Transportation Analysis Process
For
EL YUNQUE
NATIONAL FOREST

August 2015

Edited By

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References

- The Road Inventory for Caribbean National Forest for Puerto Rico; Road Inventory Program, Prepared by Federal Highway Administration, Eastern Federal Lands Highway Division, May 2007

Introduction

This process is intended to identify opportunities for the EYNF (EYNF) transportation system to meet current or future management objectives, and to provide information that allows integration of ecological, social, and economic concerns into future decisions. This report is tailored to local situations and site conditions as identified by forest staffs and collaborated with public input. The outcome of this analysis is a set of recommendations for the forest transportation system. A thorough Travel Analysis supports subsequent National Environmental Policy Act (NEPA) process, allowing individual projects to be more site-specific and focused, while still addressing cumulative impacts.

On January 12, 2001, the Forest Service issued the final National Forest System Road Management Rule. This rule revised regulations concerning the management, use, and maintenance of the National Forest Transportation System. In 2005 the Road Management Rule was slightly amended and renamed the Travel Management Rule to also include motorized trails. The final rule is intended to help ensure that additions to the NFSR network are essential for resource management and use.

This forest level Transportation Analysis Process (TAP) addresses all NFSRs located in the EYNF. This Transportation Analysis is not a NEPA document but supports NEPA Planning. It is an integrated ecological, social, and economic approach to transportation planning, addressing both existing and future roads. 36 CFR 212.5 requires that the forest identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands.

The Transportation Analysis Process is described in Report FS-643, Roads Analysis: *Informing Decisions About Managing the National Forest Transportation System*. The Transportation Analysis requirements for Forest, Area, Watershed and Project Scale are described in *FSM 7700 – Transportation System: Chapter 7710 – Transportation Atlas, Records, and Analysis;* also see Interim Directives that may be policy at the time of the report. Below is the link to the complete FSM 7700 – Transportation System.
http://fsweb.wo.fs.fed.us/directives/fsm/7700/7710.rtf

Objectives
The objective of this analysis is to provide the Forest Service Line Officer with critical information to ensure that existing and future road systems are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, are in balance with available funding for needed management actions, and are consistent with road management objectives FSM 7712.5. This analysis will not change or modify any existing NEPA decisions, but information generated by this analysis might cause the line officer to reconsider, and perhaps at some future date revise previous NEPA decisions.

Public Involvement
The El Yunque National Forest NFSR network is a gated road system dedicated to administrative use and access to communication sites and utilities under special use. General public is allowed foot access to most of the routes. Parties affected by the outcome of this analysis include the International Institute of Tropical Forestry, The Federal Aviation Administration, The Puerto Rico Energy & Power Authority, The Puerto Rico Aqueduct & Sewer Authority, and several commercial communication & broadcast companies. Some of them were consulted during the analysis and all of them will receive a letter informing them of the outcome of the analysis and providing a link to the report. The outcome of the analysis does not have any positive or adverse effect on the general public and the report will be posted on the Forest Web Page for information.

Transportation Analysis Overview
This analysis is intended to identify changes to the national forest transportation system that may be needed to meet current or future management objectives, and to provide information that allows integration of ecological, social, and economic concerns into future transportation decisions. The process is intended to complement, rather than replace or preempt, other planning and decision processes.

Six Step Process
The analysis process is a six-step progression, regardless of scale, customized to local situations; landscape and site conditions coupled with public issues, forest plan land allocations, and management constraints. The process provides a set of possible road-related issues and analysis questions. Only those relevant questions and any additional suggestions on information needs and research findings that might apply to the project need to be addressed. The six steps are:

Step 1. Setting up the Analysis
Step 2. Describing the Situation
Step 3. Identifying Issues
Step 4. Assessing Benefits, Problems and Risks
Step 5. Describing Opportunities and Setting Priorities
Step 6. Reporting

The amount of time and effort spent on each step differs by the complexity of the issues, specific situations and available information particular to the project. Details about these steps can be found in FS-643 titled *Roads Analysis: Informing Decisions about Managing the National Forest Transportation Syste*m.

Transportation Analysis Products
This report is a product of the analysis process and documents the information and analyses used to identify opportunities and priorities for future national forest road and motorized trail systems (where applicable). Included in this report is a transportation map displaying the existing/recommended road system and where applicable the existing/recommended motorized trail system and the needs and/or recommendations for each. This report will:

- Identify needed and unneeded roads;
- Identify road related social, environmental and public safety risks;
- Identify site-specific priorities and opportunities for road improvements and decommissioning;
- Identify areas of special sensitivity or any unique resource values.

This report will help managers address questions on road access related to ecosystem health and sustainability, commodity extraction, recreation, social and cultural values, and administrative uses. Further, the report will help to inform future management decisions on the merits and risks of building new roads; relocating, upgrading, or decommissioning existing roads; managing traffic; and enhancing, reducing, or discontinuing road maintenance. This analysis is based upon:

- Use of the best available scientific information;
- Economics;
- Social and economic costs and benefits of roads; and
- Contribution of existing and proposed roads to management objectives.
- Input from resource specialists

Step 1 – Setting Up the Analysis

Purpose, Scope and Objectives:
The purpose of the analysis is to identify the **minimum road system** needed to administer and utilize National Forest System (NFS) resources within budget constraints. This TAP will also support the Forest Plan.

The scope of this analysis includes the area bounded by the 28,000 acre EYNF in Puerto Rico. This is a forest scale TAP with boundaries indicated on the map in Appendix F. The analysis will include maintenance level 2, 3, 4, and 5 roads. Maintenance level 1 may be used for some specific resource analyses and briefly discussed.

The objective of this Transportation Analysis is to provide critical information for a **minimum road system** that is safe and responsive to public needs and desires, is affordable, conforms to the EYNF Plan, is efficiently managed, has minimal negative ecological effects on the land, and is sustainable with available funding for needed management actions. All existing system roads as well as access roads to the Forest Boundary are included in this Transportation Analysis.

The "Transportation and Access Study for The EYNF, 2002" for local and state roads and the Land and Resources Management Plan (LRMP) for the EYNF and the Luquillo Experimental Forest (1997) were used in this analysis. The information in these documents and information gathered through an internal scoping process and meetings with Puerto Rico Department of Transportation and Federal Highways Administration was compiled and

presented for analysis and consideration.

This analysis provides a comprehensive look at the network of NFS roads and will be used during the NEPA process. The TAP is intended to be a broad scale comprehensive look at the transportation network. The main objectives of the TAP are:

- Balance the need for access while minimizing risks by examining important ecological, social, and economic issues related to roads and trails;
- Furnish maps, tables, and narratives that display transportation management opportunities and strategies that address future access needs, and environmental concerns;
- Identify the need for changes by comparing the current road and areas to the desired condition;
- Make recommendations to inform travel management decisions in subsequent NEPA documents.

This document provides information for the Forest Plan and the Travel Management Rule as it relates to the EYNF. This analysis will also review option concerning access issues and needs where applicable.

Analysis Plan

The following items were specifically investigated in this analysis:

- Verify current road conditions and drivability.
- Verify accuracy of road locations on maps.
- Interdisciplinary Team (IDT) and Line Officer identify preliminary access and resource issues, concerns and opportunities.
- Identify additional issues, concerns and opportunities through internal resource staffs.
- Recommend changes to the existing road system based on the findings of this transportation analysis.

Information Needs

The IDT identified needs and gathered as much information as available about the following items:

- Accurate location and condition of all system roads within the project area.
- Assessment of opportunities, problems and risks for all roads in the project area.
- Public access and recreational needs and desires in the area including access to private landowners.
- Areas of special sensitivity, resource values, or both.
- Best management practices for the area.
- Current forest plan and management direction for the area.
- Agency objectives and priorities.
- Interrelationship with other governmental jurisdictions for roads.
- Public and user group values and concerns.

Potential Key Issues, Concerns, and Opportunities

The following items were considered in this analysis:

- Special Uses
- Recreation
- Wildlife and plants
- Soils, Watersheds, Air related issues to resources
- Cultural resources and Archaeological sites within the study area
- Fire Management

Step 2- Describing the Situation

Regional Setting

The following are some of the communities located in proximity of the forest boundary:

- Luquillo
- Naguabo
- Juncos
- Bartolo
- Fortuna
- Gurabo
- Fajardo
- Humacao
- Canovanas
- Campo Rico
- Rio Grande
- Rio Blanco
- Caguas
- Mariana
- Maizales
- El Mango

The Interdisciplinary Team (Appendix C) convened and examined the existing transportation system in relation to current forest plan direction. This required a description of the road system; its location, ownership, condition, and current forest plan direction. A description of the physical, biological, social, cultural, and economic aspects of the analysis area was discussed and generated by the team.

A map of the area's transportation system was developed to facilitate this description. (See Appendix F).

The products of this step are:

- A map or other descriptions of the existing road system defined by the current forest plan, and
- Basic data needed to address transportation analysis issues and concerns.

<u>Existing Direction for Roads</u>
Travel analysis is focused on identifying needed changes to the forest transportation system; identifying the existing direction is an important first step. In general terms, the existing direction includes the NFSRs, trails and areas currently managed for motor vehicle use. Restrictions, prohibitions, and closures on motor vehicle use are also part of the existing direction on the forest.

Existing direction from laws and regulations, official directives, forest plans, forest orders, and forest-wide or project specific roads decisions, determine the motorized routes and areas open to public motorized travel. This information about a unit's managed system is often documented in road and motorized trail management objectives, maps, Recreation Opportunity Guides, tabular databases, and other sources.

