit from the Forest socioeconomically and from a cultural diversity standpoint?</p> <p>To what degree are Forest-related partnerships and other collaborative arrangements increasing with and around the Forest?</p>	<ul style="list-style-type: none"> ▪ Levels of production of multiple uses including Forest products; water outputs; camping, special-use and other permits; recreation opportunities; etc. Frequency: Annual ▪ Number and type of education and youth programs. Frequency: Annual ▪ Number of individuals, and youth in particular, participating in Forest education and youth programs. Frequency: Annual ▪ Number, type, and total dollars for direct employment with El Yunque. Frequency: Annual ▪ Number, type (conservation, recreation, restoration, education, etc.), and funding (total, Forest Service, matching) of partnerships around Forest resources, within and across forest boundaries. Frequency: Annual ▪ Number and type of Forest-based special-use permits. Frequency: Annual ▪ Number and type of licensed Forest operators/concessions Frequency: Annual ▪ Number, type (conservation, recreation, restoration, education, etc.) and funding (total, Forest Service, matching) of partnerships and other collaborative relations around Forest resources, within and across Forest boundaries. Frequency: Annual ▪ Number of partnerships specializing in interpretive and education programs for visitors and communities. 	<p>Source: SUDS, CENSUS data, forest documentation, Grants and Agreements</p> <p>Scale: Forest wide, Regional, Island wide</p> <p>Adaptive Management Strategies: Partnerships and collaboration with surrounding communities and key stakeholders are increased to encourage economic growth in the region as well as cultural richness.</p> <p>Alert: There is no increase in collaborative agreements, youth participation, community engagements.</p> <p>Response: Social sustainability becomes a Forest priority.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
		Frequency: Annual ▪ Number of staff and volunteers participating in trainings and learning opportunities. Frequency: Annual ▪ Number of training opportunities offered or attended in the area of interpretation and environmental education. Frequency: Annual ▪ Results of the Environmental Literacy Survey for Middle School. Frequency: Annual	
Cultural Resources			
<p>Desired Condition</p> <ul style="list-style-type: none"> Proper monitoring, stewardship, and preservation of the cultural resources is carried out in accordance with the best Federal practices and regulations. <p>Standard</p> <ul style="list-style-type: none"> Heritage management work must comply with all Federal laws, regulations, and Forest Service policy related to the protection of archaeological sites, cultural resources, and historic properties. <p>Desired Condition</p> <ul style="list-style-type: none"> The program provides the public with learning and engagement opportunities with the past. <p>Objective</p> <ul style="list-style-type: none"> Develop educational and interpretative offerings that highlight historical information. 	<p>Are historic properties assessed and managed according to Federal law and agency regulations? Have potentially reusable historic structures been assessed and refurbished for active use? Are the interpretation and recreation offerings that promote engagement with the history of the Forest and its cultural resources in place? Are the desired conditions being met through the integration of cultural/historic interpretation?</p>	<ul style="list-style-type: none"> Number of sites evaluated and nominated. Frequency: 2 years Annual heritage program target score. Frequency: Annually Number and status of new or updated interpretative and education offerings related to cultural resources and historic sites. Frequency: 3 years 	<p>Source: NRM/Heritage Database, SUDS Scale: Forest-wide Adaptive Management Strategy: Have a variety of partnerships and agreements aimed at addressing the protection, use, stewardship and dissemination/study of cultural resources in the Forest. Alert: Monitoring, stewardship and preservation of cultural resources is not being carried out. Heritage management work is not following established regulations and policies. Response: In order to bring the failing standards to normalcy, new projects can be developed, staffed and funded through a variety of sources, including but not limited to agreements, partnerships, training, budget allocation and temporary personnel allocation. Alert: Information about cultural resources is not disseminated or made available to the public. Response: The Heritage Program Management Standard Indicator 6 will identify the amount of public dissemination initiatives taking place. If the metric identifies that projects are not being developed, the standard should be brought to level through the development of new</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
			<p>initiatives staffed and funded through a variety of sources, including but not limited to agreements, volunteers, partnerships, training, budget allocation and temporary personnel allocation.</p>
<p>Desired Condition</p> <ul style="list-style-type: none"> The program supports the proper stewardship and protection of existing historic infrastructure. 	<p>What progress has been made to maintain and reuse existing historic infrastructure?</p>	<ul style="list-style-type: none"> Number of historic structures reused. Frequency: 5 years 	<p>Source: INFRA, SUDS Scale: Forest-wide Adaptive Management Strategies: Have a variety of partnerships and agreements aimed at addressing the protection, use, stewardship and dissemination/study of cultural resources in the Forest. Alert: No historic properties have been reused within the monitoring period. Response: Analyze the reasons why the reuse of historic properties has not been implemented, in order to address the possible faults of the approach or review the time frame for the implementation of the desired condition. New shared stewardship, concessions, special use permits, partnerships, or property transfers should be developed to facilitate the reuse of the structures.</p>
<p>Objectives</p> <ul style="list-style-type: none"> Reduce the backlog of deferred maintenance needs on Priority Heritage Assets and reuse at least two neglected existing historic structures. 		<ul style="list-style-type: none"> Number of sites with deferred maintenance needs met. Frequency: 2 years 	<p>Source: INFRA, SUDS Scale: Forest-wide Adaptive Management Strategies: Have a variety of partnerships and agreements aimed at addressing the protection, use, stewardship and dissemination/study of cultural resources in the Forest. Alert: Maintenance needs are not been met for historic properties. Response: Analyze the reasons why the maintenance needs are not being met and allocate funding or personnel to address the needs through partnerships, volunteerism, budget allocation or contracting.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Ecosystem Services			
<p>Desired Condition</p> <ul style="list-style-type: none"> El Yunque National Forest provides a collection of goods and services that are critical to human health and livelihood for the region and Puerto Rico. <p>Goal</p> <ul style="list-style-type: none"> Maintain and improve, according to the available resources, the level of yield from the ecosystem services of the Forest. 	<p>What are the primary goods obtained from the Forest?</p> <p>What are the primary services provided by the Forest?</p> <p>What quantities of good and services are produced?</p> <p>How is the Plan facilitating ecosystem services production?</p>	<ul style="list-style-type: none"> Acreages of soil and water improvements Frequency: 2 years Water produced Frequency: 2 years Number of special-use permits Frequency: 2 years Number of research publications Frequency: 2 years Number of conservation educational activities Frequency: 2 years Number of visitors and scenery inventories Frequency: 2 years Number of maintenance, restoration, or improvement activities. Frequency: 2 years 	<p>Source: GIS, INFRA, SUDS, Watershed Improvements (WIT), WCATT</p> <p>Scale: Watersheds, Geographic Areas</p> <p>Adaptive Management Strategies: Compare ecosystem services output against yearly work plan and redefine priorities.</p> <p>Alert: Reduction in the level of ecosystem services.</p> <p>Response: Review funding, resources needs, demands and constraints.</p>
Infrastructure			
<p>Desired Conditions</p> <ul style="list-style-type: none"> The transportation system is well planned, built, and maintained. Traffic and parking are orderly even on busy summer weekends. 	<p>What is the status of the travel management system?</p> <p>What is the road maintenance and deferred maintenance for the Forest?</p> <p>How are the people accessing the Forest? Is access connected to adjacent natural areas?</p> <p>How are infrastructure objectives contributing to desired conditions?</p>	<ul style="list-style-type: none"> Approved transportation analysis and road safety plan stages of implementation Frequency: 2 years Percent of maintenance accomplished and reduction backlog. Frequency: Annually Road connectivity index, number of touristic routes, regional trails. Frequency: 3 years Objectives met from the facilities master plan Frequency: 2 years Number of historic structures restored Frequency: 5 years 	<p>Source: GIS, NRM/INFRA, SUDS, TAPS</p> <p>Scale: Forest wide, watersheds, geographic areas.</p> <p>Adaptive Management Strategies: The Forest uses new technology and alternative transportation systems.</p> <p>Alert: Vehicle use deteriorates forest resources and infrastructure.</p> <p>Response: Develop travel management and use guidelines.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Lands			
<p>Goals</p> <ul style="list-style-type: none"> Collaborate with Municipalities' Territorial Plan and Puerto Rico Land Use Plans by fostering an "all lands regional" perspective. 	<p>How many acres of land within the proclamation boundary are dedicated to agriculture or forestry?</p> <p>How do we collaborate with municipal planning?</p> <p>What/ how much land is being acquired to be added on to the Forest?</p>	<ul style="list-style-type: none"> Land use and land cover. Frequency: 5 years Number inputs sent to Puerto Rico Planning Board. Frequency: 5 years Acres under conservation agreement. Frequency: 5 years Acres of land ownerships. Frequency: 5 years Public involvement in land acquisition. Frequency: 5 years Acres of border surveyed. Frequency: 3 years 	<p>Source: GIS, NRM/INFRA, SUDS</p> <p>Scale: Forest wide, watersheds, geographic areas</p> <p>Adaptive Management Strategies: Coordinate land acquisitions using partnerships.</p> <p>Alert: No land is acquired in 3 years.</p> <p>Response: Host partners meetings.</p>
Recreation			
<p>Desired Conditions</p> <ul style="list-style-type: none"> Use the recreation sustainability framework as a guide to manage recreation sites. Provide visitor information services that address the ecological, social, economic and cultural background of the Forest. Identify recreation opportunities at the lower elevations of the Forest. Forest works with local communities and municipalities as well as Federal and State agencies in addressing regional recreation and tourism demands. Recreation demands are balanced with the ability of the land to sustain use and the capacity of the Forest to manage its use. <p>Objectives</p> <ul style="list-style-type: none"> Establish a process to accurately determine visitor impact to recreation areas. Alleviate the high concentration of visitor activity along the main Forest recreation corridor. 	<p>Are Forest recreation sites being impacted by high visitation and use?</p> <p>Are visitors being provided adequate and current interpretive and heritage information related to the Forest?</p> <p>Is there a potential to create recreation opportunities in the lower elevations (Community Interface Resource Management Area) of the Forest?</p> <p>Are current regional recreation and tourism needs being addressed?</p> <p>How does the Forest manage current recreation use and demands?</p>	<ul style="list-style-type: none"> Annual site visit to recreation areas and trails. Frequency: 4 years Conditions in the most used sites (La Mina and its associated trails, trailheads, facilities and picnic areas). Frequency: 2 years Conditions and locations of SUP issued for recreation purposes on the Forest. Frequency: 2 years Dispersal of recreation opportunities. Frequency: 5 years Number of recreation opportunity guides that are produced. Frequency: 2 years Website hits looking into Forest information and time span. Frequency: 2 years Visitors hosted at El Portal Visitor Center and Reception area. 	<p>Source: GIS, INFRA, SUDS, NVUM, PAO, Grants and agreements,</p> <p>Scale: Forest wide</p> <p>Adaptive Management Strategies: The Forest will frequently evaluate use and demands in comparison to carrying capacities particularly for Management Areas: 2, 3, and 4</p> <p>Provide visitors with current and accurate information about the Forest's heritage resources.</p> <p>Alert: Recreational sustainability indicators reflect excessive or low use and demand.</p> <p>Response: Conduct a Forest wide review to assess the reasons why sustainable recreation indicators are not being met, and develop an action plan to address issues and identify solutions.</p> <p>Alert: Recreation sites along a specific management area are being impacted by high visitor use.</p> <p>Response: Focus efforts in promoting use and recreation in other management areas</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
<ul style="list-style-type: none"> ▪ Create partnerships with surrounding Forest communities, special interest groups, and municipal governments to enhance recreation opportunities. ▪ Monitor recreation sites to evaluate visitor use and impacts to the resource. 		<p>Frequency: Annually</p> <ul style="list-style-type: none"> ▪ Number of materials produced. Frequency: 5 years ▪ Number of trails and existing sites identified which have recreational value. Frequency: 4 years ▪ Partners offering sustainable recreation opportunities on the Forest. Frequency: 5 years ▪ Economic and geographical shifts in Special Use Permits related to recreation. Frequency: 10 years ▪ Number of outreach meetings held with neighboring communities and municipalities. Frequency: 5 years ▪ Coordination with PR Tourism Company regarding Forest offerings Frequency: 5 years ▪ Coordination with Regional Natural Protected Areas offerings Frequency: 5 years ▪ Visitor use numbers. Frequency: 5 years ▪ Partners offering more dispersed recreation off PR 191 road, in other areas on the Forest, SUP or agreements Frequency: 5 years 	<p>(particularly at lower elevations) to disperse visitor use, coupled with restoration of those affected areas. This also includes improving other recreational areas to make them apt for use as well as improving the roads that provide access to these areas.</p> <p>Alert: There is a lack or no communication with surrounding communities, municipalities and other agencies to address recreation and tourism demands.</p> <p>Response: Conduct a Forest wide review to assess the reasons why this communication is not occurring and develop an action plan to address issues to increase dispersal of recreation opportunities along the Forest.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Wilderness			
<p>Desired Conditions</p> <ul style="list-style-type: none"> ▪ Current or improved wilderness character. ▪ Provide for primitive recreation opportunities and solitude. <p>Objective</p> <ul style="list-style-type: none"> ▪ Manage and protect wilderness character. ▪ Provide for the wilderness recreation opportunities that provide solitude. 	<p>Is the wilderness area being properly managed to program standards?</p> <p>Are recreation activities meeting wilderness recreation guidelines?</p>	<ul style="list-style-type: none"> ▪ Area and number of sites impacted by use. Frequency: 5 years ▪ Wilderness plan stages of implementation and development. Frequency: 2 years ▪ Visitor use rates and number of encounters. Frequency: 5 years ▪ Special use permit affecting wilderness and impacts Frequency: 5 years 	<p>Source: GIS, INFRA, SUDS, NVUM Scale: El Toro Wilderness Area Adaptive Management Strategies: Develop a Wilderness Management Plan including a Wilderness character monitoring plan. Alert: There is decrease in Wilderness monitoring score. Response: Analyze what specific resources are contributing to the decrease in condition and take action and management direction to address the declining resource.</p>
Wild and Scenic Rivers			
<p>Desired Conditions</p> <ul style="list-style-type: none"> ▪ Manage the rivers' free-flowing condition, water quality, and outstanding remarkable values which made them wild and scenic rivers. ▪ Implement Forest trash-free zones in "recreation" segments of wild and scenic rivers. <p>Objectives</p> <ul style="list-style-type: none"> ▪ Wild and scenic river standards are protected and perpetuated. ▪ Reduce the amount of time currently dedicated to trash removal at wild and scenic river "recreation" areas. 	<p>Are the Comprehensive River Management Plan guidelines being implemented?</p> <p>Is the trash-free zones initiative being implemented?</p>	<ul style="list-style-type: none"> ▪ Conditions and results of the seasonal monitoring of water quality of wild and scenic rivers and connecting streams data. Frequency: 2 years ▪ Trash collection visits by Forest Service teams to wild and scenic river "recreation" segments. Frequency: Annually ▪ Pounds of trash collected. Frequency: Annually 	<p>Source: Condition surveys Scale: Designated river segments Adaptive Management Strategies: Conserve and restore river fragments' outstanding remarkable value (ORV). Alert: Criteria or values of river segments are being degraded. Response: Identify all sources that are degrading a segment's ORV's, and either develop a plan to reduce those occurring within or caused by the Forest and establish communication and generate solutions for sources from outside the Forest.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Environmental Literacy and Education			
<p>Desired Condition</p> <ul style="list-style-type: none"> Partnerships are created with local communities, schools, special interest groups, and government agencies to develop and support interpretive and educational efforts and to strengthen regional identity and capacity for shared stewardship. <p>Objectives</p> <ul style="list-style-type: none"> Develop an interpretation and environmental education strategy within 2 years of Plan approval to be implemented within a 3- to 5-year timeframe that builds upon current standards and guidelines, and measures the effectiveness of programs and initiatives in partnership with surrounding communities, government agencies, special interest groups and organizations. 	<p>Is the Forest developing partnerships toward the strengthening of interpretative and educational initiatives to improve the regional identity and the capacity for shared stewardship?</p> <p>Does the Forest have an interpretation and environmental education strategy within 2 years of Plan approval?</p> <p>Is the environmental literacy in the region improving?</p>	<ul style="list-style-type: none"> Number and types partnerships with related themes or objectives directed to interpretative and educational initiatives. Frequency: 2 years Accomplishments of the interpretation and environmental education strategy developed for the Forest. Frequency: 2 years after the development of the education strategy Surveys in schools to measure knowledge and awareness of the Forest management strategies and connection of the Forest goods and services. Frequency: 5 years 	<p>Source: Review of permits, agreements and collaborative activities.</p> <p>Scale: Forest wide and regional management.</p> <p>Adaptive Management Strategies: Engage external resources and implement shared stewardship.</p> <p>Alert: Although partnerships and collaborative initiatives are documented; they did not include an interpretative and educational initiative</p> <p>Response: Review the work plans and projects considered with partners to integrate the environmental literacy and education component.</p> <p>Alert: The partnerships and collaborative groups associated with environmental literacy and education did not develop with the Forest interpretation and environmental education strategy within 2 years of Plan approval.</p> <p>Response: Create a special group or task force toward the development of the interpretative and educational initiative.</p>
Collaboration			
<p>Desired Condition</p> <ul style="list-style-type: none"> The Vision and Management Strategy asks for a collaborative process to achieve the vision on which internal and external stakeholders can rally around and reflect the uniqueness of the Forest. 	<p>How effective are the collaboration activities in helping to implement the Forest Plan?</p> <p>Is the Plan's implementation facilitating shared understanding and collaboration?</p> <p>How is the collaboration process required as part of the vision and management strategy of the Forest progressing through the Plan period?</p>	<ul style="list-style-type: none"> Number of collaborative projects. Frequency: 5 years Number of new partnerships originated by communities or local and State government organizations in coordination with the Forest that caters to outdoor recreation opportunities. Frequency: 5 years Number of regional environmental literacy initiatives and education projects with local communities to promote and strengthen a collaborative and participatory management approach required in the Vision and Management Strategy. Frequency: 5 years 	<p>Source: Partners information sharing with the Forest Service on environmental literacy in the region, Forest Service documentation of participation and outcomes.</p> <p>Scale: Region wide</p> <p>Adaptive Management Strategies: Partners and collaborators are accessed through community outreach and relationship development.</p> <p>Alert: Partnership agreements do not increase.</p> <p>Response: Host partner meetings.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Geographic Area: El Oeste y Sur			
<p>Desired Future Condition</p> <ul style="list-style-type: none"> To have a community-based use of the forests of the region with emphasis on environmental education and community-based enterprises in the western and southern municipalities of Canóvanas, Juncos, Las Piedras, Naguabo, and Humacao. <p>Objective</p> <ul style="list-style-type: none"> Maintain alternatives of community-based enterprises in the region of the geographic area through the plan duration. 	<p>How many environmental education and community-based enterprises have been developed in the municipalities of the geographic region?</p> <p>How many projects related to forest products have been established in the region?</p>	<ul style="list-style-type: none"> The number projects for environmental education. Frequency: 5 years The number projects associated with community-based enterprises. Frequency: 5 years The number of forest products projects. Frequency: 5 years 	<p>Source: Partners information sharing with the FS on environmental literacy in the region, FS Documentation of participation and outcomes.</p> <p>Scale: Region wide</p> <p>Adaptive Management Strategies: Partners and collaborators are accessed through community outreach and relationship development.</p> <p>Alert: Community-based enterprises are not being developed in the area.</p> <p>Response: Identify elements that are limiting development of such enterprises, assess the communities' needs, and help make as many resources available to these communities for the necessary training and preparations to start such projects.</p>
Geographic Area: El Norte			
<p>Desired Condition</p> <ul style="list-style-type: none"> The prevailing road access systems and a regional trail system facilitate and provide access to El Yunque through the Río Grande and Luquillo municipalities. <p>Goals</p> <ul style="list-style-type: none"> Integrate trail systems that facilitate alternative access from the municipalities of Río Grande and Luquillo to the recreational settings of the Forest. Develop projects that will impact the economic and social wellness of Palmer, Río Grande and Barrio Sabana, Luquillo. 	<p>Are there partnerships being developed to develop this regional trail system?</p> <p>Are the roads that provide main access being maintained?</p> <p>Are the communities of Sabana and Palmer integrated in this new regional trail system and are they informed of the economic opportunities stemming from this project?</p>	<ul style="list-style-type: none"> Amount and distance of new trails providing connectivity with the region being developed. Frequency: Annually during first 5 years upon plan approval Number of agreements with partners established around the development of a new regional trail system. Frequency: Annually during first 5 years upon plan approval. Amount of maintenance activities done in the main access roads into El Yunque. Frequency: Annually or depending on heavily damaging events Number of interpretation initiatives with the municipalities, residents, and organized regional groups. Frequency: Annually 	<p>Source: Partner information sharing with the FS, FS Documentation of participation and outcomes.</p> <p>Scale: Region wide</p> <p>Adaptive Management Strategies: Outreach to partners is increased.</p> <p>Alert: Regional trails system project does not progress</p> <p>Response: Analyze the reasons why the project needs are not being met and re-assess or create a special group or task force toward the development of the project.</p> <p>Alert: Both communities, Palmer and Sabana are not up to date or involved with the opportunities regarding the development of a new regional trail system or other projects in the region.</p> <p>Response: Partners and collaborators are accessed through community outreach and relationship development.</p>

