

EL YUNQUE NATIONAL FOREST

# COMPREHENSIVE EVALUATION REPORT

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SEPTEMBER 2008



RIO GRANDE  
PUERTO RICO

# COMPREHENSIVE EVALUATION REPORT

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## ACRONYMS

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AASHTO	American Association of State Highway and Transportation Officials	FSR	Forest Service Road
AMS	Analysis of the Management Situation	HPM	Heritage Program Manager
APHIS	Animal and Plants Health Inspection Services	IITF	International Institute of Tropical Forestry
CCC	Civilian Conservation Corps	INFRA	Infrastructure
CER	Comprehensive Evaluation Report	IPM	Integrated Pest Management
CFR	Code of Federal Regulations	ITES	Institute for Tropical Ecosystems Studies
CNF	Caribbean National Forest	LEF	Luquillo Experimental Forest
DC	Desired Condition	LRMP	Land and Resource Management Plan
DFC	Desired Future Condition	LWCF	Land and Water Conservation Funds
DNER	Department of Natural and Environmental Resources	MOU	Memorandum of Understanding
EPA	Environmental Protection Agency	NEPA	National Environmental Policy Act
EQB	Environmental Quality Board	NFS	National Forest System
EYNF	El Yunque National Forest	NHPA	National Historic Preservation Act
FA&O	Fire, Administration and Others	NRHP	National Register of Historic Places
FAA	Federal Aviation Administration	O&M	Operational and Maintenance
FEIS	Final Environmental Impact Statement	OGC	Office of General Counsel
FS	Forest Service	OHV	Off Highway Vehicle

PRDOT	Puerto Rico Department of Transportation
PETS	Proposed, Endangered, Threatened, and Sensitive
PHA	Priority Heritage Assets
PR	Puerto Rico
PRP	Puerto Rican Parrot
REA	Recreation Enhancement Act
RNA	Recreation Natural Area
RO	Regional Office
SF	Square feet
SHPO	State Historic Preservation Office
UN	United Nations
UNESCO	United Nations Educational, Social, and Cultural Organization
US	United States
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geographical Service
WO	Washington Office

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## INTRODUCTION

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In 1997, the *Revised Land and Resource Management Plan* (Revised Plan or LRMP) for the El Yunque National Forest and Luquillo Experimental Forest was put into effect. Alternative C-mod from the *Final Environmental Impact Statement* (FEIS) was selected to develop the Revised Plan. This Plan revision came about as a result of the appeals to the 1986 Forest Plan and the subsequent attempts to resolve the appeals through amendment of the Plan. In 1991 an analysis of the management situation (AMS) on the Forest indicated it was more appropriate to address the issues raised in the appeal through a revision rather than amendment. Forest Service Chief F. Dale Robertson authorized a plan revision on September 6, 1991 because the AMS indicated the need to consider substantial change to existing Plan direction and the timeframe for a required plan revision was fast approaching.

As stated in 36 CFR 219.6 [2008 Planning Regulations], the Forest Supervisor shall prepare a *Comprehensive Evaluation Report* (CER) which evaluates social, economic, and ecological conditions that contribute to sustainability, as described in 36 CFR 219.10, at least every 5 years to determine whether conditions or trends have changed substantially. This CER will focus on conditions and trends on the El Yunque National Forest during the 5-year period from 2003 to 2007; however some sections contain information from additional years.

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## AREA OF ANALYSIS

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The area being analyzed in this report is the El Yunque National Forest and Luquillo Experimental Forest (El Yunque or EYNF). The Forest is located in the Sierra de Luquillo Mountains, 25 miles southeast of San Juan, Puerto Rico. The Forest headquarters is the Forest Supervisor's office in Rio Grande, Puerto Rico. Puerto Rico (PR) is located between 17 55' and 18 31' N latitude and 65 39' and 67 15' W longitude, or about 1,000 miles southeast of Miami, Florida. Lying between the Atlantic Ocean and the Caribbean Sea, it is the easternmost island of the Greater Antilles. Total land area is 3,421 square miles.

El Yunque contains 28,002 acres. Elevation ranges from 100 to 3,533 feet above sea level. The climate is tropical. Average annual rainfall over the Forest is 120 inches per year. Topography is rugged, with 24 percent of the Forest exhibiting 60 percent slope or higher. The Forest is located in parts of eight municipalities (equivalent to counties in the U.S.): Canovanas, Ceiba, Fajardo, Juncos, Las Piedras, Luquillo, Naguabo, and Rio Grande.

El Yunque is also designated the Luquillo Experimental Forest. Research is conducted on the Forest by the International Institute of Tropical Forestry. The Institute is headed by a director and staffed with research scientists and technicians. The Institute's office is located on the grounds of the University of Puerto Rico's Botanical Garden in Rio Piedras, Puerto Rico.

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# MANAGEMENT REVIEW OF COMPREHENSIVE EVALUATION

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## SUMMARY OF FINDINGS

Located on the Caribbean Island of Puerto Rico in the Greater Antilles group, the El Yunque National Forest is the sole tropical rainforest in the U.S. National Forest System. The forest's relatively small 28,002 acre size belies its importance. It differs significantly from all the other U.S. National Forests because of its year-round tropical climate and immense biodiversity.

The rugged Luquillo Mountains that rise to 3,533 ft. above sea level comprise most of the forest land. Their steep slopes can sometimes receive rainfall of over 200 inches (508 centimeters) at higher elevations. Caressed by gentle easterly winds the forest has an average temperature of 73° F (21° C), and seasonal changes are almost imperceptible. It is the ideal climate for exuberant tropical vegetation. The rainforest is noted for its biodiversity; it is home to thousands of native plants including 150 fern species and 240 tree species (88 of these are endemic or rare and 23 are exclusively found in this forest). The El Yunque National Forest has no large wildlife species, but hundreds of smaller animals abound in this gentle forest, many of which exist nowhere else on the planet.

The parts of the Forest Plan that are working well will remain unchanged and our revision will be limited to areas where new regulations, policy, science, or changing social, economic, and ecologic conditions have created a need for updated guidance. Our revision effort will focus on 14 resource areas identified through internal and public scoping:

- Vegetative Communities – Desired Condition (DC) and Management Direction should be updated to reflect current science.
- Fish and Wildlife – DC should be updated to provide protection for species that may be affected by climate change.
- Air – Management Direction should be updated to reflect current science.
- Research – DC should be updated to address disclosure of research activities and promote high priority research topics for study for forest.
- Recreation – Standards and Guidelines for camping should be updated.
- Scenery – Standards and Guidelines should be updated using new Scenery Management System.
- Heritage – DC should provide emphasis on preserving and stabilizing heritage resources. Management Direction should be updated to reflect current science.

- Timber Demonstration – Management Direction should be updated to reflect current science.
- Minerals – DC should be updated to reflect Management Direction for minerals.
- Landownership – DC should state priorities clearly and emphasize the need for more partnerships.
- Special Uses and Communication Sites – Public-private partnerships may need to be increased. Climate change, sustainability, and green technology Standards and Guidelines should be incorporated into permit uses.
- Access Management – DC should address greenhouse gas emissions caused by vehicle traffic.
- Facilities – DC should be updated to address minimizing construction practices that contribute to greenhouse gas emissions.
- Socioeconomics – Monitoring should be developed to gather data on social and economic trends for future evaluations.

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## **COMPREHENSIVE EVALUATION**

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### **RESOURCE TYPES AND CONTRIBUTIONS**

#### **ECOLOGICAL**

The climate of Puerto Rico is dominated by the northeast trade winds in the summer and by northwest cold currents in the winter. Orographic precipitation is generated by the collision of the trade winds with the Sierra de Luquillo and Central Mountain ranges. This causes heavy rains in the north and east sections of the island and dry conditions in the south and west sections of Puerto Rico (García-Martínó et al., 1996). The average annual rainfall for Puerto Rico ranges from 1.5 to 5 m, depending on elevation and location on the island. The average annual temperature is 19 °C at 1000 m and 27 °C at sea level<sup>1</sup> (Luquillo Long Term Ecological Research, 2006).

Holdridge life zones are used to describe vegetation in Puerto Rico (Brandeis et al., 2003). Elevation within the LEF ranges from 100 to 1075 m above sea level. There are four major forest types within the LEF: tabonuco forest at elevations less than 600 m above sea level, colorado forest between 600 and 750 m, palm forest at elevations greater than 750 m, and dwarf forest between 750 and 1075 m above sea level. The LEF also contains four of the six life zones found on the island: subtropical wet forest, lower montane wet forest, lower montane rain forest, and subtropical rain forest (Ewel and Whitmore, 1973).

## SOCIAL AND ECONOMIC

El Yunque National Forest directly effects and is predominantly influenced by the citizens and governments of eight municipalities in Puerto Rico – Canovanas, Ceiba, Fajardo, Juncos, Las Piedras, Luquillo, Naguabo, and Rio Grande. These municipalities form a contiguous area in northeast Puerto Rico. The other seventy municipalities are a secondary influence to the Forest. For the purposes of this evaluation all seventy-eight Puerto Rican municipalities are taken into consideration. Three major indicators of the social and economic conditions of an area are employment trends, demographic trends, and social trends.

In the 2006 Puerto Rico Community Survey (Census Bureau) 7.5 percent of PR are unemployed. The major industries in which people are employed are educational services, health care, and social assistance (21%), retail trade (13%), manufacturing (11%), public administration (10%), and construction (8%). Per capita income in 2006 was \$9,474, which is less than the US average of \$25,267. Overall, with unemployment decreasing and the per capita income increasing, the economic trend in Puerto Rico is positive.

	PUERTO RICO		UNITED STATES	
	2000	2006	2000	2006
Educational services, health care, and social assistance industry	19%	21%	20%	12.5%
Retail trade industry	12%	13%	12%	7%
Manufacturing industry	13.5%	11%	14%	7%
Per capita income	\$8,185	\$9,474	21,587	25,267
Unemployment	8%	7.5%	4%	6%

*Table 1: Social and Economic Information, Source: Census Bureau*

Demographic changes and trends in any one area may be influenced by a combination of economic and social factors such as employment opportunities, lifestyle preferences, housing costs, and amenity availability. In 2006 3.9 million people were estimated to live in PR. The median age was 34. The population was 79% White, 8% Black and 12% reported themselves as some other race. 98% reported themselves as being of Hispanic descent (of any race). Among people at least five years old living in PR in 2006, 95% spoke a language other than English at home with 100% of those reporting Spanish as the other language.

	PUERTO RICO		UNITED STATES	
	2000	2006	2000	2006
<b>Puerto Rico</b>				
Population	3,808,610	3,927,776	281,421,906	299,398,484
White	80%	75%	75%	80%
Black	8%	8%	12%	13%
Hispanic	99%	99%	12.5%	15%

Table 2: Demographic Information, Source: Census Bureau

Social conditions within communities may be influenced by local, regional, and national policies and administrative actions. Social scientists use various measures to assess community conditions and the resources of communities to respond to internal and external sources of change (Leistritz and Murdock, 1981; Michaelidou et al., 2002; National Research Council, 2002; Horne et al., 1999). These measures are sometimes termed “social indicators.” A trend in change among a set of indicators over time can suggest changes in the overall quality of life within communities.

Persons in poverty is a widely used measure of social conditions. Poverty rates may indicate underlying social conditions such as lack of employment opportunities, under-employment, or other socioeconomic issues that may affect the economic and social resources within counties and communities. Poverty also consumes social resources and may therefore affect overall fiscal and community resources to adapt to changing conditions. 41% of individuals in PR are living below the poverty level in 2006, compared with 13% as the US average that same year.

The educational level of persons in the project area is an indicator of the knowledge and skills that can be applied to responding to individual, family, and community demands for change. In 2006 66% of the population has achieved a high school diploma or higher and 21% had a bachelor’s degree or higher. This is an increase in both areas from 2000, as shown in the table below.

With the number of individuals in poverty decreasing, and percentage of the population earning high school diploma’s and bachelor’s degrees increasing the quality of life in Puerto Rico appears to be experiencing positive changes.

	PUERTO RICO		UNITED STATES	
	2000	2006	2000	2006
<b>Puerto Rico</b>				
Percent in Poverty (individuals)	48%	41%	12%	13%*
High School diploma or higher	60%	66%	80%	No data
Bachelor’s degree or higher	18%	21%	24%	No data

Table 3: Social Indicators, \*2004 estimate, Source: Census Bureau

## ECOLOGICAL

### VEGETATIVE COMMUNITIES

#### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition (DFC) for EYNF:

“The land of the Forest remains forested, primarily with native species. The Forest’s rich diversity – including species, genetic and ecosystem processes -- is maintained. Viable populations of native plants are maintained or achieved.

Primary forest is preserved. Research refines the definition and location of primary forest.

The visitor to the Forest continues to receive an impression of vastness of the essentially unmodified forest, in sharp contrast to much of the rest of Puerto Rico. Evidence of past human modification of care areas of the Forest remains largely concealed even from visitors who walk trails.”