Road Definitions

Authorized Road
Existing roads open for motorized use are National Forest System Roads (NFSRs), which are currently in the Forest's INFRA database with attributes reflecting an existing, NFSR under the jurisdiction of the Forest Service with an operational maintenance level between 2 and 5.

Closed Road
Closed roads have been closed to vehicle traffic for at least a year but are necessary for future activities. If there is a future need for the road but no immediate need, then it is placed in the system as a closed (ML1) road. They appear in the INFRA database with an operational maintenance level of 1. If there is no compelling administrative or public need for the road in the long-term, then it should be decommissioned.

Unauthorized Road
An unauthorized road is not included in a forest transportation atlas or database. These roads are usually established by various users over time. They were not planned, designed, or constructed by the Forest Service.

Decommissioned Road
Decommissioned roads have some type of physical closure at their entrance or may be completely obliterated. They appear in the INFRA database with a route status of decommissioned. In order to return a decommissioned road to service as a system road, the NEPA process must be followed even when no physical work is required to allow motorized traffic back on the road.

There are five maintenance levels (also referred to as levels) used by the Forest Service to determine the work needed to preserve the investment in the road. These maintenance levels are described in *FSH 7709.58 –Transportation System Maintenance Handbook*. Levels 3, 4, and 5 provide access for passenger car traffic and make up the backbone of the forest transportation system and in Section 3 below.

Maintenance Level (ML) Descriptions:

1 = Basic custodial care (closed)
2 = High clearance vehicles
3 = Suitable for passenger cars
4 = Moderate degree of user comfort
5 = High degree of user comfort
C = Convert use
D = Decommission

Maintenance levels only apply to roads under Forest Service jurisdiction.

- Operational Maintenance Level = How the road is maintained on-the-ground.
- Objective Maintenance Level = Maintenance level the road would be maintained to if funding permitted. Reconstruction may be required before the road could be maintained to this level.

The following are the five maintenance levels classified by the FSH 7709.58:
Road Maintenance Level 5 (ML5) – roads that provide a high degree of user comfort and convenience. These roads are normally double-lane, paved facilities, some may be aggregate surfaced and dust abated. These roads are subject to the Highway Safety Act (HSA) and Manual of Uniform Traffic Control Devices (MUTCD). These roads have the following characteristics:

- Highest traffic volume and speeds
- Typically connect to State and county roads
- Usually arterial and collector roads
- Drainage addressed by use of culverts.

Road Maintenance Level 4 (ML4) – roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most are double-lane and aggregate surfaced. These roads are also subject to the HSA and MUTCD and have the following characteristics:

- Moderate traffic volume and speeds
- May connect to county roads
- Usually a collector road
- Drainage addressed by use of culverts

Road Maintenance Level 3 (ML3) – roads that are open and maintained for travel by prudent drivers in a standard passenger car. User comfort and convenience are low priorities. These roads are typically low speed, single lane with turnouts, and spot surfacing. These roads are also subject to the HSA and MUTCD and have the following characteristics:

- Moderate to low traffic volume
- Typically connect to arterial and collector road, and/or are collector roads
- Combination of grade dips and culverts provide drainage
- Potholing or washboarding may occur.

Road Maintenance Level 2 (ML2) – roads are open for use by high-clearance vehicles; passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. The following characterize these roads:

- Low traffic volume and speed
- Typically local roads
- Typically connect collector or other local roads
- Grade dips are the preferred drainage treatment
- Surface smoothness is not a consideration
- Not subject to HSA

Road Maintenance Level 1 (ML1) – roads that are closed to vehicular traffic intermittently for periods that exceed 1 year. Basic custodial maintenance is performed to protect adjacent resources and enable the road to facilitate future management activities. Planned road deterioration may occur at this level; may be open and suitable for non-motorized uses. Roads in this category may be of any type, class or construction standard, and may be managed at any other maintenance level during the time they are open for traffic.
ML1 roads have the following attributes:

- Vehicular traffic is eliminated, including administrative traffic
- Entrance is physically blocked or disguised
- No maintenance other than a condition survey may be required so long as no potential exists for resource damage
- Not subject to HSA

The following table provides existing data such as length of road within the forest boundary, current maintenance level and use as listed in the INFRA database.

Table 2.1 – Existing Transportation System

		Road Maintenance Levels And Lengths (miles)					El Yunque National Forest
Road Number ID	**Road Name**	**NFSR - ML 1 (closed)**	**NFSR - ML 2 (High clearance)**	**NFSR - ML 3**	**NFSR - ML 4**	**NFSR - ML 5**	**Description**
FR 10	El Yunque Towers			2.00			Admin Use & Special Use Permit Only. Asphalt road; very steep grade requiring 4x4
FR 11	Water Tank Road		0.13				Admin Use & Special Use Permit Only.
FR 12	Sonadora Road		0.94				Admin Use & Special Use Permit Only.
FR 13	La Mina House Entrance Road			0.11			Admin Use & Special Use Permit Only.
FR 14	Stone House Entrance Road			0.04			Admin Use & Special Use Permit Only.
FR 15	Aserradero		0.07				Admin Use & Special Use Permit Only.
FR 27	Pico del Este					4.3	Admin Use & Special Use Permit Only.
FR 915	Cristal		2.95				Admin Use & Special Use Permit Only.
FR 9915	Bisley		0.81				Admin Use & Special Use Permit Only.
	TOTALS	**0.0**	**4.90**	**2.15**	**0.00**	**4.3**	
Total NFSR = 11.35 miles							

General Description

The transportation system on the EYNF serves a variety of resource management and access needs. Most roads on the El Yunque were originally constructed for recreational access purposes and the management of other resources, such as communication sites, during the 1930s. Over the past decades, a road network has been developed and continues to serve commercial, recreation, administrative purposes and provide access to private lands.

There are three goals for the transportation system identified in the 1997 Caribbean National Forest / Luquillo Experimental Forest Land Management Plan:

- Maintain existing roads to a high standard to protect natural resources, and protect capital investments.
- Collaborate with the Puerto Rico Department of Transportation (PRDOT) and Public work to develop a forest transportation plan.
- Construct only those road segments necessary to service the limited vegetation management demonstration program and recreation facilities.

The cooperative work proposed with the PRDOT was finalized as a report on June 2002.

There are currently 11.35 miles of inventoried, classified NFSRs on the EYNF transportation inventory.

All EYNF System Roads are currently designated as "Restricted to Administrative and Permitted Use Only". These NFSR are maintained to ML 2, ML 3 or ML 5 standards depending on the level of use and management objectives.

Step 3- Identifying Issues

The following issues are addressed in this analysis and described in more detail in Step 4:

- Recreation
- Lands
- Soil, Water, & Air
- Special Uses
- Cultural Resources and Archaeological sites within the study area
- Wildlife
- Fire Protection and Safety

The purpose of this step is to:

- Describe resource concerns and issues
- Identify the key questions and issues affecting road-related management

The products of this step are:

- A discussion of key road-related issues, including their origin and basis, and
- A description of the status of the current data

The interdisciplinary team (IDT) met initially in September 2008-2009 and again in August 2015 to identify preliminary issues. A review of the questions in FS-643 titled *Roads Analysis: Informing Decisions about Managing the National Forest Transportation System* was also used in order to help identify any issues not previously made aware for this project.

Answers to the following questions helped the IDT to identify the most important road-related issues in the analysis area.

- What are the primary public issues and concerns related to roads and access?
- What are the primary management concerns (internal issues) related to roads and access?
- What are the primary legal constraints on roads and roads management?
- What additional information will be needed to better understand and define the key issues?
- What resources and skills are available to complete an effective analysis?

Road Maintenance

The Forest Service objective for system roads is to operate and maintain NFSRs in a manner that meets road management objectives (RMOs) and that provides for:

1. Safe and efficient travel;
2. Access for the administration, utilization, and protection of its lands; and
3. Protection of the environment, adjacent resources, and public investment.

The Forest Service (FS) is responsible for maintenance of NFSRs resulting from traffic associated with:

a. Administration of FS lands,
b. Noncommercial uses and activities,
c. Incidental noncommercial use related to ownership or occupancy of isolated parcels of private land served by an NFS road,
d. Commercial road use that is not subject to cost recovery, and
e. Incidental public use.

The amount and frequency of maintenance is subject to: availability of funding, obligations, agreements, and protecting the Forest's investment.

Road Maintenance Levels

Maintenance levels are defined by the Forest Service Handbook (FSH) 7709.58 as the level of service provided by and maintenance required for, a specific road. The maintenance level must be consistent with RMOs, and maintenance criteria.

The maintenance level is determined by the Line Officer by considering the following factors:

- Resource program needs
- Environmental and resource protection requirements
- Visual quality objectives
- Recreation spectrum classes
- Road investment protection requirements
- Service life and current operational status
- User safety
- Volume, type, class, and composition of traffic.

The RMO identifies the current maintenance level or operational maintenance level and desired maintenance level or objective maintenance level for each road. The operational and objective maintenance level may or may not be the same for a road depending on the current needs, road condition, budget constraints, and environmental concerns and those forecasted for the future.

Annual Maintenance is the performance of one or more work activities needed to preserve or protect a roadway including surface, shoulders, roadside, structures and such traffic-control devices as are necessary for its safe and efficient use to the standard provided through construction, the most recent reconstruction, or other condition as agreed.