Selected Plan Component	Monitoring Questions	Indicators*	Source, Scale and Adaptive Management Strategies
Geographic Area: El Este			
<p>Desired Condition</p> <ul style="list-style-type: none"> The geographic area is a model for integrated watershed management in the eastern municipalities of Fajardo and Ceiba. <p>Objective</p> <ul style="list-style-type: none"> Engage in community-based enterprises, groups, and other organizations for rivers, floodplains, and riparian area restoration and conservation efforts. 	<p>Is there more land, through different contracts and initiatives, being allocated to maintain the connectivity of these watersheds?</p> <p>Are there new conservation/restoration efforts being created with municipalities, organizations, enterprises?</p> <p>Are there sustainable recreation projects in these watersheds being developed?</p>	<ul style="list-style-type: none"> Amount of land acquired, through different agreements, for the conservation of these watersheds. Frequency: 5 years Amount of land treated with specific restoration projects. Frequency: 2 years Number of restoration projects performed in this region. Frequency: 2 years Number of community-based enterprises working in sustainable recreation activities around these watersheds. Frequency: Annually 	<p>Source: GIS, FS Documentation of participation and outcomes. Review of agreements and collaborative activities.</p> <p>Scale: Region wide</p> <p>Adaptive Management Strategies: Outreach to partners is increased.</p> <p>Alert: Land use around watersheds is not acquiring a sustainable direction.</p> <p>Response: Establish conversations and contact between municipal planners, local stakeholders, private landowners and the PR Planning Board about identifying incentives for transitioning into more sustainable land use practices.</p> <p>Alert: No restoration projects are being performed that promote watershed connectivity</p> <p>Response: Analyze why desired conditions needs are not being met and re-assess or create a special group or task force toward the development of projects concerning watershed connectivity in the region.</p>