Primary forest is a monitoring item in the plan. The effect of recreation on primary forest, and the level of protection were used as indicators of meeting the DFC.

#### *Existing Conditions and Trends*

No new trail construction occurred in primary forest from 2002 to 2005. During 2007 preliminary trail clearing occurred in sections of Sabana Area Trail. The trail has segments in high elevations within primary forest. Campers tend to use the upper elevations of the Forest. However, no negative effects of camping were observed.

The forest remains covered with native species after Tropical Storm Jeanne and additional un-named storm events. Plant diversity has been sustained over the period. No denuded areas exist on the Forest. Primary forest was affected by an oil spill at El Yunque Peak and one at East Peak. Landslide revegetation resulted in native vegetative cover on 27 acres primarily in Tabonuco forest type areas. The Forest is distinguished by a long history of exotic species introductions, less pronounced seasonality, frequent hurricanes, and a weather driven by steep mountains and oceans (Wong, 2007). The forest monitors invasive species and noxious weeds. Plant surveys are conducted on landslides and road sites for species on 13 infestations sites. The forest reviewed the National Invasive Plant list and Regional Database. There is no major spread of invasive plants.

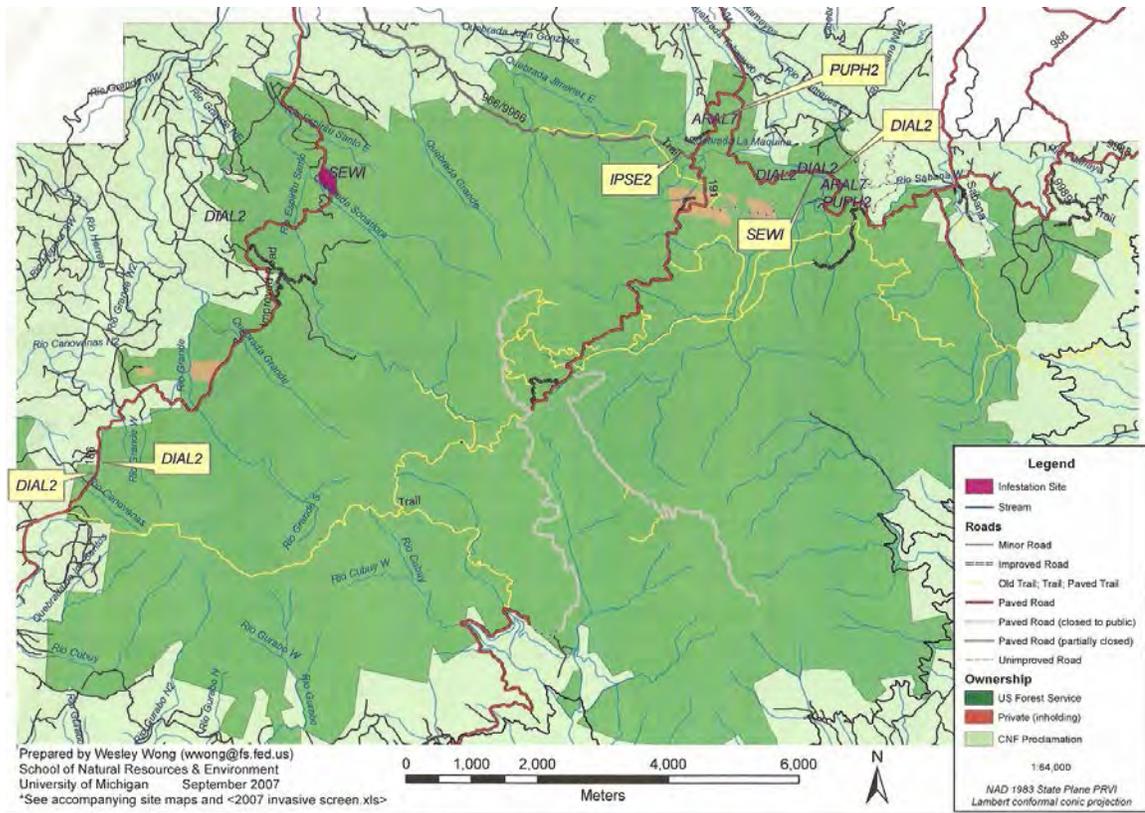


Figure 1: Location of invasive species survey plots on El Yunque National Forest. Source: Wong, W. 2007.

A review of a three year trend shows:

- Systematic monitoring of sensitive areas in relation to invasive species occurs.
- Rapid treatment of landslides with native species.
- Treatment of small areas with minimum impact to vegetation.

#### *Status of Desired Conditions*

The Desired Conditions for vegetation are partially appropriate to the current management situation since they need to be tempered to new invasive species and noxious weed existing condition, policies and regulations.

Significant changes in policy occurred during the five year period. First, the Agency has identified invasive species as one of the four critical threats to our Nation's. Second, Regional strategy was established in 2003. Third, El Toro Roadless area was designated as Wilderness in 2005. The designation affects the efforts to meet the DC by imposing restrictions on invasive plant/noxious weeds projects due to Wilderness Act; thus, reducing capacity to control and restore the healthy watershed conditions in Rio Espiritu Santo.

The Forest adapted its field data sheet using the National Invasive Weeds Data Protocol and completed a new field guide. Monitoring activities were initiated in 2003.

Two new issues have emerged in the last 4 years.

1. There is a need to work cooperatively identify invasive species (including noxious weeds) problems and develop control programs.
2. There is a concern on the effect of climate change on plant associations, natural succession and primary forest.

### *Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP is not current. Management direction does not utilize current invasive species science. The Standards and Guidelines listed in the LRMP served well during the period for site disturbing projects such as the construction of a new aviary, road maintenance on Palo Hueco and Bisley, a picnic area, and landslide restoration.

There is a need to add new goals to incorporate invasive species/noxious weeds management:

- “Reduce, minimize, or eliminate the potential for introduction, establishment, spread, and impact of invasive species across all landscapes and ownerships.”
- “Conduct risk assessments to define invasive plant and noxious weeds threats and prioritize species for treatment.”
- “Work outside traditional jurisdictional boundaries to improve the ecological health of forest resources.”
- “Foster partnerships for education and awareness on invasive plants and noxious weeds.”
- “Assist and promote cooperative efforts with internal and external partners to collaboratively address invasive plant, pathogen, vertebrate and invertebrate infestations.”
- “Integrate inventory and treatment monitoring activities for new or expanding infestations of invasive species in aquatic and terrestrial areas into all National Forest System program activities.”
- “Integrate invasive species management funding broadly across NFS programs and utilize funding sources which reflect the purpose and need of the invasive species project as well as the species being targeted for management.”

There is a need to add new Standards and Guidelines:

- (S) Ensure that National Forest management actions do not lead to the establishment or spread of invasive species. At no time are invasive species to be promoted or used in restoration, revegetation, or rehabilitation projects or activities.
- (G) Determine the risk of introducing, establishing or spreading invasive species associated with any proposed action, as an integral component of project analysis, and where necessary provide for alternatives or mitigation measures to reduce or eliminate that risk.
- (G) Manage invasive species on lands and water using an integrated pest management approach to achieve the goals and objectives identified in Forest Land and Resource Management plans, Environmental Management Systems, and Strategic Plans.
- (S) Use contract and permit clauses to ensure the activities of contractors and permittees prevent the introduction, establishment, and spread of invasive species.

## RARE PLANTS

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“The Forest’s rich diversity – including species, genetic diversity, and ecosystem processes – is maintained. Viable populations of native flora, including proposed, endangered, threatened, and sensitive species, are maintained or achieved. The ranges, distributions characteristics and limitations, and habitat requirements and associations of forest species are better understood.”

Rare Plants are a monitoring item in the plan. The existing population status, identification of new populations, and the success of propagation and reintroductions are indicators of DFC.

### *Existing Conditions*

The Desired Future Condition of rare plants on the forest requires survey, identification and reproduction of individuals. These actions occur on natural conditions as well as in nurseries. Given the limited budget for rare plant management, the forest focused on plant propagation and re-introduction as a means to protect and improve plant diversity. The existing conditions and trends were summarized in Table 4.

Species	Measurement or Management	2002	2003	2004	2005	2006
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Action						
<i>Styrax portoricensis</i>	Existing Population Status Surveys	9 individuals	9 individuals		9 individuals	
<i>Styrax portoricensis</i>	Propagations and Introductions	8 germinated	6 germinated			10 propagated  Bearing fruits at Canyon San Cristobal
<i>Callicarpa amplia</i>	Propagations and Introductions		2 air layered			100 seeds collected and stored. 2 seedlings planted
<i>Tourtogo prieto</i>	Propagations and Introductions		4 cuttings			
<i>Eugenia haematocarpa</i>	Propagations and Introductions		6 wildlings	10 seedlings		
<i>Ravenia urbanii</i>	Identification of New Populations			1 population		
<i>Ravenia urbanii</i>	Propagations and Introductions			285 wildlings		
<i>Brusenfalia portoricensis</i>	Identification of New Populations			1 population		
<i>Brusenfalia portoricensis</i>	Propagations and Introductions			82 seedlings 5 wildlings		
<i>Pleodendrum macrantum</i>	Propagations and Introductions			157 seedlings		

Table 4: Rare Plants Trends

Four trends were identified:

- Species from Tabonuco forest type seems to be more readily available for seed collection, propagation and new population establishments.
- Forest is focusing on these species to attain USFWS Recovery Plan targets for those particular species.
- Re/introduction to same life zones outside the Sierra de Luquillo on protected lands is being practiced to increase species range in PR.
- Actively reproducing *Styrax portoricensis*, *Pleodendrom macrantum* and *Callicarpa ampla*.

Rare plant program events completed include:

- US Fish and Wildlife Service permit for *Styrax portoricensis* seed collection and cultivation.
- Collaboration with Puerto Rico Conservation Trust nursery and seed orchard.
- GIS mapping of federally listed species.
- Five *Styrax portoricensis* donated to Carite State Forest, DNER.
- Twenty *Pleodendrum macratum* donated to Rio Abajo State Forest, DNER.
- Five *Styrax* donated to Parque Dona Ines from the Fundacion Luis Munoz Marin for planting at their Metropolitan Urban Forest in 2006.
- Two individuals planted at El Jardin Botanico, Universidad de PR, Rio Piedras.



Figure 2: Air layering technique on *Callicarpa ampla*

#### *Status of Desired Conditions*

Reduced budgets limit the capacity of working towards the DC. The Forest has used volunteers and students to assist in plant propagation. Also, professional collaboration with University of PR, PR Department of Natural and Environmental Resources, and the Puerto Rico Conservation Trust improved the ability to reproduce and introduce species. Finally, the strong NEPA requirements foster protection through the Biological Evaluation process. This has served well in construction projects as well as special use permit management.

The trend analysis shows that Desired Future Conditions for rare plants are appropriate for the management situation of the Forest. We can conclude that we worked towards meeting the DFC.

Significant changes in policy occurred during the five year period. El Toro Roadless area was designated as Wilderness. The designation enhances level of species protection on 10,000 acres. The only emerging issue is the effect of global climate change on plant distribution and succession.

### *Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP is still current and viable. Management direction reflects current science. The Standards and Guidelines listed in the LRMP served well during the period in projects such as the construction of a new aviary facility and construction of a picnic area.

To formalize the recovery efforts of PETS, a Partnership Agreement should be developed between the EYNF and all of the interested organizations.

## FISH AND WILDLIFE

### *Desired Conditions*

The EYNF Desired Future Condition for fish and wildlife are:

- Maintain viable populations of native flora and fauna, including Proposed, Endangered, Threatened, and Sensitive (PETS) species.
- Better understanding of forest species' ranges, distributions, population characteristics, limitations, and their habitat requirements.

Goals for fish and wildlife are:

- Sustainable populations of native species will be maintained through active vegetation management and natural resources protection through public education.
- Non-consumptive uses of wildlife will be emphasized to promote public awareness and appreciation of the conservation of the wildlife, plant, and aquatic resources.
- Active participation in the population protection and habitat stewardship of PETS species shall contribute to their recovery, in particular the Puerto Rican Parrot, Sharp-shinned Hawk and Broad winged Hawk.
- Interagency coordination will be improved to ensure both aquatic and terrestrial species conservation and produce cost-share habitat improvement efforts.
- Provide special protection for limited and sensitive habitats, such as the primary and dwarf forests.
- Integrate the knowledge and technology of the Forest's Wildlife and Fisheries and Rare Plants program with International assistance throughout the Caribbean and Latin America.

### *Existing Conditions*

#### Puerto Rican Parrot:

EYNF lands continue to support the present wild population (Table 5). Coordination with U.S. Fish and Wildlife Service regarding parrot indices on the EYNF involving both EYNF wildlife specialists and the Puerto Rico Department of Natural Resources personnel were conducted for population estimates and to provide protection for the last wild flock.