Unpaved roads require much more frequent maintenance than paved roads, especially after wet periods and when accommodating increased traffic. Wheel motion shoves material to the outside (as well as in-between travelled lanes), leading to rutting, channelizing of water, reduced water-runoff to ditch line, and eventual road damage if unchecked. As long as the process is interrupted early enough simple re-grading is sufficient for several years, with material being pushed back into shape.

The Highway Safety Act (HAS) requires maintenance level 3-5 roads to meet the standards for directional, regulatory, and warning signs. Clearing for sight distance and safety is not occurring as often as needed due to limited funding. Therefore with limited funding, the focus must be on high-priority roads which are identified in the Annual Maintenance Plan which is approved by the line officer. High priority roads are often maintenance level 3-5 roads and almost always have higher traffic volumes than maintenance level 2 roads.

Shared or exchanged road maintenance is occurring primarily on maintenance level 3-5 roads, but could be increased overall. The Forest currently has a Memorandum of Understanding with the Puerto Rico Department of Transportation for maintenance of state routes within and providing access to the Forest. The Federal Aviation Administration maintains FSR 27 under a special use permit. Efficiencies which serve all public road agencies are actively sought.

Deferred maintenance is the practice of postponing needed maintenance activities such as grading for one or more maintenance cycles in order to save money and/or labor. The failure to perform needed repairs leads to road deterioration and ultimately road impairment. Sustained deferred maintenance may result in higher eventual maintenance costs, road failure, and in some cases, road safety implications.

The accounting standard-setter for the U.S. Government defines deferred maintenance in this way, *"Deferred maintenance" is maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period. For purposes of this standard, maintenance is described as the act of keeping fixed assets in acceptable condition. It includes preventive maintenance, normal repairs, replacement of parts and structural components, and other activities needed to preserve the asset so that it continues to provide acceptable services and achieves its expected life. Maintenance excludes activities aimed at expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than, those originally intended.*

An example of deferred maintenance for a system road is not performing recommended routine maintenance or repairs as recommended in road condition surveys: the road will not remain at its recommended standard or serviceability and will be more likely to degrade and become damaged over time.

Operating a road system and attempting balance between resource protection and public wishes is a challenging task. This travel analysis helps to fulfill two major requirements of 36 CFR 212, Subpart A – *Administration of the Forest Transportation System* and Subpart B- *Designation of Roads, Trails, and Areas for Motor Vehicle Use*:

- **212.5** Road System Management – Identify the minimum road system.
- **212.55** & **212.56** – Identify and subsequently designate a system of roads, motorized trails, and areas for motor vehicle use.

In so far as feasible there is a need to get more financially in balance with road maintenance funding versus road maintenance needs. The forest's authorized road network will continue to degrade and have access impacts as well as environmental impacts as long as needs exceed funded maintenance efforts. Decreasing Forest maintenance costs and increasing road maintenance funding should continue to be our overall goal. Reducing costs, balancing resource needs and meeting access needs are major components of our operation and maintenance efforts. Strategies that reduce road maintenance costs include:

- Lower road maintenance levels (e.g. ML3 to ML2).
- Decrease mileage by closing or decommissioning system roads (abandonment or obliteration).
- Transfer jurisdiction (ownership) or maintenance responsibilities to other maintenance entities (including private land owners and home owner associations) as appropriate.
- Convert open and/or closed roads to motorized trails recognizing this will increase trail maintenance costs (class 1, 2, or 3 which is basically a minimally maintained, natural surfaced trail).
- Reduce mileage of paved roads.
- Work cooperatively with other public road agencies and associations for material and equipment/labor sharing opportunities.
- A combination of the above strategies.

The EYNF has few roads that will receive maintenance during the current fiscal year. The entire Forest has approximately 4.90 miles of ML 2 roads, approximately 2.15 miles of ML 3 roads, and approximately 4.3 miles of ML 5 roads. Therefore there are a total of about 11.35 miles of NFSRs on this forest. Some of these roads are under Special Use Permit and are maintained as such by the Permittee. FR 27 is a maintenance level 5 road and is maintained by the permittee.

The Forest has conducted required annual road condition surveys since 1999 to determine the maintenance and associated funding needed to maintain roads to the required safety standards and assigned maintenance levels. Condition surveys describe the features of the road (e.g. surfacing material, ditches, culverts, signs, etc.) and their current condition. Deferred and annual maintenance costs for those roads are then calculated using a regional standard cost guide.

Road Maintenance Frequency

The quantity and frequency of maintenance is subject to: availability of funding, obligations under agreements, and protecting the FS's investment. In accordance with the maintenance levels described above the following table displays the cyclic activities required to properly maintain roads:

Activity	As Needed		Annually		
	ML 1	ML 2	ML 3	ML 4	ML 5
Maintain traveled way for protection of investment, resource values, and to provide some degree of user comfort			Low	Moderate	High
Maintain road prism to provide for passage of high clearance vehicles (4x4)		X			
Maintain shoulder for structural integrity of roadway and drainage functionality		X	X	X	X
Keep drainage structures/features functional and prevent unacceptable resource damage	X	X	X	X	X
Vegetation removal to provide for sight distance			X	X	X
Vegetation removal for access and to control resource damage		X			
Alleviate erosion or sedimentation on or from roadway	X				
Remove roadside hazard trees			X	X	X
Maintain structures to provide for passage of planned traffic and preserve structure and to protect natural resources		X	X	X	X
Install/maintain warning, regulatory, and guide signs and other traffic devices to provide for existing traffic			X	X	X

Road Maintenance Costs
The Forest Service maintains NFS roads in accordance with their management objectives and the availability of funds. Unfortunately, resources are limited, and the Forest Service has a substantial backlog of maintenance needs. In some cases, an extended lack of maintenance can lead to deterioration of a road to the point that it must be closed to address user safety or to prevent severe environmental damage. The availability of resources for administration and maintenance of routes should not be the only consideration in developing travel management proposals (FSM 7715.5 para 1c). Special Use Permittees and cooperators supplement agency resources for maintenance and monitoring, and their contributions are considered in assessing the availability of resources.

Federally appropriated funds used for road operation and maintenance on the EYNF have ranged from about $30,209 to $45,277 per year over the last five years, with the average funding being approximately $37,000 per year.

Besides the on-the-ground performance of maintenance related work, all road systems have fixed costs associated with management of the systems. Management includes:

- Oversight of the road system.
- Establishing and maintaining road management systems required by law (e.g., pavement management, bridge management, safety management, sign management, and congestion management).
- Collecting and maintaining data about the road system (e.g., conducting road condition surveys, gathering traffic count and vehicle accident information, etc.).
- Providing information services (e.g., maps, road condition reporting, etc.).
- Out-year project planning (e.g., specialist surveys/reports, agreements with other entities, etc.).
- Office support (contracting officers, utilities, equipment, etc.)

Based on data from the 2009 Annual Roads Condition Survey the annual maintenance cost of FS roads is $72,392; deferred cost is $173,799 and Capital Improvement need is $113,848.

Road Maintenance Costs
Summary of needed funds for road maintenance and operations on the El Yunque National Forest.

Road ID	Road Name	Length (miles)	ML	Annual Costs	Deferred Costs	Capitol Improvement	Total Costs
FR 10	El Yunque Towers (Maintained under road use agmt.)	2.00	3	$0	$0	$0	**$0**
FR 11	Water Tank Road	0.13	2	$872	$4,101	$8,595	**$13,568**

Road ID	Road Name	Length (miles)	ML	Annual Costs	Deferred Costs	Capitol Improvement	Total Costs
FR 12	Sonadora Road	0.94	2	$11,737	$20,850	$11,315	**$43,902**
FR 13	La Mina	0.11	3	$427	$329	$112	**$868**
FR 14	Stone House	0.04	3	$299	$596	$428	**$1,323**
FR 15	Aserradero	0.07	2	$21,288	$68,282	$50,956	**$140,526**
FR 27	Pico del Este (maintained by FAA)	4.30	5	$0	$0	$0	**$0**
FR 915	Bisley	0.81	2	$17,067	$23,051	$6,815	**$46,933**
FR 9915	Cristal	2.95	2	$15,887	$27,116	$11,207	**$54,210**
			Total Costs	**$72,392**	**$173,799**	**$113,848**	**$301,330**

As a result of this analysis, FR15 will be decommissioned, therefore all costs associated with that road will be eliminated. The revised total cost after FR15 decommission will be **$160,804**

Step 4- Assessing Benefits, Problems and Risks of the Existing Road System

The purpose of this step is to:

- Assess the benefits, problems and risks of the current road system and whether the objectives of the Forest Plan are being met

The products of this step are:

- A synthesis of the benefits, problems and risks of the current road system,
- An assessment of the ability of the road system to meet management objectives

Roads analysis is a science-based process and the interdisciplinary team (Appendix C) used and interpreted relevant scientific literature to identify issues which may cause potential impacts. Any assumptions made during the analysis, and limitations of the information on which the analysis is based will be described.

Specific questions were used to assess benefits, problems, and risks. Benefits are the potential uses and socioeconomic gains provided by roads and related access. Problems are conditions for certain environmental, social, and economic attributes that managers deem to be unacceptable. Risks are likely future losses in environmental, social, and economic attributes if the road system remains unchanged. The questions were used as a checklist to scan the range of possible

benefits, problems, and risks and to screen them for those relevant to roads in the area under consideration.