This page left intentionally blank

5 References Cited

- Adame P.; Brandeis, T.J.; Uriarte, M. 2014. Diameter growth performance of tree functional groups in Puerto Rican secondary tropical forests. *Forest Systems* 23(1): 52–63. [www.inia.es/forestsystems]
- Birdsey R.A.; Weaver, P.L. 1982. The forest resources of Puerto Rico. USDA Forest Service Resource Bulletin SO-85. New Orleans, LA. 59 pp.
- Brandeis, T.J. 2009. Diameter growth of subtropical trees in Puerto Rico. Research Paper SRS–47, USDA Forest Service, Southern Research Station, Asheville, NC. 39 p.
- Campos-Cerqueira, M. and Aide, T.M., 2016. Improving distribution data of threatened species by combining acoustic monitoring and occupancy modelling. *Methods in Ecology and Evolution* 2016. doi: 10.1111/2041-210X.12599.
- Caughley, G. Gunn, A., 1996. *Conservation Biology in Theory and Practice*. Blackwell Science, Inc. 238 Main Street, Cambridge, MA 02142
- Chamberlain J. 2003. A Strategy for nontimber forest products research and technology transfer for southern United States. In: *Sustainable production of wood and non-wood forest products*. Proceeding of the IUFRO Division 5 Research Groups 5.11 and 5.12; New Zealand, March 11-15, 2003.
- Cohn, D., Patten, E., Hugo Lopez, M. 2014. Puerto Rican Population Declines on Island, Grows on U.S. Mainland. Pew Research Center. *Hispanic Trends*. August 2014.
- Crow, T.R.; Weaver, P.L. 1977. Tree growth in moist tropical forest of Puerto Rico. Research Paper ITF–22, USDA Forest Service, Institute of Tropical Forestry, Río Piedras, PR. 17 p.
- Federal Reserve Bank of New York. (2012). Report on the Competitiveness of Puerto Rico's Economy. New York: Federal Reserve Bank of New York. Retrieved from <https://www.newyorkfed.org/medialibrary/media/regional/PuertoRico/report.pdf>
- Gould, W.A., M Sartinuzzi y I. K. Parés-Ramos 2012. Land Use, Population Dynamics, and Land-Cover Change in Eastern Puerto Rico. Chapter B of *Water Quality and Landscape Processes of Four Watersheds in Eastern Puerto Rico*. Ed. Sheila F. Murphy and Robert F. Stallard. US Department of Interior. US Geological Survey.
- Donoghue, E.M.; Benson, G.L.; Chamberlain, J.L.; (technical coordinators). 2004. General Technical Report PNW-GTR-604, USDA Forest Service Pacific Northwest Research Station, Portland, OR.
- Ewel, J.J.; Whitmore, J.L. 1973. The ecological life zones of Puerto Rico and the U. S. Virgin Islands. Research Paper ITF-18, USDA Forest Service, Institute of Tropical Forestry, Río Piedras, PR. 72 p.
- Huey, R. B., 2009. Why tropical forest lizards are vulnerable to climate warming. *Proc. R. Soc. B* published online 4 March 2009. doi: 10.1098/rspb.2008.1957
- Hutchinson, I.D.; Wadsworth, F.H. 2004 Efectos de la liberación en el bosque secundario de Costa Rica 2005/6. *Recursos Naturales y Ambiente* 46–47: 152–157.