YEAR	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Successful Nesting Attempts	1	5	6	6	6	5	3	3	4	2	5	5	2	5	5	3	5
Total Young Produced in the wild	2	8	10	13	13	14	7	7	10	3	13	14	2	5	7	5	4
Young Fledged into the Wild	2	7	11	15	14	15	8	7	9	3	7	5	1	4	7	4	8

Table 5: Summary of Puerto Rican Parrot Recovery from 1990 to 2006

Along with releases of individual parrots throughout the past 15 years the unit has reestablished miles of trails within the secluded parrot nesting area on the EYNF and provided multiple artificial nests for potential use by the endangered parrot.

Significant threats continue to exert pressure on the Forest's Puerto Rican Parrot population. These limiting factors include the predation of adult parrots from Red-tailed Hawks, exotic rats and mongoose killing young nestlings, and nest competition from other cavity nesting birds and Africanized honeybees. Based on biologist's observations and data collection the wild parrot population has not reached intended targets due to the limiting factors mentioned above. However the creation of a new aviary and continued technological transfer improving controlling methods has been beneficial for the endangered parrot.

Puerto Rican Sharp-shinned and Broad-winged Hawks:

Coordinated raptor counts conducted by EYNF personnel and other organized bird counts on the Forest have shown low occurrences of both hawk subspecies. Reduction of the population has been noted since the 1980's. Only one Puerto Rican Broad-winged hawk nest has been documented since the 1997 LRMP.

White-necked crow:

Since the extirpation of this federally listed bird took place in 1968 in Puerto Rico there are no immediate or long-term efforts regarding this bird on the Forest.

Puerto Rican Boa:

The use of roadside nighttime surveys during breeding season has proven that a stable population is still in existence (Table 6). The number of specimens documented and reports

of multiple encounters from residents surrounding the Forest supplement the evidence of widespread distribution of the snake.

INDIVIDUAL	CAPTURE DATE	CAPTURE TIME	SEX
1	4/29/2002	8:23pm	M
2	5/7/2002	9:21pm	M
3	5/8/2002	10:00pm	M
4	5/10/2002	7:48pm	F
5	5/14/2003	8:17pm	M
6	5/15/2003	9:40pm	M

Table 6: Boa capture data on the EYNF

Warblers:

Bird surveys show the Elfin Woods and Black-throated blue Warblers populations are declining. Many of the migratory avian species are experiencing multiple pressures in both the tropics and temperate zones of their ranges. Warblers on the EYNF are important due to global concern of population decrease.

Eleutherodactylus species:

These include all coqui (tree frog) species on the EYNF. As with species that are affected by detrimental changes to their habitats, the coqui have been declining in population on the Forest. Those coqui species that are specialized to very unique habitats are in the most precarious situation. The *coqui duende* is a good example of how a species that require focused resources for their life cycles are impacted to the changing climate and their effects to the habitat. The more common coqui species have the ability to acclimate to changes but are still in peril due their adaptability limitations. Non-native species have been detrimental to the coqui and continue to pose a serious concern to the viability of these amphibious species.

Yellow-bearded Anole:

The lizard species on the EYNF have been extremely hard to gauge due to the environment and its inhibited nature. From field-going Forest personnel observations it appears that the lizard species has been affected by the increase of non-native species. At recreation locations and trails where EYNF personnel routinely work there has been a drop in reported sightings of many anole species. The rise in mongoose and feral cat populations has also been noted. Populations of the anoles throughout the Forest are in flux and will continue as long as habitat components continue to change.

Aquatic species:

The fish and shrimp species of the rivers of the EYNF have been documented as remaining stable. This display of resilience to consumptive use of water for human development surrounding the Forest and fishing indicates that the species are able to exist.

However, without management many of these aquatic species are susceptible to overuse. The mountain mullet and river shrimp are prized for culinary uses and have been reduced to low numbers outside of the Forest. Habitat manipulation through dams and intakes has reduced stream flows but riparian vegetation has not significantly changed. These aquatic species provide an important component for the general health of the Forest's rivers.

#### *Status of Desired Conditions*

The wildlife community is a natural and integral component of the environment under the supervision of the El Yunque National Forest. Recognizing wildlife and fisheries functional role in contributing to the integrity of EYNF's aquatic and terrestrial ecosystems, the Forest Plan directs the unit to maintain habitat for the existing variety of tropical wildlife and fisheries. The Forest Plan's objectives, standards, and guidelines further directs the unit to protect and enhance habitat condition for the species associated with old forest, unique vegetation types, and aquatic ecosystems. The unit anticipated that viable population of native species would be maintained through active forest management. In addition it was predicted that land use restrictions by the unit and reintroduction efforts would protect and enhance conditions for PETS species, namely the Puerto Rican Parrot (PRP).

Research conducted on the EYNF has shown that the concept of a steady state vegetation type is in fact constantly changing. This new idea promotes that Forests are not as fragile as once thought. Managing to keep tropical vegetation types in a certain age-class or group is problematic.

Climate change and its effects on the Forest is a great concern as we anticipate future management issues. Climate change is very complex and an obvious concern on a tropical forest because of species that are susceptible to minor alterations to their habitats.

The appearance of new disease is a threat to both humans and animal species. Avian diseases are a constant threat to the PRP. Funguses have been documented that harm the PRP recovery and affect other native species. Through increased visitation by international vessels disease and species normally found in Africa and Asia are now present in PR.

Increasing human population adjacent to the EYNF affects the forest in many ways. Habitat fragmentation is a problem that has separated the Forests natural areas. Ecological functions are now conducted through a small quantity of natural corridors.

#### *Need for Change*

There is a need for change to provide protection to species that may be affected by climate change.

## WATERSHED

#### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“Clean water flows from the Forest. The Forest healthy watershed condition – water quantity and quality, and soil productivity – are maintained. Rivers arising on the Forest provide dynamic links for the aquatic life of Puerto Rico’s eastern mountains and the sea. Use of water for human consumption is balanced within in-stream flow needs for recreation, research and aquatic and terrestrial ecosystem maintenance.

Aquatic ecosystems remain healthy, watershed condition is restored, enhanced, or maintained, rivers provide dynamic links, water used and development is balanced.”

*Existing Conditions*

Three conditions comprise the main core of the DC for soil and water resources; healthy watersheds, rivers dynamic links, and the balanced use of water. A healthy watershed is measured in acres of watershed condition class. The Forest Service measures performance towards sustaining a healthy watershed condition in acres needing restoration or maintenance. The number of acres restored depends on funds received. Funds are received based on field inventories. Inventories are influenced by natural forest conditions and tropical storm events. The balanced consumptive use is measured by the number of intakes and estimates of water extracted from the Forest. The Forest aims to provide water while protecting the hydrological integrity and aquatic life. The Forest streams are located in the headwaters of the Luquillo Mountain Range. The number of intakes in the lower drainages of the mountain range and amount extracted are significant elements when considering river continuity. Un-managed water recreation, erosion and sedimentation, and poisoning can affect water quality. Researchers document that water use continues to be the same: extraction, recreation, ecological integrity, and biodiversity (Crook et al., 2007). Programmatic events are useful indicators of actions towards meeting goals of the Land Management Plan. The existing conditions and trends were summarized in Table 7.

<b>DFC</b>	<b>Measurement or Management Action</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
<b>Healthy Watershed</b>	Acres restored	5	9	8	15	7
<b>Healthy Watershed</b>	Acres affected by illegal use	0	0	0	0	8
<b>Balanced Water Use</b>	Extraction	51 mgd	51 mgd	66.4 mgd	66.4 mgd	66.4 mgd
<b>Balanced Water Use</b>	Intakes	32	32	34	36	36
<b>Dynamic Links</b>	Flows	Not below natural minima				

<b>Plan Goals</b>	Number of programmatic events	6	6	8	8	7
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Table 7: Water and Watershed Conditions on EYNF

Scientists indicate that human recreation did not impact water quality at La Mina site. Nitrate and ammonium levels were significantly below limits of pristine waters (Marcial, 2006). The frequent rainfall results in rapid discharge of stream flows.

Four trends were identified:

- A continued need to restore the land after consecutive storm events.
- Increased water consumption while flows remain sustained.
- Use of programmatic events to further soil and water conservation.
- Water quality is good but, it is affected by sedimentation during peak flow events.

The annual budget of the Soil and Water Conservation Program averaged \$ 85,000. The budget was supplemented by project specific restoration funds from tropical storms and a hydrologist trainee has been assigned. Watershed program events completed include:

- Landslide restoration after Tropical Storm Jeanne 2002
- Landslide restoration after Rainfall Event of April 2003
- Environmental Assessment Input to University of Puerto Rico Canopy Trimming Experiment
- Support for Long Term Ecological Research of Landslides
- International Technical Assistance to Guatemala after Hurricane Mitch
- Technical Assistance in development of Wild and Scenic River Environmental Assessment and Plan
- Certification of Forest Soil Survey
- Technical Assistance to East Peak Oil Spill
- Participation in United Nations Educational, Scientific, and Cultural Organization (UNESCO) Hydrology, Environment, Life and Policy of Luquillo Mountain Range
- Collaboration on Fisheries Population and Habitat Assessment of P.R. Streams by the Zoology Department, North Carolina State University
- Participation in United Nations (UN) World Water Day with Universidad del Este and Universidad Interamericana
- Collaboration with University of Pennsylvania Hydrology Research Program
- Collaboration with FS Pacific Northwest Research Station on water use for recreation.
- Support to U.S. Geological Survey management of permanent station.
- Technical assistance in development of Jimenez Aviary Environmental Assessment.
- Technical assistance in implementation of Sabana Recreation Picnic Area.

- Technical input to special use permits.
- Participation in development of Puerto Rico Integrated Water Resources Plan

The tropical rain forest condition, geographical location, topography and climate continue to be dominant forces affecting the maintenance, restoration, and enhancement of the watershed condition. Three major storm events resulted in 29 acres of landslides during the five year period. The restoration of 27 acres represents a trend towards meeting the healthy watershed DC.

The Forest Service permits rights of way for land used to build a water intakes within the Forest. The Department of Natural Resources and Environment permits the amount of water that may be extracted. A permit right of way is issued based on an environmental analysis. The study considers in-stream flow needs. The environmental decision document allows the Forest to management balanced water resource use.

In 2002, the Forest had 34 permitted intakes. Six new points of water withdrawal have been added on rivers draining El Yunque on and off-forest. Four intakes have been added within the forest in Rio Espiritu Santo and Rio Grande. Two intakes have been added outside the forest in Rio Fajardo and Rio Blanco. This results in an increase extraction of 15 million gallons per day (mgd) (Crook et al., 2007). There is a trend towards balanced management of water resource use.

The geomorphic integrity and drainage stability combined with improvement to physical conditions of uplands, riparian areas and aquatic systems after Hurricane Georges, Tropical Storm Jeanne and one un-named event, demonstrate resilient river dynamics.

Finally, budget and staffing levels influence the ability to work towards DC. The forest received funds ranging from \$ 77,000 to \$ 86,000. Hydrology services were reduced to 15 % of a full time specialist. The forest water special use permit returns \$ 500.00 dollars to the U.S. Treasury. The estimated withdrawal on streams draining the Forest is 66.4 mgd. The market value of water produced by the forest is \$ 8,320,000 million using as index the Emery Evaluation of Luquillo Experimental Forest (Odum, 2000).

#### *Status of Desired Conditions*

The trend analysis shows that Desired Future Conditions for watershed are appropriate for the management situation of the Forest. During the 5-year period, we conclude that we worked towards meeting the DC. However, recent changes in water extraction off-forest threaten hydrological linkages.

Significant changes in policy occurred during the five year period. First, Rio Icacos and Rio Mameyes were designated as Wild and Scenic Rivers. Second, El Toro Roadless area was designated as Wilderness. These legal actions will affect the effort to meet the DC as follows:

- Eliminates the possibility of constructing intakes in 10,000 acres of Wilderness; thus, reducing the capacity of the Forest to issue Water Use Permits.

- Imposes restrictions on soil and water improvement project due to Wilderness Act implementation; thus, reducing capacity to implement a project that restores the healthy watershed conditions in Rio Espiritu Santo.
- Facilitates water and soil conservation on stream banks of Rio Mameyes and Rio Icacos.
- Stimulates local government to enact rules and regulations that protects areas off-Forest.

Finally, the Puerto Rico Department of Natural Resources and Environment completed the Integrated Water Resource Plan 2008. The plan calls for the establishment of “heritage rivers” in a concept similar to Wild and Scenic River systems.

The Forest soil survey was certified by Natural Resource Conservation Service in 2002. The soil survey identified 20 soil mapping units. The analysis classified soils associations for the Tabonuco life zone as Isohyperthermic Region, Palo Colorado life zone as Isothermic Region, and dwarf-forest life zone as Isomesic Region (NRCS, 2002).

The Environmental Protection Agency included Rio Espiritu Santo and Rio Fajardo in the listing of impaired watersheds (EPA, 2008).