The relevant questions were then used to guide more in-depth assessment and link to the science base for each of the identified benefits, problems, and risks. These questions were not intended to be prescriptive, but were used to assist the interdisciplinary team in developing questions and approaches appropriate to each analysis area. Which questions are appropriate for a particular analysis area and which warrant deep or cursory treatment will depend on the particular area and the issues being addressed. Some question may need to be addressed at several scales. Addressing these and other road-related questions was done with maps, GIS, statistical summaries, or other information that contributed to understanding the benefits, needs, risks, and effects of the roads. These indicators did not answer questions directly but assisted in discerning and quantifying important interactions.

Lands

- *How does the road system connect large blocks of land in other ownership to public roads (ad hoc communities, subdivisions, inholdings, and so on)?*
- *How does the road system affect managing roads with shared ownership or with limited jurisdiction? (Federal Revised Statute 2477, cost-share, prescriptive rights, FLPMA easements, FRTA easements, DOT easements)?*
- *How does the road system connect to public roads and provide primary access to communities?*
- *How does the road system affect managing special-use permit sites (concessionaires, communications sites, utility corridors, and so on)?*
- *What are people's perceived needs and values for access?*

All EYNF NFSRs, with the exception of FR 9915, connect to public roads but do not provide direct access to neighboring communities. Most of the roads found within the EYNF boundary are public roads under the jurisdiction of the Puerto Rico Department of Transportation. Any given community neighboring the El Yunque has a public road that provides access to the community.

People's perception of access to forest attractions is positive as judged by the lack of issues raised or complaints received in the headquarters office. Most recreation attractions are either located along state routes or accessed by hiking over trails connected to state routes. Foot or non-motorized traffic is accepted over most of the gated NFSRs. FR 12 is currently closed to all use and is located across parrot critical habitat. The public receives this well, given their support to the parrot recovery efforts. The few inholdings in the forest access their property over state routes or private roads/driveways under special use permits. In terms of access to Special Use facilities, the EYNF road system accesses many representative general areas of the forest and all forest types. It is supplemented by a non-motorized trail system of 5.3 miles.

Road safety is a real concern on the EYNF. The overall road conditions, in combination with the topography and the ever changing weather, makes road safety a major issue. The defensive driving theory takes precedence on the EYNF road system. The management of roads and information signs, as well as road maintenance levels, addresses most of the conditions related to the safety of road users. The lack of regular road maintenance, on the road prism and right of way, creates safety issues for Law Enforcement Officers while on duty patrol. This in turn slows down investigative and law enforcement activities. The mitigation of unsafe road conditions is a forest priority and the Forest is working with the local authorities to correct unsafe road conditions.

Comments and Recommendations

Road Number	Comment/Recommendation
FR 10	Restricted to Administrative and Special Use only. Provides access to commercial communication sites, an old aviary site that could potentially become an Eco lodge, and recreation foot traffic to outstanding scenery on the El Yunque, Los Picachos, and Mt. Britton peaks. **Recommendation:** Retain; No change.
FR 11	Restricted to Administrative Use only. Provides access to the slow sand filter plant providing potable water to the El Portal Visitor Center and the Forest Headquarters. **Recommendation:** Retain; No change.
FR 12	Restricted to Administrative and Special Use only. Provides access to critical parrot habitat and to Puerto Rico Aqueduct and Sewer Authority water intakes under permit. Public access is totally prohibited to this critical parrot habitat area. **Recommendation:** Retain; No change.
FR 13	Currently restricted to administrative use only. Provides access to La Mina House, part of the old aviary complex that could also potentially be part of an Eco lodge or retained for volunteer housing. **Recommendation:** Retain; No change.
FR 14	Restricted to Administrative Use only. Provides access to the eligible historic site - Stone House. Recreation foot traffic allowed to fenced perimeter with view of the stone house. **Recommendation:** Retain; No change.
FR 15	At one time provided access to an old sawmill, but now is no longer in use. **Recommendation:** Decommission entire road. No longer needed to meet forest resource management objectives.
FR 27	Restricted to Administrative and Special Use only. Provides access to the Federal Aviation Administration (FAA) radar site, research areas, recreation residences, and recreation foot traffic to outstanding scenery overlooks. **Recommendation:** Retain; No change.
FR 915	Restricted to Administrative Use only. Provides access to research areas. Recreation foot traffic, mainly hiking for fitness, is allowed but not encouraged. **Recommendation:** Retain; No change.
FR 9915	Restricted to Administrative Use only. Provides access to research areas. Recreation foot traffic to Wild & Scenic Mamayes River is allowed but not encouraged. **Recommendation:** Retain; No change.

FUTURE CONSIDERATIONS

The overall situation for forest access will remain stable in future years. All NFSRs except one will retain current use with access restricted to administrative use and/or access to facilities or sites under Special Use Permit. Foot traffic and non-motorized vehicles will continue to be allowed on most forest routes.

Forest road 15 (0.07 miles) is recommended for decommissioning since it is no longer needed to meet forest resource management objectives.

Soil, Water, Air, and Forestry

- *How and where does the road system modify the surface and subsurface hydrology of the area?*
- *How and where does the road system generate surface erosion?*
- *How and where do road-stream crossings influence local stream channels and water quality?*
- *How and where does the road system create potential for pollutants, such as chemical spills, oils, or herbicides to enter surface waters?*
- *How and where is the road system 'hydrologically connected' to the stream system?*
- *How do the connections affect water quality and quantity (such as delivery of sediments, elevated peak flows)?*
- *What downstream beneficial uses of water exist in the area?*
- *What changes in uses and demand are expected over time?*
- *How are they affected or put at risk by road-derived pollutants?*
- *How and where does the road system affect wetlands?*
- *How does the road system alter physical channel dynamics, including isolation of floodplains; constraints on channel migration; and the movement of large wood, fine organic matter, and sediment?*
- *How does the road system affect riparian plant communities?*

Roads affect soil, water, and air by accelerating erosion, diverting water, providing access for various polluting agents, and creating dust. The roads in EYNF watersheds are having these effects, but have not been identified as causing significant negative effects on water quality at the sampling points, or air quality at any monitoring location. However, local effects on soil, water (including riparian areas), and air may be important. Roads affect resources by providing access for management of ecosystem services.

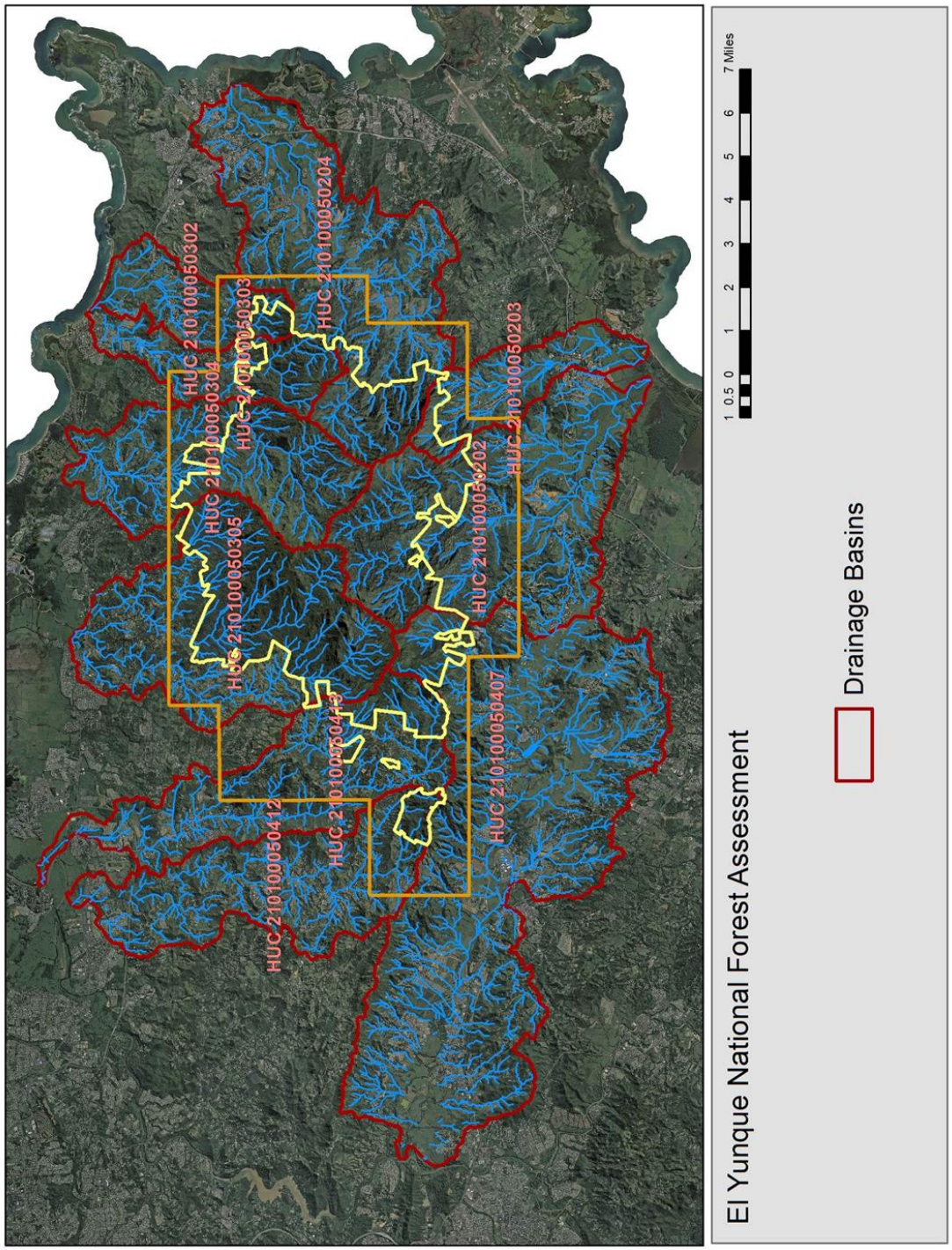
The 32 mile (This includes both Forest Service Roads and Puerto Rico Department of Transportation Roads) network of existing roads dissects the Forest north to south, and then west to east from PR route 191 to Pico del Este, about half a mile from the southeastern Forest boundary. Maintenance of the present road system is imperative, particularly PR route 191 from Palmer to the recreation and communication sites. The large 1970 landslide closed PR route 191 between mile 8 and mile 13. The current situation leaves the southern part of the Forest as integral, roadless plots of forest. Motor vehicle access to the Forest interior is controlled at a single point—the intersection of PR route 191 and PR route 9966.