- IUFRO. 2003. Sustainable Production of Wood and Non-Wood Forest Products. Proceeding of the IUFRO Division 5 Research Groups 5.11 and 5.12; New Zealand, March 11-15, 2003.
- Kicliter, V. 1997. Forest products of Puerto Rico: An overview of trends in forest products use. Report El Atlantico RC&D Area. In coordination with USDA Forest Service International Institute of Tropical Forestry and Natural Resources Conservation Service, Arecibo, PR. 61 p.
- Killmann, W.; Ndeckere, F.; Vantomme, P.; Walter, S. USDA Forest Service. 2004. Developing methodologies for the elaboration of national level statistics on NWFP: Lessons learned from case studies and from a global assessment. IUFRO. Proceedings from IUFRO Division 5, Research Groups 5.11 and 5.12, number 17; Pacific Northwest Research Station General Technical Report PNW-GTR-604.
- Kwak, T. J., P. B. Cooney, y C. H. Brown. 2007. Fishery Population and Habitat Assessment in Puerto Rico Streams: Phase I Final Report. Federal Aid in Sport Fish Restoration Project F-50 Final Report. Marine Resources Division, Puerto Rico Department of Natural and Environmental Resources. San Juan.
- López-Marrero, T.; Hernández -Báez, L.A. 2011. Participatory Listing, Ranking, and Scoring Ecosystems Services and Driver of Changes. [Guide]. Gainesville, FL: USDA Forest Service Southern Research Station. 8 p.
- López-Marrero, T.; Hernández -Báez, L.A. 2011. Participatory Mapping of Land Cover Change [Guide] Gainesville, FL: USDA Forest Service Southern Research Station. 8 p.
- Lugo, A.E. and Helmer, E. 2004. Emerging forests on abandoned land: Puerto Rico's new forests. For. Ecol. Manage. 190, 145–161
- Lugo, A.E. 2009. The emerging era of novel tropical forests. International Institute of Tropical Forestry, USDA Forest Service, 1201 Ceiba St. Jardín Botánico Sur, Río Piedras, Puerto Rico. Biotropica 41(5): 589–591.
- Mascaro J.; J.A. Harris; L. Lach; A Thompson; M.P. Perring; D.M. Richardson and E.C. Ellis. 2013. Origins of the novel ecosystem concept. In Novel Ecosystems, Intervening in the New Ecological World Order. Eds. R.J. Hobbs; E.S. Higgs and C.M. Hall. Wiley-Blackwell Publication.
- Mascaro J, Hughes RF, Schnitzer SA. Novel forests maintain ecosystem processes after the decline of native tree species. Ecol. Monogr. 2012; 82: 221–228.
- Quinn, J. H., 2004. Spatial ecology of the small Indian mongoose (*Herpestes auropunctatus*) in a subtropical rainforest: the influence of human activity and management implications-Thesis. University of California, Davis, One Shields Avenue Davis, CA 95616.
- Scatena, F. N., and S.L. Johnson. 2001. Instream-flow analysis for the Luquillo Experimental Forest, Puerto Rico: Methods and analysis. General Tech. Report IITF-GTR-11, San Juan, PR: U.S. Department of Agriculture Forest Service.
- Schmidt, R.; Weaver, P.L. 1981. Tree diameter increment in the subtropical moist life zone of Puerto Rico. Turrialba 31: 261–263.

- USDA Forest Service, 1996. The Southern National Forest's Migratory and Resident Landbird conservation Strategy: Program guidance for most neo tropical, migratory, temperate migratory and resident birds. Southern Region Office, Atlanta, GA.
- USDA Forest Service. 2012. Future of America's forests and rangelands, Forest Service 2010 Resources Planning Act assessment. General Technical Report WO-87, Washington, DC [available at http://www.fs.fed.us/research/publications/gtr/gtr_wo87.pdf].
- U.S. Census Bureau. 2015. American fact finder. U.S. Census Bureau's American Community Survey Office. 30 December 2013 [<http://factfinder2.census.gov>].
- Wadsworth, F.H. 1987. A time for secondary forestry in tropical America. In: Management of forests of tropical America: Prospects and technologies. ITF Southern Forest Experimental Station.
- Wadsworth, F.H. 1997. Forest production for tropical America. USDA Agriculture Handbook 710, Washington, DC. 563 p.
- Wadsworth, F.H.; Bryan; B.; Figueroa, J.C. 2009. Cutover tropical forest productivity potential merits assessment. Document draft, unpublished.
- Wadsworth, F.H.; Zweede, J. 2006. Liberation: Tropical forest timber production. Forest Ecology and Management 233: 45–51.
- Weaver, P.L. 1979. Tree growth in several tropical forests of Puerto Rico. Research Paper SO-1 52, USDA Forest Service, Southern Forest Experiment Station, New Orleans, LA. 15 p.
- Weaver, P.L. 2012. The Luquillo Mountains: Forest resources and their history. General Technical Report IITF-44, USDA Forest Service, International Institute of Tropical Forestry, San Juan, Puerto Rico. 159 p.
- Weaver, P.L.; Birdsey, R.A. 1990. Growth of secondary forest in Puerto Rico between 1980 and 1985. Turrialba 40: 12–22.
- Weaver, P.L.; Pool, D.J. 1979. Correlation of crown features to growth rates in natural forest of Puerto Rico. Turrialba 29(1).
- Wilson J.B. 1999. Guilds, functional types and ecological groups. Oikos 86: 507–522.

This page left intentionally blank

Appendix A: Management Situations for the Elfin-woods Warbler in the New Land Management Plan for El Yunque National Forest

Introduction

The guidelines developed for the Elfin-woods warbler (*Setophaga angelae*) management situation concept is a part of the candidate conservation agreement between the U.S. Forest Service and U.S. Fish and Wildlife Service and are intended to promote recovery of this candidate species and improve its status (thus leading away from the species being listed as endangered). These guidelines (which are found in the Plan in Section 3.1.10) will better coordinate El Yunque National Forest activities and better evaluate risks to the species to aid in the appropriate timing and placement of any developments.

The concept applies to all federally managed lands within El Yunque's boundary, and describes three distinct management situations. Each of these management situations varies in terms of its existing and potential value as Elfin-woods warbler habitat, its sensitivity to management activities, and the direction that guides such activities. In general, as the management situation number increases from 1 to 3, Elfin-woods warbler habitat values (these are present day and not necessary potential values) decrease, as do the sensitivity to management activities, the number of management constraints, and the intensity of coordination required. The three management situations are:

Management situation 1: **Prime habitat**

Management situation 2: **Potential habitat**

Management situation 3: **Limited value habitat**

Table A- 1 and Table A- 2 provide definitions and relative values for the three management situations.

The values in Table A- 1 for sensitivity to physical and human disturbance are based on the following:

High = Where actions and/or direct, indirect, or cumulative effects negatively contribute to the viability of the species; thus leading to endangered species designation by the U.S. Fish and Wildlife Service. Viability is as defined under viable population in the zero code for the proposed Forest Service Handbook.

Moderate = Where actions and/or direct, indirect, or cumulative effects increases biological stressors or limiting factors for the viability of the species.

Low = Where there is little or no direct, indirect, or cumulative impacts to the species.

Table A- 1. Description of management situations, sensitivity levels, and guidelines

Situation	Description
Management Situation 1: Prime Habitat	
Description	These areas contain scientifically known Elfin-woods warbler breeding and foraging occurrences that are essential to successful reproduction and species recovery.
Sensitivity Levels	<p><i>Site Disturbance:</i> Present understanding of Elfin-woods warbler sensitivity to human induced physical or site disturbances within prime habitats is limited. However, due to the intrinsic value of these areas, the potential for damage from uncontrolled habitat modification is extremely high, and little risk of adverse effects will be acceptable.</p> <p><i>Human Disturbance:</i> Sensitivity to disturbances from human presence and human-generated noise during the nest selection and breeding seasons is extremely high. Potential sources of human disturbance include recreational and administrative uses, research, aircraft use, and use of chainsaws or explosives.</p>
Management Situation 2: Potential Habitat	
Description	These are specific areas that contain habitat criteria such as slope, forest type, tree species basal area, and foraging resources that may in any future state may provide preferred Elfin-woods warbler habitat. These areas may or may not be occupied by Elfin-woods warbler. These spaces may be accessible for Elfin-woods warbler and studied through continued scientific analysis, which their results can be applied for improved habitats and prospective prime habitat.
Sensitivity Levels	<p><i>Site Disturbance:</i> Elfin-woods warbler sensitivity to physical disturbances within these habitats are not completely understood. It can be expected, however, that activities which would diminish the habitat's quality, abundance, or effectiveness for Elfin-woods warbler use would not promote recovery goals and avoidance for further Federal protection designation.</p> <p><i>Human Disturbance:</i> Human disturbance in these areas may be less disruptive. However, human disturbances could be significant prior to the breeding season when birds are known to explore non-prime habitats for potential nest sites. If Elfin-woods warbler recovery, that is, the growth of populations and expansion into new occurrence zones, is to be encouraged, then the effectiveness of potential areas should be ensured during nest selection period.</p>
Management Situation 3: Limited Value Habitat	
Description	These areas that have less preferential habitat components for Elfin-woods warbler needs. Most may be buffer zones from one forest type to another at certain elevations. Continuing findings are noting areas in much lower elevations, such as the Palo Colorado forest types, due to unknown factors.
Sensitivity Levels	<p><i>Site Disturbance:</i> Due to the reduced level of habitat quality or effectiveness of these areas, Elfin-woods warbler sensitivity to physical disturbances in management situation 3 areas might be expected to be moderate to relatively low.</p> <p><i>Human Disturbance:</i> Sensitivity to disturbances from noise and human presence in these areas appears to be considerable, less than in management areas 1 and 2.</p>