A new water budget was published in 2007 (Crook et al., 2007). The report mentions four new intakes within the Forest and two outside the Forest. These intakes are located in Rio Mameyes, Espiritu Santo, Blanco and Fajardo. The new budget estimates withdrawal from streams draining EYNF at 66.4 mgd. This is an increase from 51.0 mgd estimated in 1994. The current public demand is estimated at 67 mgd. 11% of the runoff is diverted for human use. However, the majority of runoff occurs during storm events; which makes this 11 % an underestimate of the ecological effect on stream flow.

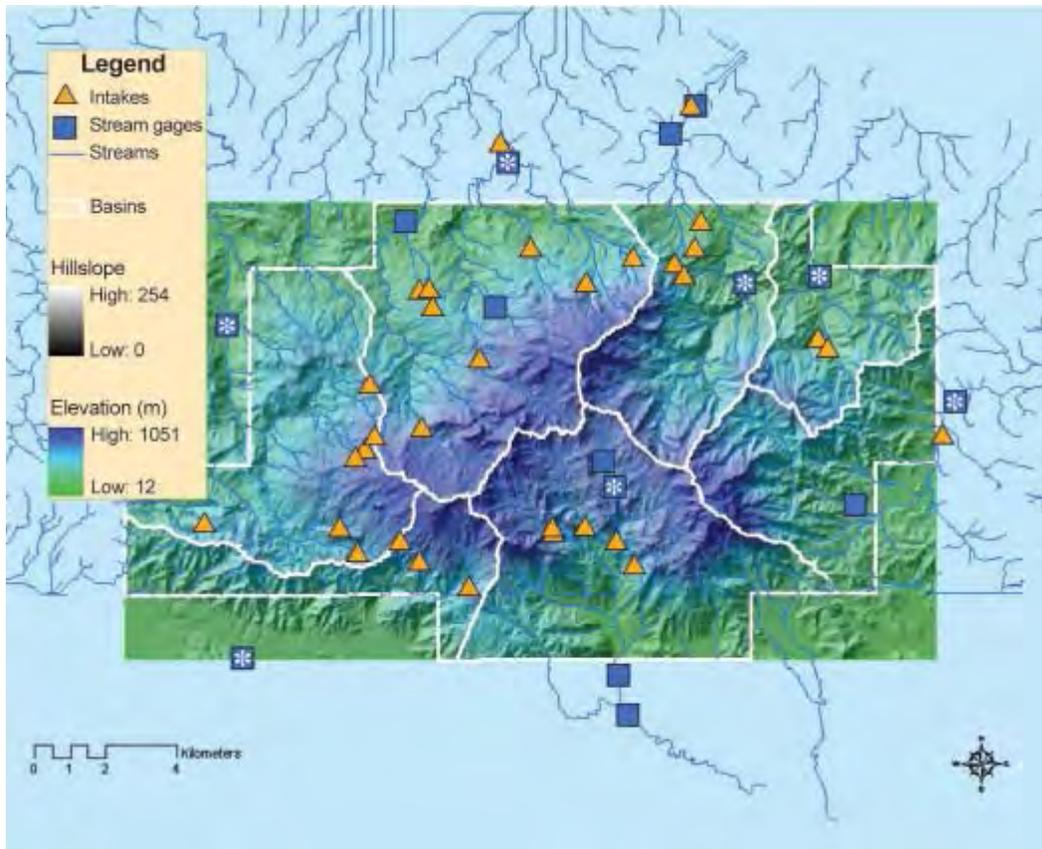


Figure 3 —U.S. Geological Survey stream gages. Watersheds, clockwise from the left, bottom corner of the Luquillo Experimental Forest are: Gurabo, Canóvanas (Loíza), Espiritu Santo, Mameyes, Sabana, Fajardo, Blanco. Source: Crook et al., 2007.

The Forest Service documented a series of issues and concerns on its Water Withdrawn from Luquillo Experimental Forest Report (Crook et al., 2007). We tier and categorized them according to potential effects on the DC.

Disturbances that can affect the rivers dynamic links:

1. Disconnection between headwaters and estuaries due to larger intakes in the lower watershed compared to smaller intakes in the higher sections of the watershed.
2. Urban and suburban developments along with climate change will likely exploit aquatic ecosystems because of the need to extract water. Tourism related development in the Northeastern part of Puerto Rico will to require a higher demand for water due to swimming pools and other hotel operations.
3. Water withdrawals in low- elevation reaches combined with effluent from wastewater treatment plants may affect populations of estuarine and migratory biota. This, in addition to the adverse effects of dams on shrimp and fish migration and habitat availability may result in an ecological disturbance.

4. An expected increase in carbon dioxide emissions and temperature could alter the vegetation and hydrologic cycle of the LEF. This could alter the amount of water availability for human consumption, recreation, research, and ecological purposes.

Disturbances that can affect the water quality include drought years that intensify problems related to reduced stream flow and increased pollution. We conclude that a threat to river continuum is emerging.

*Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP is still current and viable. Management direction reflects current science and adapts to the principles of the Conceptual Framework for Determining and Tracking Changes in Watershed Condition on Lands Managed by the USDA Forest Service. The Wild and Scenic River Management Plan will be approved in 2008. The Standards and Guidelines listed in the LRMP served well during the period in projects such as the construction of a new aviary facility and construction of a picnic area.

AIR

*Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“The Forest’s high air quality is maintained, and continues to be valued by visitors and residents as on of its valuable resources.

Air quality is preserved to ensure protection of public health and the Forest’s recreation, scenic and biological values”

*Existing Conditions*

The forest does not monitor air quality. There are no major emitting industries in Eastern Puerto Rico. The Puerto Rico Environmental Quality Board (EQB) published results on air quality station EQB#22 located in Fajardo, Puerto Rico from 2003 to 2006 (Table 8).

Pollutant	2003	2004	2004	2006	Standard
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<b>Particulate Matter &lt;10 microns</b>	23.00	23.00	22.00	28.10	USEPA revoked the annual PM <sub>10</sub> standard in 2006 (effective December 17, 2006). However, the 24 hour standard remains at 150 µg/m <sup>3</sup> .
<b>Particulate Matter &lt;2.5 microns</b>	4.93	7.30	4.63	5.39	15.0 µg/m <sup>3</sup> is annual standard. 24 hour standard is 98 <sup>th</sup> percentile in a year, averaged over three years, and should be <35 µg/m <sup>3</sup>

Table 8: Air Quality Data

The air masses over the forest are dominated by trade-winds. The visual quality of the air mass over the forest remains good. However, Sahara dust and emissions from Soufriere Volcano, Montserrat cause high peaks of particulate matter which create haze conditions.

*Status of Desired Conditions*

The Desired Condition for air is appropriate to the management situation of the Forest. No regulation or policy has been enacted that affects our capacity to work towards the DC. However, there is no budget allocated for the air program. The PR Environmental Quality Board is publishing air quality data for the island on its website. The University of PR is conducting research at East Peak Mountain on air.

Three issues have emerged in the last 2 years.

1. There is interest in establishing air research facilities at the Forest.
2. There is concern on the effect of particulate matter on forest evapo-transpiration and rainfall.
3. There is a concern on the effect of climate change on air resources.

*Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP is still current and viable. Management direction does not utilize current science. The Standards and Guidelines listed in the LRMP served well during the 5-year study period.

There is a need to add goals to the new plan:

- “Cooperate with research scientist in the establishment of projects and facilities to assess impact of air pollution and atmospheric changes.”
- “Track indicators of ozone impacts and lichens to help gauge climate change impacts.”

## INTEGRATED PEST MANAGEMENT

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“Introduced species and Forest pests threaten neither the ecology of the Forest, nor its visitor. Control efforts follow Integrated Pest Management principles.”

Wildlife and Fisheries Goals were:

“Integrated Pest Management (IPM) strategies are used to regulate forest pests to achieve management objectives. IPM is the planned and systematic use of detection, evaluation, and monitoring techniques. It employs all appropriate silvicultural, biological, chemical, genetic and mechanical tactics. The goal is to prevent damage and losses or reduce them to levels that are economically, environmentally and esthetically acceptable.”

### *Existing Conditions*

#### Terrestrial Species

Mongoose and Rat species:

The control of these continually adapting mammals has been one of the most challenging obstacles in attempting to move the Forest to a more original state. After conducting multiple studies on distributions, population dynamics and different capture protocol the conclusion is that the mongoose and rats will have populations throughout the EYNF that will rise and fall through local migration. This is of interest due to the fact that the two species are a vector for diseases that pose a threat to human health. The seasonal flux in mongoose occurrences, for example, in different locations reveals the importance of public education and preparedness for field-going Forest personnel. The two species are destructive against young Puerto Rican Parrots that are not able to fly and are attacked on the ground. The loss of one of these young endangered birds sends the recovery program back.

The current humane trapping and processing of the mammals has recorded the evolving policy of pest animal treatment and remains the most responsive programs on the Forest.

Feral Cats & Dogs, Iguanas:

With the encroaching of human development to the EYNF, the unit has been called upon to reports of wild, formerly domesticated, cats and dogs. Data shows that the Forest is seen by the public as a humane alternative to unwanted pets and releasing them there gives the pet owner the idea that the animal will be taken care of. Most of the time the animal becomes malnourished and develops a whole range of health issues, which usually ends in a prolonged death. These events are spread throughout the year, but though an awareness campaign fewer specimens are seen. The feral animals are usually at developed recreational

sites or on major roads on the EYNF. Trends show that the education of animal treatment laws and illegal dumping of unwanted pets are reducing feral pet occurrences.

#### Africanized Bees:

The honeybees that are the one of the main competitors of the PRP for nesting cavities have been kept at a controllable level. The social insect species are very opportunistic so monitoring of vacated PRP cavities are immediately placed out of commission. The trend for the population is stable with no signs of going either up or down.

#### Vegetation Species

There are several vegetative species present at EYNF with opportunistic invasive behavior. They may become invasive or pests under certain environmental circumstances (id. est. hurricane defoliation, fire, land clearing and landslides). Usually the great diversity of plant species at EYNF masks their presence and/or limits colonization of forest environments.

Active collaboration with Animal and Plants Health Inspection Survey (APHIS) and Plant Health Program of the Puerto Rico Department of Agriculture in early detection of vegetation detrimental insects, like the Pink Hibiscus Mealy bug and the Red Palm Mite has rendered excellent sanitary results by monitoring the surrounding lands of the EYNF and reporting to this two agencies the presence of the insects in areas outside forest boundaries but with potential migratory access to EYNF. Biological control of the pink hibiscus has been very successful and there is an interagency team working in data gathering and alternatives in managing the problem before it becomes a serious island wide pest situation.

There has not being an infestation of forest environment from these two insects during the last 5 years, monitoring for detection is an ongoing yearly activity.

#### *Status of Desired Conditions*

The Forest Plan directs the unit to reach objectives to manage those species that pose an immediate threat to the PETS species on the EYNF. Pesticide use is also mentioned to be handled with the utmost care and used according to the products label for proper disposal.

#### *Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP Forest Plan is still current and viable. Concerning the terrestrial species, there is no need for change in management direction and meets not only EYNF policy, but also the US Department of Agriculture (USDA) Animal and Plant Health Inspection Service-Animal Services protocol and policy.

## RESEARCH

### *Desired Conditions*

Meeting tropical forestry research needs while protecting the Forest's environmental values is issue 9 in the Land and Resource Management Plan (LRMP), 1997. Research is described and categorized as tropical forestry research or research natural area (RNA). The RNA is established to preserve outstanding examples of natural ecosystems for study and comparison to disturbed ecosystems.

The Forest was designated a Biosphere Reserve in 1976, under the Man and the Biosphere Program of the United Nations. Biosphere reserves comprise a network of samples of the world's major ecosystems. The program is designed to promote conservation of nature, through scientific research, and management that balances protection, and the interests of people living around the forest.

In the 1997 LRMP, the Desired Future Condition for research is for the forest to continue to serve as a site for research and demonstration that contributes to the improved protection and management of tropical forests.

### *Existing Conditions*

El Yunque National Forest (EYNF) was designated formally as the Luquillo Experimental Forest (LEF) because of its complexity and the requirement of an integral research program. Due to the forest dual designation as EYNF and LEF, we currently have on-going research throughout the Forest.

Several research findings have been and continue to be instrumental to forest management (i.e. the biology of the Puerto Rican Parrot, landslides, and Wild & Scenic river designations). Due to Management and Research efforts and successes with the W&S River designation, the government in Puerto Rico is currently working on implementing Wild & Scenic river designations outside the forest as well. Research was and continues to be instrumental to Land Use outside of the Forest. The forest partnered with International Institute of Tropical Forestry (IITF), and the PR Planning Board to work on a Land Use Plan surrounding the forest. EYNF is currently partnering with IITF, Southern Center for Wildland-Urban Interface Center, and University of Puerto Rico on the establishment of Ecosystem Services.