Mass movements of earth are a common landforms-scale disturbance in many upland humid tropical forests. In Luquillo, the velocity of downslope movement can range from the continuous downslope creep of soil profiles that occur on the order of millimeters per year to debris flows that move tens of kilometers per hour. The frequency of landslides and the rate of revegetation in mature forest stands have been related to bedrock geology, elevation, mean annual rainfall, and land use (Larsen and Simon 1993; Myster et al. 1997; Larsen et a1. 1999). Within areas of similar geology and mean annual rainfall, mass wasting is five to eight times more frequent along roads than elsewhere and is most common on hillslopes that (1) have been

anthropogenically modified, (2) have slopes greater than 12 degrees, and (3) face the prevailing trade winds.

Roads also act as corridors for the movement and establishment of introduced species (Walker and Boneta 1995), although little spread of introduced grasses into adjacent forests has been detected in the upper Luquillo Mountains (Olander et a1. 1998). Successional changes on abandoned paved roads at lower elevations in the Luquillo Mountains occur quickly. Within 11 years of road abandonment, the litter mass, soil bulk density, soil moisture, soil organic matter, and total soil nitrogen reached adjacent forest levels (Heyne 2000). At higher elevations, changes were slower on road fill (Olander et a1. 1998) and differed from those noted in a study conducted at a lower elevation by Heyne (2000). The species composition, however, did not resemble that of adjacent forests in any of the forests in the 60-year chrono sequence studied (Heyne 2000).

El Yunque HUC 12 Watershed Map



The road system alters physical channel dynamics through the occasional increase of sedimentation after downpours on the forest. The road system is connected hydrologically to the stream system due to surface runoff. With an average rainfall of 125 inches per year, soils of the forest are mostly saturated. The condition results in a highly interconnected surface runoff system. Primary concerns are the effect of soil erosion on water quality. Secondary concerns are non-point source pollution.

El Yunque National Forest Watersheds

HUC12	HUC12 Watershed Name	Total Acres	USFS Acres	Non USFS Acres
210100050202	Rio Blanco near mouth	17341	5181	12160
210100050203	Rio Santiago near mouth	4381	547	3833
210100050204	Rio Fajardo near mouth	16628	2805	13823
210100050302	Rio Pitahaya at mouth	4085	438	3648
210100050303	Rio Sabana at mouth	4616	1937	2680
210100050304	Rio Mameyes near mouth	9950	5203	4747
210100050305	Rio Espiritu Santo near mouth	15761	8662	7099
210100050413	Rio Canovanas	11209	1550	9659

El Yunque Towers Road (FR 10) can create potential for pollutants such as diesel spills. This road provides access to several communications sites that depend on generators as a source of power during frequent electrical power outages. The permittees carry diesel to the site in significant quantities. The area lies in the forest's highest elevations. The high rainfall and extremely low soil percolation create a high water table condition which results in a highly interconnected surface runoff system. Potential for pollutants to enter surface water is high.

The forest's road system generates surface erosion on Sonadora (FR 12), Bisley (FR 915) and Cristal (FR 9915) Roads. These roads have a gravel surface type and lie on soils dominated by clay. The major issues identified for soil erosion are mass wasting, OHV and illegal trail use.

Mass wasting is five to eight times more frequent along roads and can affect an area that is several times the width of the road itself (Larsen and Parks 1997). All the major roads in the Luquillo Mountains were constructed prior to 1970. Although some off-road vehicles occasionally enter the Forest, this activity is currently limited to annexed lands near the community of Cubuy. The vast majority of motor vehicle use is on paved or maintained roads. Nevertheless, it has been shown that roads greatly increase the magnitude and frequency of landslides and promote the establishment of alien species within the Forest.

The legacies left by road building include the expansion of nonnative species (Olander et al. 1998), landslides, and changes in slope morphology (Larsen and Parks 1997). Because of the aging road network, a greater frequency of landslides and road-related disturbances is expected in the future. Road construction and poor maintenance enhance the likelihood of landslides, as greater than 80 percent of landslides in the Luquillo Mountains occur along road corridors (Larsen and Parks 1997).

Generally roads and trails on national forests are not meeting all maintenance standards because of deferred maintenance needs. The roads in Rio Blanco and Rio Mameyes watersheds have high maintenance needs. Cristal (FR 9915) and Bisley (FR 915) roads have streams crossing in areas of high rainfall. While there are no major stream crossings, ditches and culverts drain water thereby increasing stream sedimentation. Best management practices in place reduce potential impacts.

The only known soil contamination issues are the result of historical Navy occupation on specific sites within the forest – only 2 watersheds. Minor contamination due to inappropriately discarded waste has been identified and scheduled for removal/clean up. These sites are classified as minor according to national tech guidelines. Other than this, there are no soil contamination issues prevalent on the forest as described in the national tech guide.

The road system alters physical drainage channel dynamics through the occasional increase in sediment transport after heavy precipitation on the forest. Heavy rains on the EYNF flood numerous roads and produce landslides mainly originated on the cut slope portion of the road prism (76%) where slopes are often very steep and tall. A smaller percentage (20%) of slides occur as a result of concentrated surface runoff over the fill slope onto steep saturated slopes. The landslides average a half acre in size. The affected areas quickly shed soils and the increase in sediment delivery affects aquatic habitat by filling pools.

There is no major obstruction that roads pose to wildlife species movement. However, improperly designed culverts that are necessary for access over streams can cause major problems for fish and other aquatic animals by disrupting their habitat and spawning success. The culvert should be sufficiently sized to allow for water depth, volume and velocity levels that will permit fish passage through the culverts. In situations where fish passage is not a major concern, other aquatic species may use the culvert and will need to rely on natural streambed sediments in the culvert to aid their movement. Freshwater shrimp found on this forest may be slowed at culvert crossings where the design of the culvert does not allow for upstream passage of the shrimp.

The area where a road traverses over a stream is a location where the movement of aquatic organisms may experience issues because of confinement and restrictions culverts exert on the natural flow. Freshwater shrimp and some long-ranging fish species such as the goby may be deterred in culverts due to the type of flow that is occurring. A strong flow may create an environment where the species will take longer to pass and make them vulnerable to predators. A study is being completed on the effects of these obstacles on migratory species on the forest.

The beneficial use of water for the area is connected to the development of homes and the need for a water source. There are 37 water use special use permits within the forest boundary. Run of the river dams are near Cristal (FR 9915) and Sonadora (FR 12) roads. For wildlife, the water needs to remain natural and without added chemicals. There is an expected increase in the use and demand of water in the area. There is risk to accidental or intentional introduction of chemicals or poisons from persons using roads as a thruway or access to streams on the forest.

There is an expectation of more water withdrawal from the forest. However, the Forest Plan imposes limitation on more intakes. There is no expectation of constructing new roads for the Timber Demonstration Management Area under the 1997 Forest Plan due to budget constraints.

The current road system does not affect wetlands. The 2012 Forest Assessments found that areas over 600 meters in elevation can be classified as wetlands. The Pico Del Este (FR 27) and El Yunque Towers (FR 10) roads are located in this elevation range. The road system is not affecting the wetland due to maintenance of hydrologic flow, stable right of ways and lack of vegetation management.

On the EYNF, road alignments are not close enough to aquatic systems to impact any of these aspects. Many road sections are narrow, but sufficient to allow for vegetation to contact the canopy level creating a vegetation tunnel effect.

Some effects to riparian zones where roads cross perpendicular are:

- Change in vegetation composition around the road with exotic species that become a noticeable feature.
- Shading will affect riparian zones less due to the loss of large dominant trees.
- Litter fall will be reduced because of lack of dominant trees.

There are no at-risk aquatic species on the EYNF. The current road system contributes to fishing and poaching at remote areas where monitoring of illegal activities cannot be done on a regular basis. This is occurring on the west and south side of the forest.

The road system facilitates the introduction of non-native aquatic species at large rivers located at lower altitudes such as the Río Sabana or Río Mameyes because of easy access and suitability of habitat. The road system does not however traverse thru riparian areas.

The Puerto Rico Aqueduct and Sewer Authority (PRASA) operates 12 dams on the forest, diverting stream water to treatment plants in order to provide municipal water. All these facilities gain main access through the forest road system and trails developed to reach each facility. The road right of way is also used for distribution pipes allocation.