Table A- 2. Summary of the Elfin-woods warbler management situation concept

Management Situation	Description	Sensitivity to Physical Disturbance	Sensitivity to Human Disturbance	Management Guidelines
1	Prime habitat	High	High	Time projects outside nest selection period and breeding season. Through NEPA analysis and consultation under the Endangered Species Act, projects may require significant changes.
2	Potential habitat	High to Moderate	High to Moderate	Time projects outside nest selection period and breeding season. Through NEPA analysis and consultation under the Endangered Species Act, projects may require significant changes.
3	Limited value habitat	Moderate	Moderate	Physical disturbance will be in compliance with Forest Service regulations and Elfin-woods Warbler Candidate Conservation Agreement. No timing constraint unless amplitude of disturbance influences nearby sensitive areas or further scientific findings provide more information on Elfin-woods warbler biological needs within limited value habitat.

This page left intentionally blank

Appendix B: Forest Products within the Community Interface Resource Management Area

There is a local, non-commercial demand for wood and non-timber special forest products within the arts and crafts community, and for personal use. There are more than 600 artisans certified by the Puerto Rico Economic Development Administration. Most of the Island's practicing artisans that work with wood use mainly locally available lumber resources that are harvested for that purpose, and milled in private sawmills (Kicliter 1997). Artisan's state that the supply of wood is very scarce, difficult to maintain, and expensive (Kicliter 1997).

Silvicultural Products

Using the forest to produce wood products is a management tool that can help move parts of the forest toward their desired ecological conditions. This use also contributes to the social and economic sustainability of the area.

Stand improvements will focus on the enhancement of native species through the selection and use of small-diameter timber (less than 8 inches dbh) mainly as poles, posts, carvings and other biological materials produced from the Community Interface Resource Management Area. Silvicultural applications can be considered in El Yunque National Forest within and on the edges of secondary forest that has regenerated naturally on abandoned lands that were originally cleared of trees, and where forests were historically manipulated or disturbed.

Methodology

The silvicultural treatments considered in the Community Interface Resource Management Area (CIRMA) (map 2-2) will identify tree species that should be treated as "conservation trees", or species important to maintain forest structure with genetically appropriate plant material. A tree spacing guide used in Puerto Rico (Wadsworth 1997) that considers the tree diameters and distances ($D + d$) for spacing of the conservation trees will be applied. Silvicultural treatments will consist primarily of low thinning or thinning from below to produce stands of unevenly distributed trees.

The diameter growth by functional groups has been studied in Puerto Rico, and several studies will be used as guidelines for applicable management strategies (Adame et al. 2014; Brandeis 2009; Weaver 1979; Wadsworth 1997). Plant functional types are non-phylogenetic groupings of species that show close similarities in their resource use and response to environmental and biotic controls (Wilson 1999). To classify species into groups or guilds imposes a degree of simplification which reduces information content, but reveals general patterns and facilitates predictions about forest dynamic processes.

Forestry practices would emphasize removing invasive species to encourage development of native species that already exist according to spacing guidelines. Efforts would be made to promote the regrowth of native species in healthy stands that support ecosystem functions. The use of non-native plant materials will be restricted only to those situations when timely reestablishment of a native plant community, either through natural regeneration or with the use of native plant materials, is not likely to occur, as defined in the policies of the FSM 2070. Native species are defined as plant species which occur naturally in a particular region, state, ecosystem, and habitat without direct or indirect human actions (FSM 2070).

Forest Yield

Historically, most of the forests in the CIRMA are dominated by secondary stands which are in the process of separating their canopy structure. Typically this forest integrates three canopy levels at its mature stage. About 32 species of the 150 species identified in secondary stands are species with timber use value. The other species have potential uses as special forest products and are important for the ecological settings that these forests provide in El Yunque National Forest. To establish a sustainable yield capacity, the growth rates of the species that dominate the CIRMA need to be considered as part of the wood utilization initiatives. Growth rates in the subtropical wet, subtropical rain, lower montane wet, and lower montane rain forest life zones of the Luquillo Mountains of Puerto Rico have been studied (Crow and Weaver 1977, Schmidt and Weaver 1981, Weaver 1979, Weaver and Birdsey 1990). In 2009, Brandeis published a report titled “Diameter Growth of Subtropical Trees in Puerto Rico” in which the growth among trees measured in the forest inventories of Puerto Rico were calculated by annual increase in diameter at breast height (dbh) for the period of time covered by the Forest Inventory Analysis (FIA). Most of the CIRMA is in the subtropical wet forest, with a small area of subtropical moist forest according to Ewel and Whitmore (1973). Table B- 1 from the Brandeis (2009) report shows the mean increment by life zones documenting the similar periodic annual increment in the subtropical moist and subtropical wet/rain forests.

Table B- 1. Diameter at breast height (1.4 meters) periodic annual increments by Holdridge life zone with number of trees measured, standard error of the mean (SE), standard deviation of the mean (SD), and maximum observed periodic annual increment increase from Puerto Rico forest inventory data in centimeters per year*

Life Zone	N	Mean	SE	SD	Max
Subtropical Dry	307	0.20	0.03	0.45	5.74
Subtropical Moist	2,315	0.37	0.01	0.48	4.30
Subtropical Wet/Rain	1,292	0.36	0.01	0.51	5.84
Lower Montane	112	0.20	0.02	0.24	1.28
All life zones	4,026	0.35	0.01	0.49	5.84

Note: N = number of trees measured; SE = standard error of the mean; SD = standard deviation of the mean; Max = maximum observed (Brandeis 2009).

* This table is derived from a publication which measurements were done using the International System of Units (SI)

Brandeis (2009) also provides the periodic annual increment measured by species as part of the appendix of the document. This information will be used in evaluating silvicultural applications that can support the potential growth of selected species according to the Community Interface Resource Management Area management parameters.

Timber Suitability and Sustained Yield

Planned harvests would only occur on lands “suited for timber production”. The identification of lands as “suitable for timber production” does not mean that timber production is the primary purpose of management on those lands. It means that the production of wood products is compatible with the achievement of desired conditions and objectives established by the plan for those lands (36 CFR 219.11(a)(1)(iii)), and some regular flow of wood products may be expected.

Following natural disturbance events, dead or damaged trees could also be removed on lands identified as “not suited for timber production because timber production is not compatible with the desired conditions” (see Table B- 2).

The “sustained yield limit” for the amount of timber volume that can be removed from El Yunque is based on the “lands that may be suited for timber production”, and determined based on the amount of annual growth on those lands. The sustainable limit is the amount of timber that can be removed without exceeding the established level of annual growth. Silvicultural treatments in other forests in Puerto Rico with structure and composition similar to the Community Interface Resource Management Area forests have shown potential for a significant increase in the representation of promising tree species (Wadsworth 1987). The annual growth documented in these types of forests is 56.5 cubic feet per acre per year (Wadsworth 1987), and these numbers will be used to limit the amount of timber removal per area.

Table B- 2. Timber production suitability classification

Land Classification Category	Acres
A. Total National Forest System lands	28,223
B. Lands not suited for timber production due to legal availability or technical considerations	17,752
Wilderness	10,352
Slopes over 30% (outside of wilderness)	7,400
C. Lands that may be suited for timber production (A - B)	10,471
D. Lands not suited for timber production because timber production is not compatible with the desired conditions and objectives established by the Plan	3,284
E. Lands suited for timber production (C - D)	7,187
F. Lands not suited for timber production (B + D)	21,036

Planned Wood Product Sale Program

The amount of wood products extracted from the Community Interface Resource Management Area will fluctuate, depending on the forest stand condition, expected use of the sites and on the previous silvicultural treatments that may have been applied in the area. After a review of several compartment examination and prescription reports prepared in El Yunque, it is evident that historically there is extreme variation from secondary forest to mature Tabonuco-type forests. In Tabonuco-type forests the understory density is generally lower with reports of 49 trees per acre in the 4 to 16 inches dbh range (stand 12, compartment 1; Sabana) and in stands with secondary forests, the immature commercial species are reported at a rate of 100 trees per acre in the 4 to 12 inches dbh range.