### *Status of Desired Conditions*

Research topics include the establishment, growth, and silvicultural treatments of native and exotic tree species, the effects of Hurricane Hugo (1989), watershed management, ecosystem dynamics, impacts of recreation, and monitoring of global change.

Climate change is a trend that will influence management direction overall, and will drive some of the research initiatives.

Wild & Scenic (W&S) Rivers, and El Toro Wilderness Area designations is a change in policy that will influence management direction as we comply with the Wilderness Act, the

Wild & Scenic River Plan, as we develop Limits of Acceptable Change, and as we develop the Wilderness Plan.

The Wilderness Area is the most preserved forest in Puerto Rico. The Wilderness Act enables research to use the existing vegetation and its natural changes as an indicator for climate change by observation only.

#### *Need for Change*

There is a need for research activities disclosure. The forest needs to continue partnering with IITF, Long Term Ecological Research, and with the University of Puerto Rico Institute for Tropical Ecosystems Studies (ITES), and others in order to gain public trust and have transparency with forest management.

There is a management need for specific research on the following topics: Air Quality, Specie population decline, Invasive species, Social Science, and Carbon sequestration in the tropics.

## **SOCIAL AND ECONOMIC**

### RECREATION

#### *Desired Conditions*

The needs of people who come to visit and use the Forest are met with services and facilities which recognize and respond to the unique cultural context. Facilities range from a highly developed visitor center and picnic areas to challenging trails providing access to some of the remote areas of the Forest. Recreation and interpretive sites are attractive, clean, safe, well maintained, and provide universal access. The trail system provides a variety of experiences, ecosystems, difficulties and lengths for hikers. The Recreation Opportunity Spectrum (ROS) Desired Future Condition:

- a. Developed  
The natural environment is substantially modified. Facilities are designed for use by a large number of people. Emphasis is on high density recreation. Typical facilities include: information centers, picnic sites, parking lots, trailheads and paved trails.
- b. Roaded Undeveloped  
Settings remain predominately natural-appearing. Structures are generally scattered and visually subordinate. Typical activities include: viewing scenery, hiking on trails, water play at bridges and road-side picnics.
- c. Back-Country

Settings are characterized by an unmodified natural environment. Structures are limited to trails and occasional signing. Typical activities include: hiking on trails, viewing scenery, nature study and primitive camping.

Monitoring indicators included:

- A wide range of recreation opportunities is provided.
- Forest visitors enjoy safe and enriching recreation experiences.
- Heavy used undeveloped sites are maintained.
- A variety of trail opportunities is provided with adequate safe parking at trailheads.

### *Existing Conditions*

Recreation use occurs year-round but does vary seasonally. Use in the summer months is approximately two times greater than during the winter months. The steep and rugged topography, dense vegetation, and frequent rains limit most recreation use to areas near the roads. Most developed facilities and recreation use occurs on the north side of the Forest along PR Road 191. This pattern of use results in crowding, parking and traffic problems, particularly on hot summer weekends. Developed recreation and interpretive sites have been kept attractive, clean, safe, and well maintained. Hiking continues to be a favorite activity on the Forest. Trail maintenance is being done on an as needed basis. Primitive camping continues to be the only type of camping that is available to Forest visitors.

The El Portal Rain Forest Center continues to be in good condition with no accumulation of deferred maintenance as a result of ongoing preventive maintenance and landscaping contracts.

Trends Identified:

- Continued high visitation during the summer months
- Limited trail maintenance
- Picnic areas and water play are the main recreation activities done by local visitors
- The non-local tourist visitors enjoy scenic viewing, hiking and nature photography
- Visitor safety is continuously being addressed
- Camping policy is inconsistently being implemented

Guided tours by Forest Interpreters are being used by tourist and school groups. The concentrated location of recreation sites along PR 191 makes it easier to maintain and monitor recreation sites. The few recreation sites on the western portion of the Forest are not as well maintained and monitored as those found on PR 191. There is a continued trend to improve the recreation experience on the forest. Some unresolved issues are:

- A transportation study has been ongoing for several years; one of the objectives of this study is to address the issues of road safety and limited parking on the forest during high visitation periods and limited parking areas.
- Recreation sites are used year round which require continued maintenance
- A portion of the Caimitillo Trail continues to be damaged and unusable. The trail no longer connects the Caimitillo Picnic Area with the Palma de Sierra Picnic Area.
- Hikers to La Mina Falls often enter on one trail and exit through another which sometimes makes them hike along PR 191 to locate their automobile.
- Need to improve marking and signage where Mt Britton Trail and Forest Road 10 connect.

#### *Status of Desired Conditions*

The trend analysis shows that the Forest continues to have high visitation. A new recreation facility on the south side of the Forest (Rio Sabana Picnic Area in Naguabo) will be ready for public use in 2008. Trails are being heavily used and are being maintained despite a limited budget and personnel shortage.

Portions of the Rio de la Mina and Rio Mameyes were designated as Wild and Scenic Rivers and which have recreation segments. A new Comprehensive River Management Plans will be approved this year. The Plan establishes new recreation guidelines along the recreation segments of the rivers. El Toro Wilderness Area was designated and El Toro Wilderness Plan will be developed in 2009.

#### Emerging Issues:

- There is a need for a large covered picnic area for large groups
- There still exist a need for an accessible trail at the El Portal Rain Forest Center
- Traffic congestion and parking problems continue to be a management issue during high visitation periods during the holidays in the month of July.
- There is a need to educate visitors about the “Pack-It-In and Pack-it-Out” program.
- Camping program needs to be revised

#### *Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP is still current and viable. The Standard and Guidelines listed in the LRMP served well during the last 5 years. The current camping Standards and Guidelines need to be updated and revised, particularly the car camping policy, activities and locations. The proposed W&S River and Wilderness Areas in the 1997 LRMP have been designated within the 5-year period being evaluated in this report. The Standards and Guidelines for these designated areas will be analyzed and revised following proper NEPA procedures.

## SCENERY

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“The Forest’s scenery appears natural from all areas viewed by visitors, when viewed as a background from surrounding roads, popular tourist areas, and adjacent communities.

The forest’s scenery resource continues to be one of the most valued and enjoyed amenities by visitors and local residents.”

### *Existing Conditions*

The Forest does not monitor scenery resources. The Forest scenery resource is left to nature’s natural ways. The diverse tropical vegetation with its different leaf shapes, textures and colors does not require that this ecosystem be modified or altered. The forest scenery is noticeably impacted when weather phenomena occur. Hurricanes impact scenery the most.

### *Status of Desired Conditions*

The Desired Future Condition for scenery is appropriate to the management areas on the Forest. No regulation or policy has been enacted that affects our capacity to work the Desired Future Condition. Scenery management is practiced at El Portal, vista points along PR 191, and at Yokahu Tower.

### *Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP is still current and viable. The Standard and Guidelines for scenery listed utilizing Visual Quality Objectives in the LRMP needs to be revised utilizing the new Scenery Management System.

## HERITAGE

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“The Forest’s Heritage Program contributes to Puerto Rican’s and visitors regard and understanding of people and cultures that contributed and sacrificed to make the Puerto Rico of today.

El Yunque’s contribution to the rich historic period of Puerto Rico is documented and interpreted for the public. Interpretive sites highlighting Pre-Columbian and Spanish Colonial use of the Forest and the work of the Civilian Conservation Corps increase visitors’ knowledge and enjoyment of heritage resources.”

In addition, the Forest Plan goals state:

1. Inventory, investigate, protect and evaluate heritage resources, including pre-historic and historic sites and artifacts.
2. Nominate significant sites to National Register of Historic Places.
3. Develop opportunities to interpret heritage resources, with emphasis on pre-Columbine cultures, the Spanish Colonial period, and the Forest's Civilian Conservation Corps program of 1938.
4. Implement the "Programmatic Agreement Among the USDA Forest Service..., the State Historic Preservation Officer, the Advisory Council..., and the MOA between the Forest and PR SHPO".

### *Existing Conditions*

Sites on the Forest are not distributed randomly across the landscape and were selected by their past inhabitants for use or occupation because of certain environmental variables. Most sites are from the historic period, with more from the American Colonial Period than from the Spanish Colonial Period. Prehistoric sites on the Forest are rare, but now more data is available to develop a predictive model. Because of extremely adverse survey conditions in this tropical rainforest the utility of the less intensive survey data is of limited value; certain areas may need to be re-surveyed to improve the quality of the data.

A review of the DFC, indicates that the current wording does not reflect a valid DFC statement (Rant and Goode, 2008). The DFC describes goals instead of describing a desired condition. Therefore, this review of existing conditions is based on these generalized desired future conditions statements, and more specifically on the "Goals" set forth in the LRMP Chapter 4. This review covers the five year period between fiscal years 2003 through 2007.

Beginning in FY2006 a NRHP Multiple Property Nomination for Puerto Rico Forest Reserves New Deal Multiple Properties Study was written and submitted; resulting in its listing on the NRHP in 2007. This multiple property nomination identified over 30 historic properties located on EYNF, and sets the framework to individually nominate similar properties throughout Puerto Rico. During the period under review one Spanish Colonial Period site was tested as the first step in evaluating its National Register of Historic Places (NRHP) eligibility.

During these five years, 27 on-going projects were reviewed, surveyed and/or monitored for potential effects to heritage resources. During this period, no sites were discovered during project construction or implementation. One historic site within a project was mitigated under a Memorandum of Understanding (MOU) with the Puerto Rico State Historic Preservation Office (PR SHPO); and a NRHP eligible Civilian Conservation Corps (CCC) era historic structure underwent minor stabilization repair. El Yunque Pavilion, once potentially eligible for the NRHP was severely damaged by hurricanes, eventually reaching a point where because of health and safety concerns it was partially razed; possibly making it NRHP ineligible.

Over 100 sites have been recorded to date. During the review period five new sites were recorded. This inventory of heritage assets has progressed using INFRA (a FS-wide

database) which now contains an estimated 70% of the known sites on EYNF. During the five year period under review, over 265 acres were surveyed for cultural resources. By FY2007 it is estimated that approximately one third of the Forest has been inventoried or surveyed for heritage resources. Much of the inventory was conducted prior to FY2003, largely in support of timber stand improvement activities, some land acquisitions, road and trail maintenance and recreation development.

In coordination with the Customer Services team, we prepared the Luquillo Forest Reserve Centennial Timeline exhibit displayed in 2003 in El Portal Tropical Forest Visitors Center. CNF's Heritage Program participated actively in the NEPA process for the newly declared Wild and Scenic (Icacos, Mameyes and Rio de La Mina) Rivers and El Toro Wilderness Area. The Heritage Program was instrumental in providing critical historical facts that facilitated changing the name of the Caribbean National Forest to El Yunque National Forest, a landmark that occurred in April 2007.

The exhibits and film at El Portal Rain Forest Center provide visitors with accurate information about prehistoric and historic sites, and an understanding of the people and cultures that contributed and sacrificed to make the Puerto Rico of today. One interpretive site on the Forest highlights the work of the Civilian Conservation Corps. Together these have continued to increase visitors' knowledge and enjoyment of heritage resources during the five year review period.

Recreation visitation to the Forest has increased over the last five years resulting in increased use of vulnerable and sensitive heritage resources accessible to the public. Vandalism of heritage resources on EYNF has increased during the last five years. This includes minor defacement of prehistoric petroglyphs, as well as substantial destruction of rock and concrete work at historic Mt. Britton Tower.

#### *Status of Plan Goals, and Standards and Guidelines*

The first of Heritage Resource Goal has been spottily met; inventory has advanced considerably through the entry of the data in INFRA, though the inventory is still incomplete. A few sites have been investigated. With the exception of the vandalism mentioned above, sites have been protected; certain types of sites (prehistoric petroglyphs and standing CCC structures) receive more routine protection than other types of sites. Over these five years no major steps were taken to stabilize or rehabilitate CCC era historic structures. The evaluation of EYNF's cultural resources is dependent on facility management and due to limited funds for facility operations and maintenance, only a few have been evaluated during the five year period.

The second Heritage Resources Goal calls for nominating significant sites to the NRHP. Relatively few of the potentially eligible NRHP sites on EYNF have been nominated. However, with the listing on the NRHP of the Multiple Property Nomination for Puerto Rico Forest Reserves New Deal Multiple Properties Study is a momentous step forward in the process, and should allow the EYNF to efficiently evaluate and nominate significant properties to the NRHP in the future.

The third Heritage Resources Goal calls for developing opportunities to interpret heritage resources, with emphasis on pre-Columbian cultures, the Spanish Colonial period, and the Forest's CCC programs of the 1930's. Though the exhibits and film at the visitor center are still current, no notable advances have been made on this front during the five year period under review.