Many landslides occur on or near roads on the EYNF. Landslides have been identified as a source of non-point pollution and the main contributors of sediments to the forest's streams. It is expected that road development will increase the sediment loads to water dam structures and can pose hazards to public health, increase purification costs at municipal water treatment plants, increase maintenance at hydroelectric plants, and affect marine ecosystems.

SOILS

The soil survey area is within the rugged terrain of the Sierra de Luquillo Mountains. Relief within the area can be characterized as extreme and includes numerous dissected, steep to very steep slopes that are broken by narrow ridges. Elevations range from about 100 feet at the northern boundary to 3,533 feet at El Toro Peak (30 to 1,077 meters). The main drainage systems

for the Forest are the Mameyes, Fajardo, Espiritu Santo, Río Grande, Río Sabana, and Icacos watersheds.

Within forest boundaries, soil loss of integrity is a function of landslides and subsequent erosion. Landslides are common both far and near from roads. Vegetative succession, an essential element of soil erosion control, is controlled by soil factors (Shiels et al. 2008). Illegal off-road vehicle use could severely impact soils and accelerate erosion. Because of the geographic location, soils in the Luquillo Mountains area receive sodium addition from both marine sources via precipitation and Saharan dust. Soils within EYNF boundaries appear to possess good integrity, with disruption caused by landslides and subsequent erosion. Currently agriculture is not practiced within EYNF boundaries. The majority of the lands are considered not suitable for large scale agriculture. There is a preponderance of partially hydric soils (permanently or seasonally saturated by water) and mostly are in the D Hydrologic group.

Assessed landslides occurred in soils characterized predominantly as poorly suited for recreational development and construction of roads (USDA NRCS Soil Survey 2002). The major management concerns or limitations by Soil Map Unit are:

- Zarzal-Cristal complex (20 – 60 percent slopes) - wetness in the Cristal, slope, landslides, and slumping.
- Cristal-Zarzal complex (5 – 40 percent slopes) - wetness in the Cristal, slope, landslides, and slumping.
- Zarzal very cobbly clay (40 – 80 percent slopes) – slope and restricted permeability.
- Yunque-Moteado complex (20 – 65 percent slopes) - wetness in the Moteado, slope, restricted permeability, the shrink-swell potential, restricted use of equipment, and erosion.
- Yunque cobbly clay (40 – 80 percent slopes) - slope, restricted permeability, moderate shrink-swell potential, erosion, a high clay content in the subsoil, cobbles and stones, landslides, and slumping.
- Guayabota-Yunque complex (30 – 60 percent slopes) - wetness, slope, the shrink-swell potential, restricted use of equipment, a high clay content in the subsoil, and erosion.

The NRCS Soil Survey (USDA, 2002) suggests the following to help overcome these limitations:

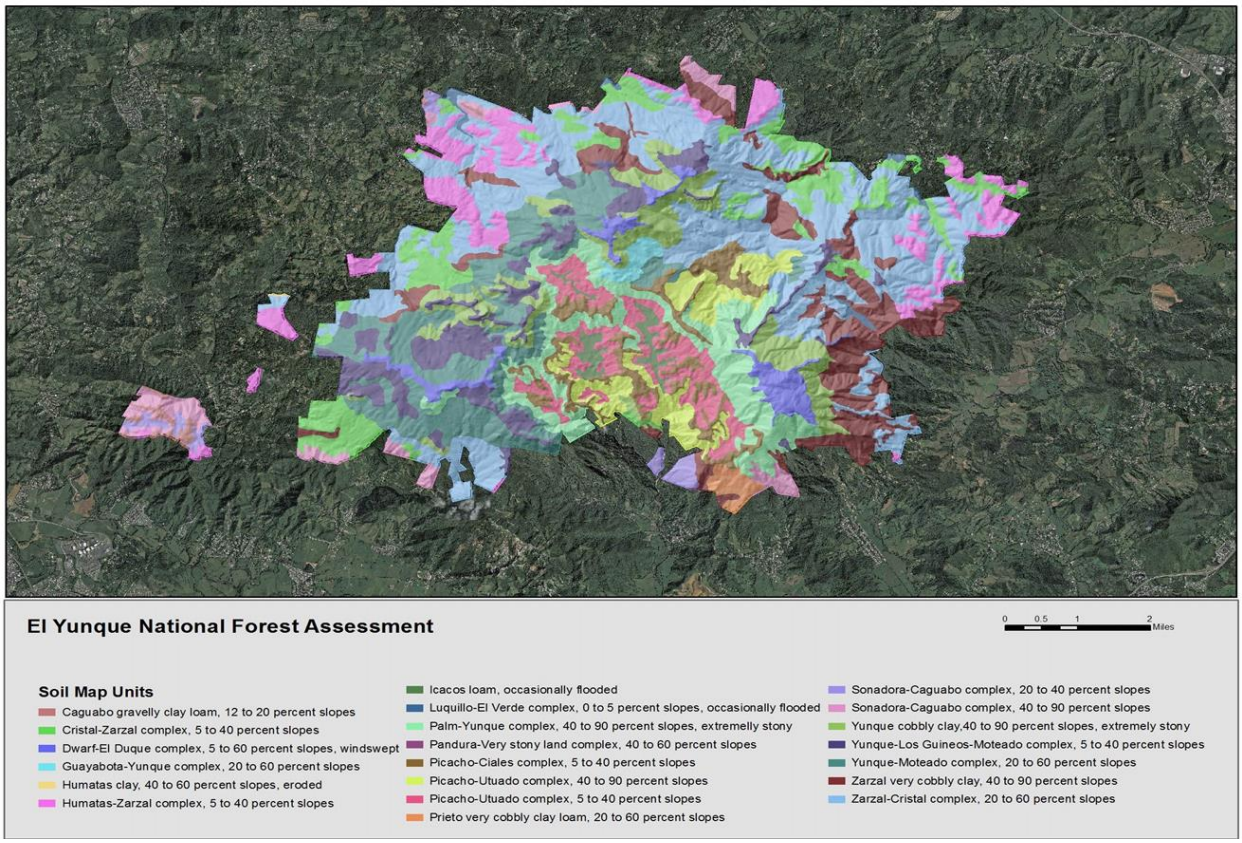
- Surfacing roads and constructing lined ditches
- Locating infrastructure on drier portions of the soil map unit
- Because of the slope, water should be drained away from the roadbed such that the water does not flow back to the roadbed farther downslope
- Construct roads on the narrow ridgetops or in less sloping areas
- Unshaped cut banks should be less than 6 feet (1.8 m) in length because of the hazard of slumping

Several of these measures have been taken and are likely to have had great benefits to soil stability and water quality on these road and recreation corridors. However, a review of the road prism shows evidence of similar landslide events occurring since the construction of the road network during the 1930s by the Civilian Conservation Corps. Because of steep mountain slopes, a large portion of the road was constructed into the slope as a full or partial bench, meaning nominal fill material and extensive cutslopes. Excess soil and rock were likely used at stream crossings and recreation sites or hauled off the forest. Cutslopes are often very tall (> 6 feet) and near vertical. Cutslopes that are not at stable slope ratios (angle of repose) and fill slopes experiencing excessive storm runoff remain at risk of failure. With the relatively extensive development in these areas, particularly in the PR 191 corridor, such failure can have catastrophic affects to human safety, infrastructure, and watershed health.

Generally all lands within the FS boundary still maintain the natural soil productivity conditions that are expected. Some areas are impacted by mass wasting which can result in a loss of productive soil layers in the upper horizons. This issue does not impact more than 5% of the watershed except for Rio Blanco.

The major issues identified for soil erosion are mass wasting and OHV and illegal trail use. 6 watersheds are identified as having issues and problems with the soil erosion. See figure below:

Soil Mapping Units



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Recreation

- *Is there now or will there be in the future excess supply or excess demand for roaded/unroaded recreation opportunities?*
- *Is developing new roads into unroaded areas, decommissioning existing roads, or changing maintenance of existing roads causing significant changes in the quantity, quality or type of roaded/unroaded recreation opportunities?*
- *What are the adverse effects of noise and other disturbances caused by constructing, using and maintaining roads on the quantity, quality, or type of roaded/unroaded recreation opportunities?*
- *Who participates in roaded/unroaded recreation in the areas affected by road constructing, maintaining, or decommissioning.*
- *What are these participant's attachments to the area, how strong are their feelings and are alternative opportunities and locations available.*

The EYNF does not anticipate an excess supply or excess demand for unroaded recreation opportunities. The current EYNF LMP allocates 65% of its lands to Wilderness and RNAs. This allocation is expected to adequately sustain any future unroaded recreation demand.

The EYNF does not anticipate or recommend the construction or development of new roads into unroaded and roaded areas or changing the maintenance level of current roads (the exception is FR 15). The roads that are currently used as partial tread for roaded recreation and administrative needs are expected to supply future recreation and administrative demand. This is consistent with the LMP as well as the revisions to the LMP currently planned. The quantity of visitation will increase as more visitors continue to explore the forest. Currently the forest receives over 1.1 million recreation site visits per year (NVUM 2011). The increase in number of visitors per year is expected to decrease the quality and type of experience expected for this kind of recreation. Route FR 15 is recommended for decommissioning since this road is not necessary for administrative or public use.

The effects of noise and other disturbances caused by developing, using, and maintaining roads on the quantity quality, and type of unroaded recreation opportunities are minimal. Forest system roads are located at distances substantially away from recreation sites or trails and maintenance of roads is either completed under Special Use Permit agreements or other means. Facilities and recreation sites, that are located adjacent to roads, are affected temporarily with increased levels

of noise as vehicles transit the area. Parking may also become an issue and a safety hazard as vehicle use increases at roaded areas.