The potential volume of production of stands throughout the CIRMA will also vary depending on the forest structure, previous treatments, site quality and the response of the areas to natural disturbances. The level of harvest in the 1997 Plan was estimated to be 22 acres per year for the first decade with 23 thousand cubic feet (MCF) per year of yield (Table II-3 1997 Plan FEIS). The number of acres per year was based on a scaled down demonstration of forest products on 1,100 acres (about 4 percent of the Forest). For the revised Forest Plan, even though there are 7,187 acres in the CIRMA where planned timber harvesting activities could occur for the first two decades, it has been determined that the level of harvesting activity considered in the 1997 Forest Plan will be maintained within the CIRMA (apart from any salvage operations conducted in response to hurricanes). The silvicultural prescription considered for stands in the CIRMA would plan for a stand to be entered every 50 years. So $1,100 \text{ acres} / 50 = 22 \text{ acres}$ to be treated per year. The yield of 1.045 thousand cubic feet per acre from the 1997 Forest Plan will also be used for the yield projections under this revised plan. This will result in a total projected yield of 23 thousand cubic feet per year ($22 \text{ acres} \times 1.045 = 23 \text{ thousand cubic feet}$). The ten year projections are

presented in Table B- 3. The integration of other forest products (non-wood) are incorporated into these yields and a review of the projected harvest acres per year and yields will be conducted after the first 5 years of implementation (see section in appendix B, Special Forest Products (Non-Timber)).

If timber removal is considered and allowed, it is expected that there would be an established method for administration of the system of removal considered, either by permit or contract (FSH 2409.15 and FSH 2409.18).

Sustained Yield Limit

The sustained yield limit (SYL) is an estimate of the quantity of timber that can be removed annually in perpetuity on a sustained-yield basis (see 36 CFR 219.11(d)(6)). The sustained yield limit is also determined based on the total “lands that may be suited for timber production”, which from Table B- 2 is 10,471 acres. For El Yunque National Forest, the sustainable limit is the amount of timber that can be removed without exceeding the established level of annual growth. Silvicultural treatments in the forest with structure and composition similar to the CIRMA forests in Puerto Rico has shown possibilities for a significant increase in the representation of promising tree species (Wadsworth 1987). The annual growth documented in this type of forests is 56.5 cubic feet per acre per year (Wadsworth 1987). The sustained yield limit for El Yunque is therefore 56.5 cubic feet/acre x 10,471 acres = 591,612 cubic feet per year or 591.6 thousand cubic feet per year.

Table B- 3. Planned timber sale program; decadal volume outputs for the first and second decade

Sustained Yield Limit = 591.6 thousand cubic feet per year	First Decade	Second Decade
Timber Products Volumes other than salvage or sanitation volumes that meet timber product utilization standards	Thousand Cubic Feet	Thousand Cubic Feet
A. Lands suitable for timber production		
A1. Sawtimber	0	0
A2. Other products (total for the decade)	230	230
B. Lands not suitable for timber production		
B1. Sawtimber	0	0
B2. Other products (total for the decade)	0	0
C. Projected Timber Sale Quantity (A1+A2+B1+B2)	230	230
Other Estimated Wood Products Fuelwood, biomass, and other volumes that do not meet timber product utilization standards		
D. Fuelwood	0	0
E. Projected Wood Sale Quantity (C + D)	230	230

With respect to the Sustained Yield Limit, it needs to be noted that the sustained yield limit does not apply to the sale of volume from salvage or sanitation harvesting of timber stands substantially damaged by hurricanes or other catastrophes, or that are in imminent danger from insect or disease attack (see U.S.C 1611(b)).

Estimated Vegetation Management Practices

Land management planning direction (36 CFR 219.7(f)) states that forest plans will “contain information reflecting proposed and possible actions that may occur on the plan area during the life of the plan, including: the proportion of probable methods of forest vegetation management practices expected to be used.” These estimates are displayed in Table B- 4 below.

Table B- 4. Estimated vegetation management practices, annual average per decade (acres)

Vegetation Management Practice	1st Decade	2nd Decade
Uneven-aged Management/Thinning	22	22
Invasive Plant Control, Mechanical	5	10 ¹

Special Forest Products (Non-Timber)

Different definitions are used for products that originate from the forests that are not timber-based, but are of biological origin. The regional strategy embraces the use of the term “special forest products” to provide consistency (Chamberlain 2003). These products can be organized into four major product categories: culinary, wood-based crafts, floral and decorative, and medicinal and dietary supplements.

There are several plant products (non-timber forest products) that are requested year-around in the Forest and managed via “free use permits” These products are mostly for personal consumption. Those products that are requested for commercial use are managed via a “special forest product permit.” Usually, these products include native *Heliconia* flowers and dead tree fern stems of *Cyathea arborea*.

During Christmas season, there are many requests for yams (*Dioscorea* spp.), yautia (*Xanthosoma* spp.) (tanier), malanga (*Colocasia* spp.) (taro) and bananas (*Musa* spp.) which occur naturally in particular zones of the Forest. These crops have been historically and traditionally used and consumed at a small scale from the lower elevations of the Forest. These consumption products are part of the vegetation persistent from past agricultural practice or from home gardens of previous occupants of lands acquired since the 1920s. These products are harvested yearly from the same location; mainly root crops where the regeneration parts (the crowns) are replanted for harvest the next year.

For home decoration and Christmas tree manufacture, the fallen leaves of the *Cecropia* tree are collected during the season. Occasionally, dead and downed trees are permitted to artisans or for firewood.

Other non-timber special forest products that could be provided from the Community Interface Resource Management Area include such products as (1) foods, like wild edible mushrooms, native fruits, and nuts; (2) medicinal plants and fungi; (3) floral greenery and horticultural stock; (4) fiber and dye plants, lichens, and fungi; (5) oils, resins, and other chemical extracts from plants, lichens, and fungi.

While these products will be provided through the use of a special forest product permit, there are strict limitations with the use of these permits. Special forest product permits can only be used for products that can be managed on a sustainable basis, and the amounts offered are limited to the amount that can be harvested annually in perpetuity (see 36 CFR 223.219).

There is not much information to accurately assess the current situation and to make informed decisions concerning management of non-timber forest resources in the CIRMA. An assessment and inventory of these products is recommended in the first five years of the plan to review the yields and products from

the CIRMA. By year 6 of the Plan, the Forest will reassess the yields and products from special forest products and potential projects within the CIRMA.

Special Forest Product Strategic Goals

Four strategic goals and associated actions within a framework of ecosystem management will be used to assess the ecological, economic and social aspects of special forest products as defined by Chamberlain (2003). These goals and selected actions are:

1. Provide knowledge and information to sustain levels of special forest products
 - a. Inventory the species or groups of species in the CIRMA
 - b. Assess ecological impacts of special forest product harvesting on the special forest product and associated species
 - c. Determine sustainable harvest practices and levels for selected special forest products
2. Provide knowledge and information to ensure the economic sustainability of special forest product markets.
 - a. Determine the value and volume of the major commercial special forest products
 - b. Define the scope and scale of established and emerging markets
 - c. Determine the economic impacts to local people and communities
3. Produce and provide information on the different aspects of human interaction with special forest products and incorporate an understanding of the human dimension into policy, planning and management decisions.
 - a. Identify special forest product collectors, the special forest products they collect, and their functional and livelihood uses of these products
 - b. Examine compliance with existing special forest product regulations, and implications for management strategies and law enforcement
 - c. Establish a process of collaborative planning with collectors, and other agencies and interested publics
4. Promote public understanding of special forest product uses, users, conservation, and future potential.
 - a. Determine methods to create public understanding of special forest products
 - b. Develop education and outreach programs that target harvesters, land managers, school groups and others

Appendix C: Priority Watersheds

El Yunque National Forest has evaluated its watersheds and their current conditions according to the new forest planning directives, which state:

The Planning Rule requires land management plans to:

(i) Identify watershed(s) that are a priority for maintenance or restoration; (36 CFR 219.7(f)(1)).

Identification of priority watersheds is done to focus effort on the integrated restoration of watershed conditions in these areas.

The Responsible Official should identify an appropriate number of watersheds in the plan for maintenance or improvement that corresponds to reasonable and achievable plan objectives for a 5-year period and within current budget levels. Priority watersheds in the plan are the watersheds where plan objectives for restoration would concentrate on maintaining or improving watershed condition.

What exactly are “priority watersheds” as referenced in FSH 1909, Section 22.31?

“Priority watersheds,” as referenced in chapter 20 of the Land Management Planning Handbook, are those 12-digit hydrologic unit watersheds specifically identified as the focus for investments in maintenance or improvement of watershed conditions (soil and hydrologic functions supporting aquatic ecosystems) that have been established under the agency’s Watershed Condition Framework (WCF) process. An overview of the watershed condition framework and reference materials can be found at the following web link: http://www.fs.fed.us/biology/watershed/condition_framework.html.