The final Goal for Heritage Resources calls for implementing the Programmatic Agreement (PA) between the RO, PRSHPO and the ACHP; and implementing the Memorandum of Agreement (MOA) between the Forest and the PR SHPO. The regional level PA expired during the period under review, and has not been revived; however the MOA is current. The PA between the Forest and PR SHPO covers many issues and streamlines procedures, including Sections 106 and 110 of the NHPA, as well as other legislation. The stipulations of the PA were met to varying degrees during the review period. In meeting the stipulations of the PA over the past five year period the Forest has been successful in inspecting projects prior to their implementation. It has not been successful in enhancing, stabilizing and interpreting heritage resources during the review period; deferred maintenance of nearly one third of the properties listed as Priority Heritage Assets (PHA) have not been conducted. Though the PA stipulates that EYNF would develop a predictive model to aid in identifying areas with archaeological site potential, this model has not been designed.

There are eight Standards and Guidelines (S&G) for Heritage Resources in the 1997 LRMP and they are all still appropriate. Of the eight Standards and Guidelines listed in the LRMP, five (#'s 1, 2, 3, 4 and 8) have been met over the last five years. However, due to limited resources and funding, S&G 5, 6, and 7 have not been fully implemented.

In prior years the trend has been that the Heritage Program workload has been driven by Forest Priority projects and recovery efforts after severe tropical storms and hurricanes. In the last five years, with fewer severe storms, Forest-wide and Forest-driven projects have determined the Heritage Program workload.

Beginning in 2003, the Forest Service-wide trend to emphasize INFRA and Deferred Maintenance has highlighted and quantified deficiencies in the preservation and protection of heritage resources on EYNF. The shift in focus to INFRA reporting has created an additional workload and level of complexity. The current policy is to conduct condition surveys of all PHAs at least every five years. Funds beyond the project and program management level are extremely limited, making it a challenge to initiate new projects benefiting heritage resources and meeting the DC.

Increased concerns with Global Climatic Change are an emerging issue where archaeological sites within EYNF could provide significant data on past climatic regimes. Archaeological sites contain unique records of past environments, such as fossil pollen and plant phytoliths, bones of extinct species of fauna, and carbonized plant remains; as well as geomorphological data. Archaeological sites can provide data for periods with little or no written records, not just the prehistoric past, but also the Spanish Colonial Period and early American Colonial Period.

Ecological influences that directly affect heritage resources include both catastrophic events, such as hurricanes, earthquakes and landslides, as well as slower destructive processes caused by water, wind, heat and vegetation. The catastrophic events are more likely to quickly devastate a site, creating massive damage; such events are uncontrollable, and their damage can only be mitigated after it happens. After past catastrophic events that affected cultural resources EYNF has always responded effectively, because funding for recovery efforts has been forthcoming. On the other hand, the slower destructive processes also take their toll on heritage resources, such as soil erosion at an archaeological site, the growth of roots in cracks in concrete buildings, or the decomposition of the rock causing collapse of a trail bridge. Lichen growth on rock surfaces with prehistoric petroglyphs, along with the natural chemical erosion of these surfaces exposed to air are just as destructive to the resource as termites that consume the wooden walls in historic buildings. When properly identified, these slower destructive processes can be arrested by preventative maintenance and stabilization of a site. The EYNF heritage management program includes adequate procedures to monitor destructive processes, but it is imperative that LRMP emphasize the need to act in time to identify, detain and reverse them.

### *Need for Change*

Management direction does not reflect current science. Useful recent technologies, such as GIS and GPS are unavailable or underused on EYNF. In addition, the tropical forest conditions of high temperature and high precipitation accelerate the rate of deterioration of heritage resources on the Forest. Therefore, preservation and stabilization are required at a greater intensity. The PHAs are not consistently being assessed for their current condition, or maintained to standard. To adjust the land management process to these changes, we conclude that:

- The generalized Desired Future Condition set forth in the 1997 LRMP describes goals instead of a desired condition. Current agency direction can assist us to better define a desired condition. The DC needs to reflect the current trends in resource condition definition (FSM 2360 Heritage Program Management, 2008). Protection of all potentially significant heritage resources; and preservation and stabilization of the heritage resources should be incorporated into a new DC statement.
- The four Goals in the 1997 LRMP are still appropriate; though a revised DC may trigger refining Goal statements. For instance, it might be appropriate to modify the second Goal from simply “nominating” sites to the NRHP, to increasing the emphasis on nomination of EYNF’s cultural resources to the NRHP. It also might be useful to add a Goal that quantifies Priority Heritage Assets maintained to standards in management areas, and fosters the reduction of deferred maintenance on these and other heritage resources.
- The eight Standards and Guidelines are still appropriate, but they may need to be supplemented with additional ones that more accurately reflect current trends in heritage resource stewardship.

## TIMBER DEMONSTRATION

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“The main use of the area – demonstration of sustainable timber production – is compatible with the area’s secondary uses, research and dispersed recreation and with the protection of other forest resources. Timber, research, and recreation uses have minor impact on the appearance of the forest.

The sustainable timber production is demonstrated in these areas of secondary forest, using silvicultural treatments compatible with the protection of other resources.

The area provides a buffer for the Forest’s more delicate ecosystems and rare plants and animals.”

### *Existing Conditions*

No timber demonstration project has been implemented during 2002 to 2005. In 2006, a regional review of the program was conducted. The objective was to evaluate conditions on the ground, the level of interagency participation and Forest plan of action. In 2007, the Forest received \$37,000 to initiate the program.

### *Status of Desired Conditions*

The 1997 LRMP Standards and Guidelines for the Demonstration of Sustainable Timber Production, Standard 10 calls for administrative transfer to the DNER and/or non-profit community development organizations the forest products harvested as part of the program; this action impairs the participation of many other potential cooperators as are Private Land Owner, International Organizations and participants of State and Private Programs.

This program should have an Educational Component that shows silvicultural practices from seed collection to planting, cultural practices as thinnings, salvage harvesting and regular forest products harvesting. The visual and written products of this effort should be addressed to the general public.

### *Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP is appropriate. Management direction should be updated to consider current science. Demonstration and the sustainable production of wood needed throughout the tropics is also Management Direction that needs to be re-visited and analyzed in order to fully implement or eliminated during the next plan revision. Climate change should be address when analyzing timber harvest.

## MINERALS

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“Mineral exploitation remains a topic of historical interest rather than a current issue.”

### *Existing Conditions*

No trends have been established in the last five years. ~~However, mineral exploitation has become a political issue for a small sector of the general public which believes that El Toro Wilderness was created for the purpose of extracting gold.~~

### *Status of Desired Conditions*

The Desired Future Conditions for mineral resources is not appropriate to the management situation of the Forest. The DFC refers to the status of an issue and not to the condition of a resource. The DC should be:

“Mineral resources remain protected. Salable minerals are used in a manner that minimizes adverse impacts to surface and groundwater resources, and that do not detract from meeting other desired conditions applicable to the area.”

The Forest made efforts to disseminate public policy of mineral activity in El Toro Wilderness. The designation of El Toro Wilderness increases the number of restrictions on minerals management. There is a public concern about the potential mineral activity that could occur in the El Toro Wilderness. The Forest cooperated with PR Department of Natural Resource and U.S. Geological Survey fostering inactive exploration because the Forest is a declared State Wildlife Conservation refuge area.

### *Need for Change*

The generalized Desired Future Condition set forth in the 1997 LRMP should be updated to reflect current desired conditions for minerals. The Standards and Guidelines listed in the LRMP served well during the period.

## LANDOWNERSHIP

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“The Forest’s ownership pattern contributes to effective and efficient implementation of the Forest’s mission. National Forest System (NFS) lands are consolidated to improve management effectiveness and enhance public benefits.

Public lands are easily accessible.”

*Existing Conditions*

Some tracts of land have been acquired by the Forest Service in the past five years. The Forest has submitted annual requests for funding through Land and Water Conservation Funds (LWCF), but proposals have not competed successfully in receiving funding.

Acquisition cases from 2002-2008 include are listed in Table 9.

<b>Number of cases</b>	<b>Type of transaction</b>	<b>Acreage</b>
1	Purchase	14 acres/cuerdas
1	Interagency transfer	9 acres/cuerdas
1	Condemnation	175 acres/cuerdas
1	3 <sup>rd</sup> party assisted purchase	32 acres/cuerdas

*Table 9: Acquisitions 2002 - 2007*

Land priority criteria as listed in the LRMP is being followed to determine priorities for land acquisitions. Consolidation of lands adjacent to the Forest boundary is emphasized. There may be opportunities for exchange of some fragmented parcels, but no land exchanges have been initiated or completed.

LRMP direction is to survey landlines around Forest system property to standard within 10 years and to maintain established landlines every 5 years. Forest boundaries are not being marked adequately. Occupancy and trespass issues may exist. In order to maintain established landlines every 5 years, we need to maintain approximately fourteen miles/year. Currently about 1 mile of landline is being surveyed annually.

*Status of Desired Conditions*

Increased population pressures and development around Forest boundaries have elevated the desire to acquire adjacent properties for conservation and resource protection to better serve as a buffer zone around the Forest.

Funding and the process in which funds are distributed within the Region have changed since the 1990s affecting the EYNF's ability to secure LWCF funds. Puerto Rico does not have a voting representative in Congress and has not competed well for federal funding for land acquisitions.

Some partnerships efforts to assist the Forest with land acquisitions have been established. Puerto Rico Conservation Trust, a local land trust, is purchasing priority properties to eventually be sold to the Forest when funding is available.

Planning rules under the jurisdiction of the Puerto Rico Planning Board have not been adequately enforced. Landline surveys are not meeting standards. Approximately 1 mile of landlines are being surveyed per year. We are below target levels due to lack of funding and resources.

Funding and the funding distribution process within the Region has changed since acquisitions were done in the 1990's. EYNF, due to its political status as a Commonwealth, does not have a voting representative in Congress and does not compete well for funding with states. LWCF funds have also decreased and have become more competitive.

Appraised land values have steadily increased which also make it difficult to compete for funding.

Marking the boundaries of Wilderness following El Toro Wilderness designation is currently a standard in the LRMP.

#### *Need for Change*

More partnerships, public education initiatives and incentives for increased conservation practices on adjacent private lands, and conservation easements on properties outside the Forest may be helpful as LWCF funds may continue to be difficult to obtain. More partnerships with the private sector, other agencies and local and national land trusts can help assist in acquisition of lands.

High priority properties for acquisition should be even further defined as funding becomes less and less available. Coordinated EYNF staff efforts should help further define parcels of the highest ecological and significant values for purchase or acquisition.

## SPECIAL USES AND COMMUNICATION SITES

#### *Desired Conditions*

Forest administers special uses that contribute to the public's benefits from the Forest.

#### *Existing Conditions*

The number of long term and temporary special use authorizations on the Forest has remained relatively stable since 2002. Current direction for Desired Future Condition and goals for special use programs are basically being met. Special use permittees comply with most provisions of their permits and special use permit compliance inspections are conducted. We need to ensure that we are adequately considering if proposed uses can be accommodated off Forest.

While permit administration of commercial tours in the Forest is being adequately managed, capacity issues for outfitter/guides may not be adequately addressed. Emphasis on resource protection, safety and tour quality should be promoted more with tour operators. There are opportunities to encourage best management practices and to work more closely with the PR Tourism Company on regulations pertaining to tour guide/operator certification and training.

A moratorium on the number of new permits for tour guides has been in effect for more than 10 years. While this practice does allow us to manage the number of permits and vehicles authorized, this limits new companies, businesses or industry professionals to obtain permits.

Recreation residence permits which at one time numbered over 30 residences on the Forest have decreased to only three active permits.

While the number of water right-of-way authorizations has decreased, there are potential water trespass issues taking place along Forest boundaries.

A food service concession was established in the Forest at the Sierra Palm recreation area in 2004 and later expanded to El Portal in response to visitor demand for this service.

Research facilities include the operation of the Institute for Tropical Ecosystem Studies which added new dormitory facilities in 2003 and the US Fish and Wildlife Service now operate their new aviary facilities under a special use permit. Approximately twenty research authorizations are managed on the Forest annually. Most research applications are screened by the International Institute of Tropical Forestry as well as Forest technical specialists.

There are two electronic communication sites in El Yunque. Commercial uses are located at El Yunque Peak and government agencies at East Peak. Current future condition and goals for the management of telecommunication sites on the Forest are basically being met. No additional communication sites have been added.

#### El Yunque Peak

Consolidation of facilities at the peak has been emphasized and interference issues have been minimized, although there has been a slight increase in the number of towers at El Yunque Peak. (one new tower currently under construction)

The majority of facilities have one facility manager; some sites are shared facilities with more than one permit issued for the site. The current electronic site plan released in 1991 provides more specific guidelines and direction for management of El Yunque Peak. The document is currently being revised. Communication leases at the peak are scheduled to expire in 2009. The Electronic Site User's Association is no longer meeting.

El Yunque Peak currently has some empty facilities of which there may be interest in using these facilities. One new tower is currently being built to accommodate a mandated digital broadcast conversion. Communication facilities from the east end of El Yunque Peak have been relocated in order to provide for recreation opportunities in this area.