Locals, international, continental and island wide visitors participate in unroaded recreation at the EYNF. Unroaded recreation occurs mainly on Trail Routes 6, 8, 9, 11, 12, 13, 15, 16, 17, 18, 18-A, 19, 34, 35, 39, and 41. Road decommissioning on the forest does not occur very often so this is not a factor. Maintenance of roads is an annual event and only occurs for a short duration of time since the roads are not very long.

Some local visitors have a cultural, spiritual or historic attachment to areas on this forest. The year round visitation to the EYNF by diverse users and the limited and/or inaccessible lands available for unroaded recreation reduces alternative opportunities, aside from the actual areas available. Attachment to the area by visitors is very strong because there are neither limited alternative opportunities nor other similar locations readily available. Also, attachment to this area by researches and special use permittees is very strong. Both groups favor limited access to these unique areas.

The overall feeling from the local population is one of high level when value of roads is considered in general. Roads are the means used to commute and connect neighboring communities as well as to transport goods and property. From a public standpoint, it is clear there is a desire for roads to be built and maintained to an acceptable operational level. The dependence on roads and vehicular transportation is very high and increasing on a daily basis.

The perception of access to areas in the forest by the public is that roads are very important to the daily operations of surrounding communities. At the forest level, neighboring communities, as well as visitors, are influenced by the way the roads are managed in terms of access control. For both groups, the more access is available, the better they feel. But the overall experience is that the desires and needs from road users have been conditioned and adjusted to access allowed by road management standards. In the past, when decisions were made to change road access, permanently or temporarily, most groups voiced their concerns, but were willing to accept the changes as long as an alternative was provided. The dependence on road access has been adjusted according to basic public needs because the reasons were fair and meant the wellbeing of users and/or resource.

If a road is accessible and well maintained, people will enjoy and use the areas with a feeling of ownership. Contrarily, if a road is not accessible or not maintained, the public feels abandoned and mistreated by the Forest Service.

Cultural values for recreating in the forest are important to the public mainly for the use of facilities and recreating near adjacent water bodies. It is general practice by the public when accessing recreational areas to park as close as possible to their destination. Allocating more resources or efforts to keeping access open and maintaining the operational maintenance level for a road leading to a particular recreational site creates the impression of preference toward a specific visitor group or surrounding community. Lack of road maintenance leading to recreation sites on the other hand is considered abandonment by the public and the area can soon become a trash-dumping zone affecting the visual quality and safety of the public. These overall

poor maintenance conditions are difficult for the public to accept and discourage the recreational use at particular sites.

Recreation activities on the EYNF are limited due to existing physical conditions found in the forest. These include steep slopes, soil types, precipitation, land allocation and dense vegetation. For these reasons, most of the recreation activities occur near existing roads and parking areas which are located next to picnic areas or trailheads.

The construction of new roads is not recommended because of the existing physical conditions mentioned above and their impact to resources. The forest only allows for pedestrian hiking trails. Motorized trails such as off-highway vehicles (OHVs) and all-terrain vehicle (ATVs) as well as equestrian trails are not allowed on the EYNF. Motorized camping is also not available in the forest. For these reasons new roads are not recommended on this forest.

The forest receives local, continental and international visitors that participate in unroaded and roaded recreational activities such as hiking, viewing and photographing nature, water play, and driving for pleasure. Some trails are located near forest roads and are used as pedestrian hiking trails. A short portion of El Yunque Towers road (FR 10) is actually a segment of Mt. Britton Trail. The Trailhead is located on a state road at a lower elevation. The trail connects with route FR10 for approximately 80 yards and then reconnects with the trail which leads to Mt. Britton Tower. After visiting Mt. Britton Tower hikers will sometimes use the entire FR10 as a trail and hike to the lower elevation where the trailhead is located. The wilderness area is setback from route FR 10 along its Eastern boundary and route FR 12 on the Western boundary. Route FR 12 is used as an access road for those that work with the PR Parrot Recovery Program. The existing wilderness trails do not connect or are near these two roads.

The Aserradero area along PR 988 was used as a primitive camping area many years ago but was later abandoned due to wet soil conditions and the presence of bees. Based on that, route FR 15 is no longer needed to meet forest resource management objectives and is recommended to be decommissioned.

Most forest roads are gated but are not restricted to hikers that wish to use them as trails. In the past, the decision to gate forest roads was questioned by some groups but they were willing to accept the changes as long as an alternative access was provided. The dependence on road access has been adjusted according to forest needs. The reasons provided to the public were understood and meant for the wellbeing of the user and the resource.

Biology

To address the unique biological resources of the EYNF, which includes the At-risk (Federally-listed and Species of Conservation Concern) and focal (management monitoring species), this section shall provide a programmatic effects analysis. This means that effects will be broad in scope, similar to a Forest Plan level summary, not a project-level analysis, where a great deal of detail is required for direct, indirect, or cumulative effects.

The following includes the accepted programmatic questions that are accepted through US Forest Service (USFS) policy and will provide a uniformed method to compare with other USFS land units:

1. *What ecological attributes, particularly those unique to the region, would be affected by "roading" of currently "unroaded" areas?*
2. *To what degree do the presence, type, and location of roads increase the introduction and spread of exotic plant and animal species, insects, diseases, and parasites?*
3. *What are the potential effects of such introductions to plant and animal species and ecosystem function in the area?*
4. *To what degree do the presence, type, and location of roads contribute to the control of insects, diseases, and parasites?*
5. *How does the road system affect ecological disturbance regimes in the area?*
6. *What are the adverse effects of noise caused by developing, using, and maintaining roads?*
7. *What are the direct effects of the road system on terrestrial species habitat?*
8. *How does the road system facilitate human activities that affect habitat?*
9. *How does the road system affect legal and illegal human activities (including trapping, hunting, poaching, harassment, road kill, or illegal kill levels)? What are the effects on wildlife species?*
10. *How does the road system directly affect unique communities or special features in the area?*
11. *Do areas planned for road entry, closure, or decommissioning have unique physical or biological characteristics, such as unique natural features and threatened or endangered species?*
12. *How and where does the road system facilitate the introduction of non-native aquatic species?*
13. *To what extent does the road system overlap with areas of exceptionally high aquatic diversity or productivity, or areas containing rare or unique aquatic species or species of interest?*
14. *What are the traditional uses of animal and plant species within the area of analysis?*
15. *How and where does the road system restrict the migration and movement of aquatic organisms?*
16. *What aquatic species are affected and to what extent?*

Current Conditions

There are two components to the biological section of EYNF's tropical wildlife and fisheries; one being aquatic, and the other terrestrial. This is only a summary of the two components starting with the aquatic (fisheries) species of the EYNF.

Trophic level begins with the benthic invertebrate's community in the EYNF by the genera of freshwater shrimps *Atya, Xiphocaris and Macrobrachium*. Ten species of omnivorous shrimp inhabit rivers of the EYNF and represent most of the functional feeding groups found in stream macroinvertebrate communities. All the EYNF shrimp species are amphidromous –spending most of their life cycle in freshwater where they grow from post larvae into reproductive adults (Covich and McDowell, 1996).

One endemic freshwater crab (*Epilobocera sinuatifrons*) also inhabits EYNF rivers as do predatory fish including the freshwater mullet (*Agonostomus monticola*), freshwater eel (*Anguilla rostrata*), and four species of omnivorous gobies: *Awaous banana, Gobiomorus dormitor, Eleotris pisonis, Dormitator maculatus*. At high elevations, the only fish species present is the algivorous goby *Sycidium plumieri*. Of special note, is the American eel, which is a catadromous fish species, where adults travel to breeding areas in the Sargasso Sea to the north and the next generation of young eels return to the EYNF streams.

EYNF's other notable aquatic species include the migratory freshwater snail (*Neritina punctulata*). Blanco and Scatena (2006, 2007) studied another dominant diadromous snail, *Neritina virginea*. The density of this snail species increases with water depth and there were no population of *N. virginea* were found in rivers that were disconnect from the ocean for most of the year.

Terrestrial species of note for the EYNF includes 11 species of Coquis (tree frogs), 3 species of snakes, many other species of lizards and geckos on the Forest that make up the majority of endemic terrestrial species.

The EYNF has under the Federally listed endangered, threatened, proposed, or candidate category five listed species: the Puerto Rican parrot, Puerto Rican broad-winged and sharp-shinned hawks, Puerto Rican boa, and Elfin-woods warbler.

The Elfin-woods warbler is now in a higher priority for the US Fish and Wildlife Service and has completed a candidate conservation plan with the EYNF to meet the challenge of reducing range. The conservation plan is an attempt to avoid being categorized as endangered. Regarding the four federally listed birds: Puerto Rican parrot, Elfin-woods warbler, Puerto Rican sharp-shinned hawk and Puerto Rican broad-winged hawk, population conditions on the EYNF are greatly affected by the present vegetation structure.

There are a total of 8 plant species listed on the Forest. During 2011, El Yunque assisted USFWS in the preparation of a 5-year review for the following species: *Styrax portoricensis*, *Ilex obcordata*, *Eugenia haematocarpa*, *Callicarpa ampla*, *Ternstroemia luquillensis* and *T. subsessilis*. *Styrax*, *Eugenia*, *Pleodendrum* and *Callicarpa* spp. have been reproduced at El Yunque via seeds or air layering. Overall, the individuals, thus populations of these species, have

increased at El Yunque and at other protected lands in Puerto Rico where they have been reintroduced or new populations located via surveys.