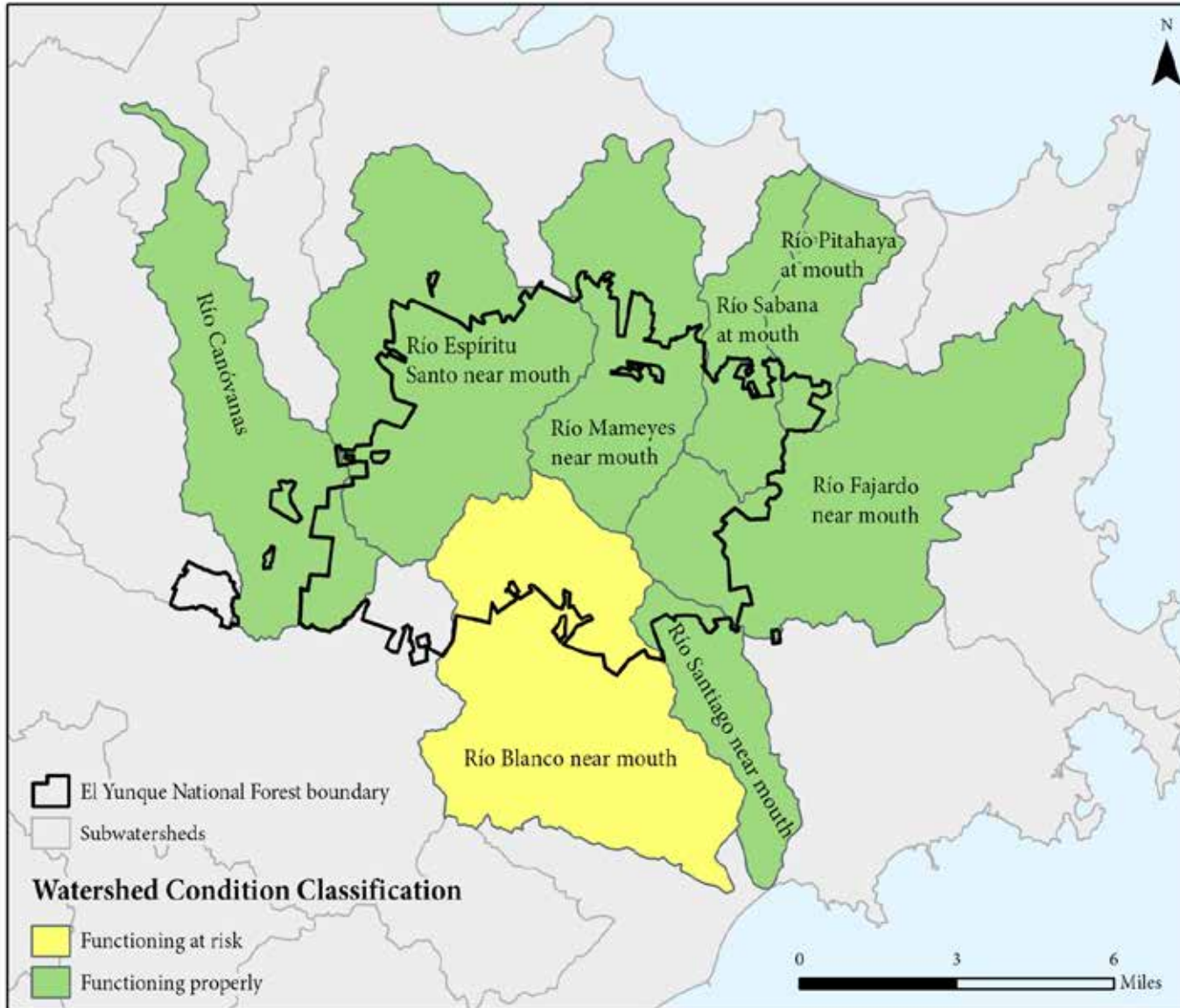
Once a watershed condition framework priority watershed is selected, a watershed restoration action plan (WRAP) is developed. The watershed restoration action plan identifies specific projects necessary to achieve the watershed condition improvement or maintenance goals. By design, watershed condition framework priority watersheds are not intended to be permanent designations—when all needed work is completed, a new priority watershed is to be identified using the same process and criteria described above. Occasionally, a change in a priority watershed designation may be needed for other reasons, including significant condition degradation (such as after a wildfire), loss of a critically important restoration partner, or to attain better alignment with active unit priorities.

What is the best way to include watershed condition framework priority watersheds in land management plans?

The plan should incorporate by reference the information contained in the website at the watershed condition framework map viewer web link <https://apps.fs.usda.gov/wcatt/>. That website will always contain the current WCF priority watersheds and associated information. However, before changing priority watersheds and the information on the watershed condition framework map viewer web link <https://apps.fs.usda.gov/wcatt/>, the responsible official shall give public notice (36 CFR 219.13(c)(2)).

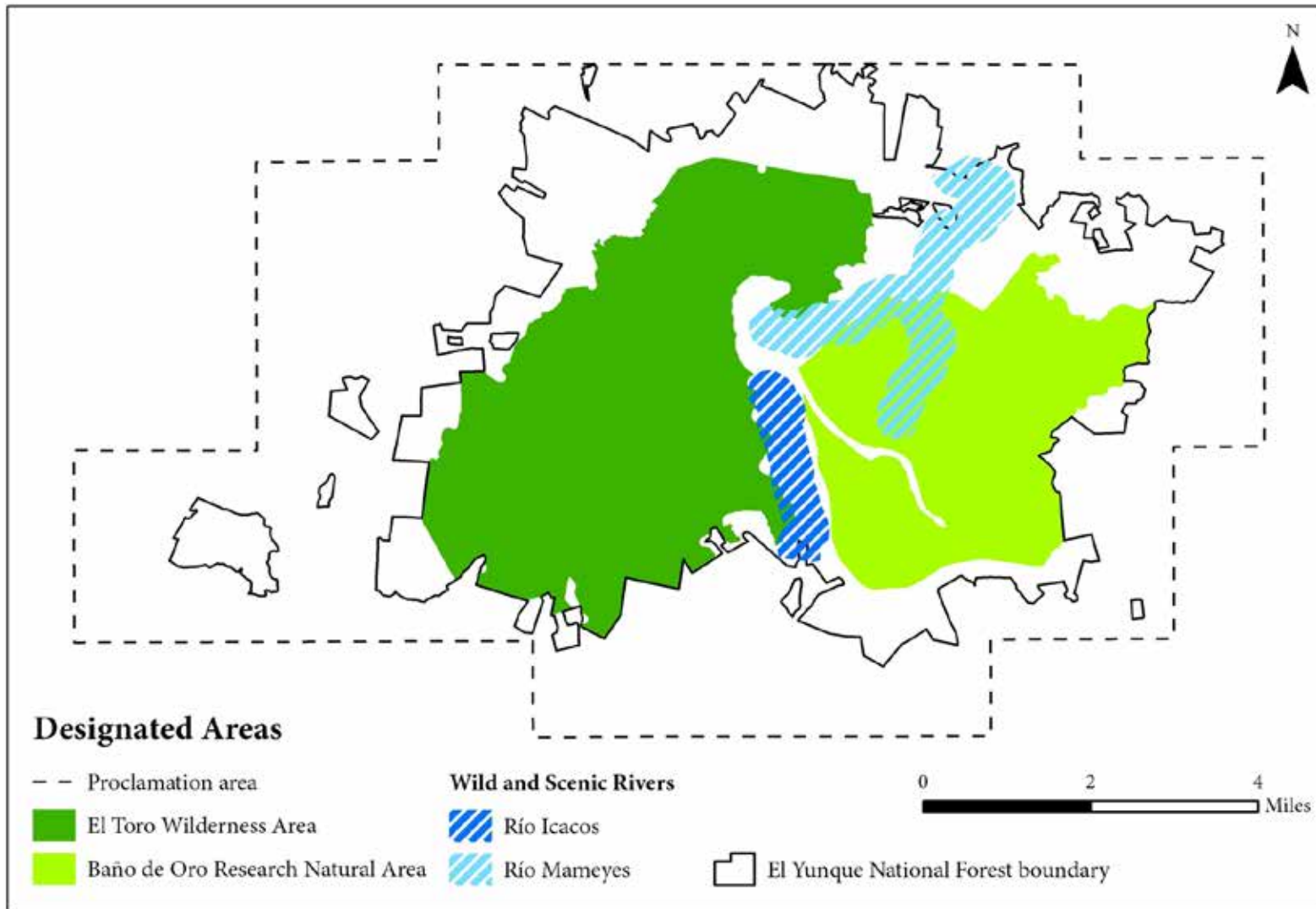
Table C- 1. Watershed condition classes and management strategies

Watersheds	Watershed Condition Classification April 2016	Management Strategy
Rio Blanco near mouth	Functioning At-Risk	<ul style="list-style-type: none"> ▪ Meet standards developed by FERC. ▪ Reduce fragmentation. ▪ Impaired functioning: Highly erodible soils, high sand content. Upper watershed flat and funnels water into channels and causes erosion. Landslides have impacted channel shape. ▪ Reduce deferred maintenance of trails and roads.
Rio Santiago near mouth	Functioning Properly	<ul style="list-style-type: none"> ▪ Reduce erosion and sedimentation.
Rio Fajardo near mouth	Functioning Properly	<ul style="list-style-type: none"> ▪ Reduce erosion and sedimentation.
Rio Pitahaya at mouth	Functioning Properly	<ul style="list-style-type: none"> ▪ Reduce erosion and sedimentation.
Rio Sabana at mouth	Functioning Properly	<ul style="list-style-type: none"> ▪ Reduce erosion and sedimentation.
Rio Mameyes near mouth	Functioning Properly	<ul style="list-style-type: none"> ▪ Remove abandoned dams. ▪ Reduce deferred maintenance of trails and roads.
Rio Espiritu Santo near mouth	Functioning Properly	<ul style="list-style-type: none"> ▪ Manage instream flows. ▪ Reduce deferred maintenance of trails and roads.
Rio Canovanas	Functioning Properly	<ul style="list-style-type: none"> ▪ Support domestic intakes.