#### East Peak

The Navy, which utilized this site since the 1960's vacated the site in 2003. The Federal Aviation Administration (FAA) continues to operate equipment in some of the remaining facilities at the site under a special use permit. The Forest Service continues to work with the Navy on a demolition plan to remove unnecessary facilities and restore the site.

Research studies take place along the East Peak road and at the peak.

#### *Status of Desired Conditions*

While the number of visitors to El Yunque using authorized tour operators over the past five years has remained relatively stable, the tourism industry in Puerto Rico is subject to changes in the economy and demand for tourism services can fluctuate. Interest in nature-based and adventure tourism is on the rise and could create demands for opportunities to provide more diverse types of tours and activities on the Forest to supplement the majority of sightseeing type tours currently being offered.

Increased water demands from population increases and development near Forest boundaries may lead to an increase in demand for water use permits and a need to more carefully monitor water extraction amounts.

Recreation residences on the Forest at one time numbered over 30 permits, currently there are only three active permits. Permit fees based on appraisal land values are required to be revised every 10 years resulting in rental fee increases. Continued fee increases may impact current permit holders desire to continue these uses in the future.

Designation of El Toro Wilderness has created a need for determining how special uses will be administered within this area. The opening of a new day use recreation facilities on the south side of the Forest may create needs for additional special use permits for tour operators or recreation services in this area.

Telecommunication uses have changed significantly in the past 5-10 years. Facilities at the peaks were established between the 1940s to the 1970s. With new and emerging technologies we need to verify if our Forest plan direction and guidelines are valid in relation to new and emerging technologies.

Forest Service does not foresee a need to expand telecommunication uses at East Peak. Opportunities for dispersed recreation, research and educational studies in this area may need to be more closely defined and provided for to the extent possible that do not conflict with existing communication uses.

One new tower was approved for construction at El Yunque Peak to meet a mandated FCC requirement for conversion from analog to digital broadcast.

#### *Need for Change*

While determining if uses for private interests can be accommodated off Forest should continue, there may be need for increased public-private partnerships through concessions, permits or in some cases agreements to offer new recreation services and/or uses for unused Forest facilities when feasible.

Climate change, sustainability and green technology concepts should be incorporated into permit holder and concession responsibilities as a Standard or Guideline.

We do not expect to expand telecommunication uses at the peaks. As equipment systems tend to become smaller, less space and fewer facilities will be needed in the future.

FAA remains at the East Peak site. Opportunities for dispersed recreation, research and educational studies in this area may need to be more closely defined and provided to the extent possible that they do not conflict with existing communication uses.

## ACCESS MANAGEMENT

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“The transportation system is well planned, built and maintained. Traffic and parking are orderly even on busy summer weekends. Roads blend into the landscape and contribute minimal amounts of sediments to streams.”

The listed goals were to maintain existing roads and facilities to a high standard to enhance public service, protect natural resources, and protect capital investments.

Management direction suggests that the Forest cooperate with the Puerto Rico Department of Transportation to develop a Forest transportation plan. The plan should consider all means of access, including mass transportation systems, to the Forest to best meet customer service needs, limit traffic problems, and minimize environmental effects.

The Forest is managed with the recognition that there is a greater capacity for people (picnicking, hiking, sightseeing, etc.) than for private vehicles. The Forest's transportation mission is to facilitate the public's access to the Forest, not necessarily people's cars, and to balance the Forest's heavy visitation with the restricted access provided by narrow mountain roads and a sensitive environment.

EYNF constructs only those road segments necessary to service the limited timber demonstration program and recreation facilities. The Forest maintains the road system in cooperation with the Puerto Rico Department of Highways and Public Works.

Monitoring for access management focused on maintaining the forest road system to serve public demand, meet management needs, and protect resources in cost effective manner.

### *Existing Conditions*

The total Forest Road network within Forest ownership is comprised of 43.2 miles.

The road system providing public access into the Forest and to all of the developed attractions consists of 50 miles of paved roads (30.9 within Forest ownership) under the Jurisdiction of the Puerto Rico Department of Transportation (PRDOT). Roads are maintained by the PRDOT under a “Master Memorandum of Understanding” dated September 13, 1963. The heart of this system is PR 191, a two lane, 30.3 km (18.8 mi.) long paved highway that traverse the island from north to south. It provides access to 70% of the developed recreation sites and to all the communication sites under special use permit. Roads are not consistently maintained to standards particularly ornate and signing are not

consistent with a high quality visitor experience. Drainage structures maintenance is also below the desired frequency standard.

PR 191 has been closed between Km 13.2 and 21.3 since the early 1970's. The closed segment is used by Forest administrative traffic and cooperators and has not received preventive maintenance during the time it has been closed. Slides caused by poorly maintained drainage structures contribute sedimentation into the Rio Icacos.

Vehicle traffic on PR 191 exceeds parking capacity on about 20% of the year. During peak use days around summer holiday weekends (10-15 days) the high visitation exceeding parking capacity becomes critical requiring management actions to discourage visitation and control the capacity.

The Forest cooperated with the PRDOT in the preparation of the Transportation and Access Study for the Caribbean National Forest (El Yunque). This study completed in June 2002 analyzed the entire state road access network around the Forest and resulted in two significant outcomes:

- It recommends a tram Alternate Transportation Mode as the preferred alternative to address the heavy visitation and traffic congestion on PR 191.
- It discloses that the closed segment of PR191 is no longer a transportation issue since to travel between the municipalities of Rio Grande and Naguabo it is more cost effective, faster, and safer to travel over PR 3 & 53, since PR 53, a toll freeway standard facility was completed in the early 2000's.

Large buses (50 passengers, AASHTO Vehicle Type Bus) are restricted in PR 191 beyond Km 4.0 as a result of a safety study conducted in cooperation between the Federal Highway Administration, the PR Highway and Transit Authority and the Forest. This is the only regulation of vehicles by size in PR.

The Forest Service Road (FSR) system consists of 6.4 miles of paved roads and 4.9 miles of gravel roads for a total of 11.3 miles. This entire network is closed to public vehicle travel and managed for specific resource management activities and administrative uses. Only three to five miles were maintained to standard each year during the five years.

No roads were constructed during five years analyzed.

Off Highway Vehicles (OHV's) are prohibited on the Forest. Trails are designated for hiking use only. There is an expressed interest around the Forest for OHV play areas. The isolated tracts of Arroyo, Sandoval, and La Condesa receive illegal OHV use resulting in resource damage.

#### *Status of Desired Conditions*

The Forest has met goals of working with the PRDOT on the maintenance of the Forest road network although DC of well maintained is not always achieved. Most significant is the progress made on working together on the analysis of the road network, the completion of the transportation study, and the resolution of the issue (Issue 8 in the plan) of reopening PR

191. Sound engineering analysis demonstrated that it is not cost effective to re-open PR 191 at the expense of high environmental impact. The Forest addressed the concern of the southern communities of lack of access to the Forest with the construction of the Rio Sabana Picnic Area.

The PR 191 closed segment between Km 13.2 and 21.3 contributes sediment to the Rio Icacos beyond the minimal Desired Future Condition due to lack of maintenance. There are also concerns of narrowing of the traveled way at fill slope failures.

This road segment still is under PRDOT jurisdiction but they have removed it from their inventory and from their maintenance plans in response to their interpretation of a court order issued in 1992 by a federal judge which prohibits any work within the closed segment unless an EIS is prepared. An Office of General Counsel (OGC) opinion in 1995 clarified that maintenance activities to protect the resources and the investment were not within the intent of the court order but the PRDOT does not support spending funds on closed roads that do not provide public access. Although an environmental achievement celebrated by the environmental community and the correct technical transportation decision, the outcome of the transportation study to keep the road segment closed is used by the PRDOT as an incentive to remove the road segment from their inventory.

The EYNF has access needs for the closed segment of PR 191 for resource management activities and research activities with IITF. Other cooperators and partners use the road to conduct their operations particularly the USGS has weather and stream gauging stations along the road and the PR Energy and Power Authority owns and maintain the overhead line that provides power to all the communications sites on the Forest and the main recreation areas and facilities on the PR 191 corridor.

The Forest does not receive sufficient funds to maintain this segment of road and is not authorized to spend the funds received on roads that are not in the FSR inventory or under agreement.

There is a need to resolve the jurisdiction issue and develop a maintenance plan that should considered commensurate share of use and contributions toward funding maintenance work by cooperators and partners.

The Forest does not receive sufficient funds to maintain all roads to full standard. Major deficiencies are vegetation control, signing, and in the case of soil/aggregate roads all weather access is sporadically affected by rutting on steep segments.

Every single FSR mile is associated with a specific administrative use, IITF research activity, or parrot program management operation by the USFWS and access to communication sites under permit. Correction of surface irregularities and narrow areas resulting from actual or potential landslides are sometimes required to accommodate traffic at night like in the case of the FSR 12, Palo Hueco Road, used by the USFWS for parrot management activities.

There is a need to access to specific road use and to develop road specific plans that will include equal share of funding by all users.

### *Need for Change*

The Desired Future Condition direction is adequate to address the issues of substandard maintenance on State and FSR roads as well as the issue of road jurisdiction and maintenance over the closed road segment of PR 191.

A guideline should be incorporated to foster commensurate share contributions by road users. A standard should be incorporated to direct that the jurisdiction of the closed segment of PR 191 be resolved and to develop an agreement with road users for the joint operation and maintenance of it.

DFC should address the need for transportation practices to consider the effect of greenhouse gases emissions caused by vehicles.

## FACILITIES

### *Desired Conditions*

The 1997 LRMP states the following as the Desired Future Condition for EYNF:

“Public facilities are attractive, harmonizing with the natural and cultural environment, and are clean, safe, well maintained, and provide universal access. Administrative facilities support high quality resource protection and public service.”

Goals were to maintain existing roads and facilities to a high standard to enhance public service, protect natural resources, and protect capital investments. The Forest provides water and sewage systems to meet federal and state clean water and pollution abatement standards. Management direction also supports the recovery effort for the Puerto Rican Parrot by providing facilities to support the Luquillo Aviary.

Monitoring guidance directs the Forest to ensure that sites are safe, esthetically pleasing and accessible to people with disabilities.

### *Existing Conditions*

Safety inspections were performed every year for all occupied administrative sites. The Catalina Service Center site and all buildings were operated and maintained to Forest Service Safety and Health standards throughout the 5 years.

Eight buildings (6,390 SF) in the administrative sites inventory remained closed throughout the 5 years. This is 36% of the total inventory in terms of number of facilities and 17% in terms of square footage. Very minimal maintenance was provided to these facilities. The Fire Administration and Other (FA&O Facility Master Plan analysis was completed (pending signature on final) and identifies all closed facilities for retention and alternate uses except the army house is identified for decommissioning.

A new aviary facility (5,000 SF main building and 1 Acre site) was constructed on Forest land in cooperation with the US Fish & Wildlife Service (USFWS). The facility is owned and construction was funded by the USFWS while planning, design, and contract preparation and administration were provided by the Forest. This facility utilizes rain water for non potable water consumption which is the bulk of the water needs at the facility.

The Rio Sabana Recreation Site, a 10-unit picnic area, was designed and constructed on the south side of the Forest over the 5 year period.

Two subsurface (for 3 wells) and one surface (sand filter) water systems were maintained & operated following PR Department of Health requirements and meeting federal and Forest Service standards.

#### *Status of Desired Conditions*

The only facility constructed during the five year period was the Rio Sabana Recreation Site. This is the third priority in the *Developed Sites Construction Priorities* identified in Table 4.5 Plan Objectives. The other project developed from that list of eleven projects was the No. 1 priority El Portal Tropical Forest Center completed in 1996. Construction of the Rio Sabana site addressed a significant issue raised during the Plan development which was the lack of Forest Service opportunities in the South side of the Forest after the closure of PR 191.

During the period of the life of the plan the way in which facility construction funding was allocated changed drastically to address fiscal realities of declining Capital Investment and Facility O&M budgets. Recreation facilities budget distribution went from a system of distributing the regional capital investment pot equally among forests to a business approach of giving priority to developments that could operate in a financially sustainable mode over the life of the facility. The financial sustainability of this system relies heavily on fees collected initially under the Fee Demo and since 2005 the Recreation Enhancement Act (REA). This is a politically unstable law currently under significant pressure to be abolished.

Under the business approach the number one priority in the Plan, the Puente Roto Picnic Area, was presented and ranked among the last 5 in a regional list of over 70 projects. This is a picnic area that REA does not allow charging fees. Other projects in the list were not submitted as they appear financially unsustainable.

There is a need to re-evaluate the list in light of the opportunities to implement projects in a financially sustainable way.

In addition to the facilities that remained closed during the five year period, the old aviary complex (4 buildings; 7,420 SF) was vacated during 2008.

#### *Need for Change*

The Desired Future Condition direction is adequate to address the issues of empty facilities and financial challenges for developing projects.

A guideline should be incorporated to direct financial sustainability to all facility development (not only those funded by RO). A standard should be incorporated to direct that only facilities clearly and consistently supporting the FS mission shall be retained.

DC should address the need for facilities construction and operation to minimize practices that contribute to greenhouse gases emissions and minimize dependency on non renewable energy sources.

## SOCIOECONOMICS

### *Desired Conditions*

The El Yunque National Forest (EYNF) contributes to Puerto Rico’s social and economic well-being by employing a workforce that provides quality service to their customers while protecting the Forest’s resources. EYNF works with local government agencies to stimulate rural development and stability. The Forest provides the public with goods, services, and resource protection. In cooperation with the Puerto Rico Department of Education, the Forest develops an environmental education outreach program. Overall, the Forest protects El Yunque as a valued national treasure.

### *Existing Conditions*

The Forest Service can be an important source of human capital for rural communities (Russell and Adams-Russell 2003). Agency personnel usually participate in the full range of volunteer and community service activities in rural communities. Forest Service offices have direct economic benefits to local communities through employment and contracting opportunities. Volunteers contribute by assisting with trash removal, interpretive programs, trail maintenance, wildlife habitat improvement and monitoring, and clerical support. The Youth Conservation Corps serves a two-fold purpose. It employs 15 to 18 year-olds and helps them develop an understanding and appreciation for their natural environment and heritage.

The table below indicates the EYNF employs a small but steady workforce. Here it is important to note that historically, socially, and economically, the Forest Service provides an important connection to not only forest resources but also human and financial capital that contributes to the quality of life in these communities.

	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Permanent Employees	34	35	37	37	31
Temporary Employees	7	8	10	10	6
Senior	84	73	85	85	0

Community Service Employees					
Youth Conservation Corps	4	7	8	8	7
Volunteers	444	480	469	469	728

Table 10: EYNF Employment, Source: EYNF Monitoring and Evaluation Reports

The LRMP encouraged Forest contributions to the economic and social vitality of its neighbors. The Forest was to work with neighboring people and communities in developing natural-resource-based opportunities and enterprises within the capabilities of the resource. Rural Development considerations were to be included in Forest decisions to assist communities in achieving long-term economic development. The Forest was to actively seek partnerships that promote development activities. Two programs through which EYNF contributes to rural development and stability are Payments to States and Gateway Communities.

In October 2000, Congress passed Public Law 106-393 entitled Secure Rural Schools and Community Self Determination Act of 2000 which stabilized federal payments to states for funding schools and roads. The law, commonly referred to as "Payments to States", facilitates the way the Forest Service returns a portion of its annual receipts (25%) to jurisdictions falling within national forest boundaries. The municipality of Juncos contains only 21 acres of Forest Service land. This represents .07 percent. They do not receive payments due to the nominal amount

Municipality	2003	2004	2005	2006	2007
Canovanas	\$3,656	\$3,623	\$4,859	\$3,468	\$3,696
Ceiba	\$3,822	\$3,788	\$5,081	\$3,626	\$3,864
Fajardo	\$1,088	\$1,078	\$1,447	\$1,032	\$1,100
Juncos	-	-	-	-	-
Las Piedras	\$2,270	\$2,250	\$3,017	\$2,154	\$2,295
Luquillo	\$6,443	\$6,386	\$8,565	\$6,113	\$6,514
Naguabo	\$9,596	\$9,511	\$12,756	\$9,105	\$9,702
Rio Grande	\$23,330	\$23,014	\$30,865	\$22,031	\$23,474

Table 11: Payments to States, Source: EYNF Monitoring and Evaluation Reports

Rural development is also fostered by the establishment of Gateway Communities. The municipalities of Naguabo and Rio Grande contain the two highest amounts of EYNF land of any jurisdiction in Puerto Rico. As such they have entered into a partnership with the Forest to establish Gateway Planning Councils. The purpose of these Councils is to advise and assist the Mayor of the respective municipalities and the El Yunque National Forest Supervisor in planning for improvements to the communities under the provisions of the Multiple-Use Sustained Yield Act of 1960, and Forest and Rangeland Renewable Resources

Research Act of 1978, as amended. Members of the Councils include representatives from the Mayors office, local business owners, community leaders, and Forest Service employees.

The goods and services provided by EYNF include developed recreation, dispersed recreation, a visitor education center, forest product removal opportunities, and special use opportunities.

Noting the number of visitors the Forest receives each year is an indicator of how well the forest provides visitors with their expected experience. From 2002 to 2004 there was a steady increase in the number of forest visitors. Since that time visitation has continued to increase and is discussed in the recreation section of the document.

<b>Year</b>	<b>Number of El Portal Visitors</b>	<b>Total Number of Forest Visitors</b>
FY2007	192,672	Not available
FY2006	182,498	1,189,700*
FY2005	199,344	667,090
FY2004	214,063	719,015
FY2003	196,203	672,690

*Table 12: Visitation on EYNF, Source: EYNF Monitoring and Evaluation Reports and \*NVUM*

El Yunque National Forest offers opportunities for the public to learn about the forest and its natural resources. In 2007 alone there were eight events and over 200 primary participants in the activities designed to introduce school children and the public at large to wildlife recovery efforts, wilderness designation, and El Yunque recreation opportunities. Also in 2007 there were over 130 teachers trained to use the Puerto Rican Parrot Educational Module which provides classes with information on this important El Yunque inhabitant.

In just the first six months of 2008 there have been four events that reached over 5,000 people. These were large media events during which EYNF partnered with corporations such as Pfizer, American Airlines, Procter & Gamble, and Wal-Mart. The Environmental Protection Agency (EPA) also partnered with the Forest to distribute materials and provide exhibits on climate change and the Puerto Rican Parrot.

<b>Year</b>	<b>Events</b>	<b>Teacher Training</b>	<b>Presentation</b>	<b>Exhibits</b>	<b>Website</b>	<b>Participants</b>
2003	14	X	X	X		3,000+
2004	11	X	X	X		2,000+
2005	6	X			X	100,000+
2006	6	X		X		2,000+
2007	8	X	X		X	2,000+
2008*	4		X	X		8,000+

*Table 13: Educational Outreach, \*As of June 2008, Source: EYNF Educational Outreach Statistics*

The values of a visitor have been found to greatly affect the ways in which they use the forest. In “Front-end and formative evaluation of El Portal de El Yunque Visitor Center” (Pizzini et al., 1992) values of resident visitors were compared to those of non-resident visitors. The study found that values of international visitors were primarily focused on the actual benefits to the visitors, the importance of the Forest for Puerto Rico, the general importance of forests to the world, and the beauty and uniqueness of El Yunque. On the other hand, local visitors treasured the value that the forest has as part of their homeland and value of its uniqueness, wilderness, clean air, rainfall and provision of relaxation, therapy and leisure (Pizzini et al., 1992).

A recent study entitled “Future Management Strategies for El Yunque National Forest” (Billmire et al., 2008) found that both resident and non-resident visitors placed nearly equal emphasis on the values of conservation, infrastructure, education, family togetherness, exercise, and Puerto Rican pride. When asked, “What do you value most about a visit to the Forest?”, conservation and infrastructure were mentioned as values ten and five percent of the time respectively. Since both conservation and infrastructure were attributes of the forest that both residents of Puerto Rico and non-locals valued, forest planners can use this information to further foster and develop these attributes.

#### *Status of Desired Conditions*

The human dimension of natural resource management has been recognized as an important component of sustainability. The major socio-economic changes affecting EYNF management and decision-making have included employment changes and social changes including poverty level decreases and educational level increases. The greatest change since 2000 has been the percent of individuals in poverty decreasing by 7% and percent of persons with a high school diploma increasing by 6%. The communities surrounding the EYNF are in a period of positive social change, enhancing the notions of community, social and economic sustainability.

The El Yunque National Forest (EYNF) has moved towards its desired condition by contributing to Puerto Rico’s social and economic well-being. The Forest employs a small but steady workforce, assists in stimulating rural development, provides the public with goods and services, develops an education outreach program, and protects El Yunque as a valued natural resource.

#### *Need For Change*

The DC is appropriate for the next planning period. The EYNF could improve its management of social and economic resources by monitoring appropriate information to keep track of socio-economic conditions and trends to improve decision making and gain the agility to keep pace in an environment of change.

The revised Forest Plan should include indicators for monitoring employment, rural development, educational outreach, and social values in order to develop the necessary information and track important trends affecting management of resources and uses. This information will assist forest managers by providing relevant and reliable information to inform decision making and identify opportunities.

Along with informing decision making, socio-economic monitoring could identify opportunities that can enhance the economy, encourage public stewardship and build new partnerships that benefit the Forest's environmental, social and economic values.

## **EVALUATION OF NEED TO CHANGE EXISTING PLAN DIRECTION**

### **DESIRED CONDITIONS**

Desired conditions are the social, economic, and ecological attributes toward which management of the land and resources is to be directed. Desired conditions are aspirations and are not commitments or final decisions approving projects and activities, and may be achievable only over a long time period.

### **MONITORING**

Objectives are concise projections of measurable, time-specific intended outcomes. The objectives for a plan are the means of measuring progress toward achieving or maintaining desired conditions. Like desired conditions, objectives are aspirations and are not commitments or final decisions approving projects and activities.

### **STANDARDS AND GUIDELINES**

Standards and Guidelines provide information and guidance for project and activity decision-making to help achieve desired conditions and objectives. Standards and Guidelines are not commitments or final decisions approving projects and activities.

### **NEED FOR CHANGE**

Using the current LRMP the Forest conducted a need for change evaluation in this CER using a four step process. First, stating the Desired Future Condition listed in the 1997 Caribbean National Forest and Luquillo Experimental Forest Revised Land & Resource Management Plan. Second, assessing the current or existing conditions on the forest. Next, comparing the Desired Future Condition to the existing condition and evaluating accomplishments and challenges in meeting the DFC. This evaluation took into account trends, changes in policy, new information, emerging issues, human influences, and ecological disturbances. Finally a need for change to existing plan direction is identified based on this evaluation.

### **SUITABILITY OF AREAS**

Areas of each NFS unit are identified as generally suitable for various uses (§ 219.12). An area may be identified as generally suitable for uses that are compatible with desired conditions and objectives for that area. An area may be identified as generally not suitable for uses that are not compatible with desired conditions and objectives for that area. Identification of an area as generally suitable or not suitable for a use is guidance for project and activity decision-making and not a commitment nor a final decision approving projects and activities. Uses of specific areas are approved through project and activity decision-making.

## SPECIAL AREAS

Special areas are areas in the NFS designated because of their unique or special characteristics. Special areas such as botanical areas or significant caves may be designated, by the responsible official in approving a plan, plan amendment, or plan revision. Such designations are not final decisions approving projects and activities. The plan may also recognize special areas designated by statute or through a separate administrative process in accord with NEPA requirements (§ 219.4) and other applicable laws.

## SCIENCE CONSISTENCY

### BEST AVAILABLE SCIENCE

The responsible official must take into account the best available science (36 CFR 219.11). For purposes of this report, taking into account the best available science means the planning team must document how the best available science was taken into account in the planning process within the context of the issues being considered and document that the science was appropriately interpreted and applied. The proposed 2008 Planning Rule states that the responsible official may use independent peer reviews, science advisory boards, or other appropriate review methods to evaluate the application of science used in the planning process.

In the preparation of this 5-Year Review of the Revised Forest Plan, best available science was used to update some of the information provided in the 1999 Revised Plan. The following lists some ways best available science was used to provide quality information for preparing this document:

- 2000 Census Data
- 2008 Census Estimates
- National Invasive Weeds Data Protocol
- USFWS Recovery Plan
- Integrated Water Resource Plan 2008
- 2002 Transportation and Access Study for the Caribbean National Forest

### RISK AND UNCERTAINTY

For any type of planning, some risk and uncertainty will exist when trying to predict unexpected events and the short and long-term consequences of those events. Catastrophic events like hurricanes, wildfire, flooding, and insect epidemics are hard to predict with any certainty. If these unplanned events occur, either separately, or concurrently, the Plan's expected outcomes could change. Changes in public laws, court decisions, and budget appropriations could constrain or redirect planned outcomes. Also, events that occur on

private lands may indirectly or cumulatively affect conditions needed to attain outcomes planned for the Forest.

The management direction (goals, objectives, DCs, Standards and Guidelines) in the Revised Plan makes the basic assumption that our desired outcomes will remain “desirable” for at least a decade, and that any unplanned natural or man-made events will be at a scale small enough to not be a significant threat to achieving the planned objectives. This assumption is also predicated upon many smaller resource-based cause-and-effect assumptions that need validation over time through the monitoring system developed for the Plan. For this reason, the Forest relies predominately on its annual monitoring reporting to assess changing conditions and new risks as they develop, and adapt management direction as necessary to reach the Plan’s desired outcomes.

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