Map C- 1. Watershed condition classification

Appendix D: Forest Designation Area Map



Map D- 1. All designated areas

Appendix E: List of At-Risk Species

Table E- 1. Species of conservation concern

Taxonomic Group	Taxonomic Subgroup	Species	Common Name
Amphibians	Frog	<i>Eleutherodactylus eneidae</i>	Eneida's coqui
Amphibians	Frog	<i>Eleutherodactylus karlschmidti</i>	Web-footed coqui
Amphibians	Frog	<i>Eleutherodactylus unicolor</i>	Dwarf coqui
Amphibians	Frog	<i>Eleutherodactylus locustus</i>	Locust coqui
Amphibians	Frog	<i>Eleutherodactylus richmondi</i>	Richmond's coqui
Amphibians	Frog	<i>Eleutherodactylus gryllus</i>	Cricket coqui
Amphibians	Frog	<i>Eleutherodactylus hedricki</i>	Hedrick's coqui
Amphibians	Frog	<i>Eleutherodactylus portoricensis</i>	Upland coqui
Amphibians	Frog	<i>Eleutherodactylus wightmanae</i>	Melodius coqui
Amphibians	Frog	<i>Eleutherodactylus brittoni</i>	Grass Coqui
Aquatic	Eel	<i>Anguilla rostrata</i>	American eel
Aquatic	Fish	<i>Awaous banana</i>	Yellow river goby
Aquatic	Fish	<i>Dormitator maculatus</i>	Fat sleeper
Aquatic	Fish	<i>Eleotris pisonis</i>	Spinycheek sleeper
Aquatic	Fish	<i>Gobiomorus dormitor</i>	Bigmouth sleeper
Aquatic	Invertebrate	<i>Macrobrachium carcinus</i>	Bigclaw river shrimp
Aquatic	Invertebrate	<i>Macrobrachium crenulatum</i>	Crenulated river shrimp
Bird	Bird	<i>Icterus portoricensis</i>	Puerto Rican oriole
Bird	Bird	<i>Falco peregrinus</i>	Peregrine falcon
Mammal	Bat	<i>Stenoderma rufum</i>	Red-fig eating bat
Mollusc	Snail	<i>Luquillia luquillensis</i>	Luquillo mountain land snail
Reptile	Lizard	<i>Anolis cuvieri</i>	Puerto Rican giant anole
Reptile	Lizard	<i>Anolis occultus</i>	Dwarf anole
Vascular Plant	Fern	<i>Lindsaea stricta var. jamesoniiformis</i>	Lindsaea
Vascular Plant	Herb	<i>Pilea multicaulis</i>	P. Multicaulis (endemic)
Vascular Plant	Herb	<i>Pilea yunquensis</i>	P. yunquensis (endemic)
Vascular Plant	Orchid	<i>Brachionidium parvum</i>	B. parvum
Vascular Plant	Orchid	<i>Brachionidium ciliolatum</i>	B. cilionatum (endemic)
Vascular Plant	Orchid	<i>Lepanthes caritensis</i>	L. caritensis (endemic)
Vascular Plant	Orchid	<i>Lepanthes dodiana</i>	L. dodiana (endemic)
Vascular Plant	Orchid	<i>Lepanthes selenitepala ssp. ackermanii</i>	L. selenitepala (endemic)
Vascular Plant	Orchid	<i>Lepanthes stimsonii</i>	L. stimsonii (endemic)
Vascular Plant	Orchid	<i>Lepanthes veleziana</i>	L. veleziana (endemic)
Vascular Plant	Orchid	<i>Lepanthes woodburyana</i>	L. woodburyana (endemic)
Vascular Plant	Shrub	<i>Miconia foveolata</i>	Camasey (endemic)
Vascular Plant	Shrub	<i>Marlierea sintenisii</i>	Beruquillo (endemic)
Vascular Plant	Shrub	<i>Varronia wagnerorum</i>	Varronia (endemic)

Taxonomic Group	Taxonomic Subgroup	Species	Common Name
Vascular Plant	Shrub	<i>Solanum woodburyi</i>	Solanum (endemic)
Vascular Plant	Shrub	<i>Brunfelsia lactea</i>	Jazmin de monte (endemic)
Vascular Plant	Shrub	<i>Brunfelsia portoricensis</i>	Jazmin portoricensis (endemic)
Vascular Plant	Shrub	<i>Urera chlorocarpa</i>	Ortiga (endemic)
Vascular Plant	Shrub/small Tree	<i>Cybianthus sintenisii</i>	Cybianthus (endemic)
Vascular Plant	Shrub/small Tree	<i>Xylosma schwaneckeanum</i>	Palo de Candela (endemic)
Vascular Plant	Shrub/small Tree	<i>Eugenia eggersii</i>	Palo de murta (endemic)
Vascular Plant	Small Tree	<i>Miconia pycnoneura</i>	Camasey (endemic)
Vascular Plant	Tree	<i>Symplocos lanata</i>	Nispero cimarron (endemic)
Vascular Plant	Tree	<i>Ternstroemia heptasepala</i>	Palo colorado (endemic)
Vascular Plant	Tree	<i>Calyptanthus luquillensis</i>	C. luquillensis (endemic)
Vascular Plant	Tree	<i>Laplacea portoricensis</i>	Maricao verde
Vascular Plant	Tree	<i>Ardisia luquillensis</i>	Mamayuelo (endemic)
Vascular Plant	Tree	<i>Maytenus elongata</i>	Cuero de Sapo
Vascular Plant	Tree	<i>Psidium sintenisii</i>	Hoja menuda (endemic)
Vascular Plant	Tree	<i>Ravenia urbanii</i>	Tortugo prieto (endemic)
Vascular Plant	Tree	<i>Morella holdridgeana</i>	Palo de cera (endemic)
Vascular Plant	Tree	<i>Ternstroemia stahlii</i>	Palo de buey (endemic)
Vascular Plant	Tree	<i>Banara portoricensis</i>	Caracolillo (endemic)
Vascular Plant	Tree	<i>Calyptanthus woodburyi</i>	C. woodburyi (endemic)
Vascular Plant	Tree	<i>Conostegia hotteana</i>	Camasey peludo
Vascular Plant	Tree	<i>Coccoloba rugosa</i>	Ortegon
Vascular Plant	Tree	<i>Magnolia splendens</i>	Laurel sabino (endemic)
Vascular Plant	Vine	<i>Gonocalyx portoricensis</i>	Gonocalyx (endemic)
Vascular Plant	Vine	<i>Mikania pachyphylla</i>	Miconia (endemic)

Table E- 2. Threatened and endangered species

Common Name	Scientific Name	Category
Puerto Rican Parrot	<i>Amazona vittata</i>	Bird
Puerto Rican Broad-winged Hawk	<i>Buteo platypterus brunnescens</i>	Bird
Puerto Rican Sharp-shinned Hawk	<i>Accipiter striatus venator</i>	Bird
Elfin Woods Warbler	<i>Setophaga angelae</i>	Bird
Puerto Rican Boa	<i>Epicratus inornatus</i>	Reptile
Capá Rosa	<i>Callicarpa ampla</i>	VascularPlant
Uvillo	<i>Eugenia haematocarpa</i>	VascularPlant
Palo de Jazmín	<i>Styrax portoricensis</i>	VascularPlant
Palo Colorado	<i>Ternstroemia luquillensis</i>	VascularPlant
Chupacallos	<i>Pleodendron macranthum</i>	VascularPlant
None	<i>Lepanthes eltoensis</i>	VascularPlant
None	<i>Ilex sintenisii</i>	VascularPlant
None	<i>Ternstroemia subsessilis</i>	VascularPlant