A 2001 survey showed an increase of four times the number of *Lepanthes eltoroensis* individuals reported at the time when the Recovery Plan for the species was developed in 1996. The total known population and expected new sites where the population may also exists lies protected within the El Toro Wilderness Area.

Ternstroemia luquillensis and *T. subsessilis* were not able to be located during the 5-year review field surveys at EYNF. There is an information gap about these two species due to the lack of monitoring surveys and official recent reports. Reconnaissance field surveys for the historic recorded sites will be implemented to determine the actual status of the species at EYNF. *Ilex obcordata* showed to be stable and new populations sites were documented for the species at EYNF during the 5-year review surveys.

The Species of Conservation Concern (SCC) category; consists of ten species of coquies, two species of anole lizards, one bat species, four bird species, five species of fishes, two species of freshwater shrimp, and forty three plant species.

Table 4.1 Threatened, Endangered, and Proposed Animal and Plant Species known to or suspected to occur on the EYNF

Group	Species Scientific Name	Common Name	Federal Status
BIRDS	***Amazona vittata***	**Puerto Rican Parrot**	E
	Buteo platypterus brunnescens	**Puerto Rican Broad-winged Hawk**	E
	Accipiter striatus venator	**Puerto Rican Sharp-shinned Hawk**	E
	Dendriocia angelae	**Elfin Woods Warbler**	C*
REPTILES	***Epicratus inornatus***	**Puerto Rican Boa**	E
PLANTS	***Callicarpa ampla***	**Capa Rosa**	E
	Eugenia haematocarpa	**Uvillo**	E
	Ilex obcardata	**Cuero de Sapo**	E
	Lepanthes eltoroensis	**Babyboot Orchid**	E
	Pleodendron macranthum	**Chupa Gallo**	E
	Styrax portoricensis	**Palo de Jazmin**	E
	Ternstroemia luquillensis	**Palo Colorado**	E
	Ternstroemia subsessilis	**Kobuski el yunque colorado**	E

C* is for the Candidate category by the US Fish and Wildlife Service. This bird species is presently in the stages for further federal listing and is expected to change in the fore-seeable future thus the species is treated as a proposed species.

Table 4.2 Species of Conservation Concern Animal and Plant Species known to or suspected to occur on the EYNF

Scientific Name	English Common Name	Spanish Common Name	S-Ranking	PRDNER Rank[1]
Amphibian: Coqui Species Group (PRDNER 2008)				
Eleutherodactylus eneidae	Mottled coqui	Coqui de eneida	S1	CR/EC
Eleutherodactylus karlschmidti	Web-footed coqui	Coqui palmeado	S1	CR/EC
Eleutherodactylus unicolor	Burrow coqui	Coqui duende	S2	DD/BV
Eleutherodactylus locustus	Warty coqui	Coqui martillito	S2	VU/EC
Eleutherodactylus richmondi	Ground coqui	Coqui caoba	S2	VU/EC
Eleutherodactylus gryllus	Cricket coqui	Coqui grillo	S2	DD/BV
Eleutherodactylus hedricki	Tree-hole coqui	Coqui de hedrick	S2	DD/EC
Eleutherodactylus portoricensis	Puerto Rican coqui or upland coqui	Coqui de la montana	S2	VU/EC
Eleutherodactylus brittoni	Grass Coqui	Coqui de las llervas	S2	DD/BV
Eleutherodactylus wightmanae	Wrinkled coqui	Coqui melodioso	S2	DD/BV
Reptiles: Lizard (PRDNER 2005)				
Anolis cuvieri	Puerto Rican giant anole	El legarto verde	S2	DD
Anolis occultus	Puerto Rican pygmy anole	Legartijo pigmeo	S2	DD/BV
Mammal (PRDNER 2008)				
Stenoderma rufum	Red fig-eating bat	Murcielago frutero nativo	S2	VU/EC
Bird (PRDNER 2005)				
Icterus dominicensis portoricensis	Black-cowled oriole	Calandria	S2	DD/BV
Dendroica caerulescens	Black-throated blue warbler	Reinita azul	S2	DD
Falco peregrinus	Peregrine falcon	Falcon peregrinus	S1	CR/EC
Fishes and Aquatic Species (PRDNER 2005)				
Anguilla rostrata	American eel	Anguilla	S1	DD
Awaous banana	River goby	Saga, gobio de rio	S2	DD
Dormitor maculatus	Fat Sleeper	Mapiro	S2	DD
Eleotris pisonis	Spinycheek sleeper	Moron	S2	DD
Gobiomorus dormitor	Bigmouth sleeper	Guavina bocon	S2	DD
Macrobrachium carcinus	River shrimp	Camaron de rio	S2	LR-da,BV
Macrobrachium crenulatum	A shrimp	Camaron	S2	LR-ca/EC
Mollusc Species (PRDNER 2005)				
Luquillia luquillensis	A land snail	Un caracol	SNR	
Plant Species				

Scientific Name	English Common Name	Spanish Common Name	S-Ranking	PRDNER Rank[1]
Brachionidium ciliolatum	Hairy cup orchid			
Lepanthes caritensis	Carite babyboot orchid			
Lepanthes dodiana	Island babyboot orchid			
Lepanthes selenitepala ssp. ackermanii	Mountain babyboot orchid			
Lepanthes stimsonii	Babyboot orchid sp.			
Marlierea sintenisii		Beruquillo		
Miconia foveolata	Puerto Rico johnnyberry			
Miconia pycnoneura	Ridge johnnyberry			
Pilea multicaulis	Liquillo mountain clearweed			
Symplocos lanata	Nispero cimarron			
Ternstroemia heptasepala	Saintedwood			
Varronia wagnerorum	Luquillo Mountain manjack			
Xylosma schwaneckeana	Schwaneck's logwood			
Solanum woodburyi	Woodbury's nightshade			
Calyptranthes luquillensis	Luquillo Forest lidflower			
Cybianthus sintenisii	Puerto Rico ridgerunner			
Pilea yunquensis	Mountain clearweed			
Laplacea portoricensis		Nino de cota		
Ardisia luquillensis	Mountain Marlberry			
Maythenus elongate				
Brachionidium parvum	Little cup orchid			
Brunfelsia lacteal	Lady of the night			
Brunfelsia portoricensis	Puerto Rico raintree			
Psidium sintenisii		Hoja menuda		
Ravenia urbanii		Tortugo prieto		
Lindsaea stricta var. jamesoniiformis	Smallstalk necklace fern			
Eugenia borinquensis		Guayabota De sierra		
Eugenia stahlii	Stahl's stopper			
Garcinia portoricensis		Palo de cruz		
Gonocalyx portoricensis	Puerto Rico brittleleaf			
Lepanthes veleziana	Puerto Rico babyboot orchid			
Lepanthes woodburyana	Woodbury's babyboot orchid			

Scientific Name	English Common Name	Spanish Common Name	S-Ranking	PRDNER Rank[1]
Mikania pachyphylla	Luquillo Mountain hempvine			
Morella holdrigeana				
Justicia martinsoniana	Puerto Rico water-willow			
Urera chlorocarpa		Ortiga		
Ternstroemia stahlii		Mamey de cura		
Eugenia eggersii		Guasabara		
Banara portoricensis		Puerto Rico palo de ramon		
Calyptranthes woodburyi	Woodbury's lidflower			
Conostegia hotteana	Luiquillo Mountain snailwood			
Coccoloba rugosa		Ortegon		
Magnolia splendens	Laurel magnolia			

[1] The PRDNER rank is from Puerto Rico comprehensive wildlife conservation strategy (Garcia 2005) and the Puerto Rico natural patrimony species list (Rivera 2008, 2013). The PRDNER adapted the following five categories from the International Union of Conservation of Nature red list (IUCN 2012): Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Low Risk (LR); and Data Deficient (DD).

FS Sensitive Species General Discussion – Construction and maintenance of roads in currently un-roaded areas has the potential to impact a variety of species in similar ways. Bird species are impacted most by fragmentation of habitat, disturbance during breeding season, and changes in habitat due to introduction of non-native plants and altered fire regimes. Increased encroachment on un-roaded areas results in impacts related to urbanization described at the beginning of this section. Plant species are also affected through direct disturbance of individuals during road construction or creation of wildcat roads. Additional effects to plant species can result from increased illegal collection of rare species and the introduction of non-native competitors that degrade habitat quality or alter natural fire regimes. Similarly, insect species are also potentially impacted by the introduction of non-native plants along travel corridors. Most frequently, non-native plants compete with and exclude native plant species that function as host plants for insects during some part of their complex life cycles.

Table 4.3 Potential Focal Species*

Scientific name	Common name	Group*	Ecological sustainability evaluation Crosswalk*
Lamponius portoricensis	Walking stick	A	2, 6
Setophaga angelae	Elfin woods warbler	B, C	1, 2, 3, 6
Buteo Platypterus brunnescens	Puerto Rican Broad-winged hawks	B, C	1, 2, 3, 6

Scientific name	Common name	Group*	Ecological sustainability evaluation Crosswalk*
Accipter striatus venator	Puerto Rican Sharp-shinned hawk	B, C	1, 2, 3, 6
Eleutherodactylus eneidae	Mottled coqui	C	1, 2, 3
Eleutherodactylus karlschmidti	Web-footed coqui	C	1, 2, 3
Eleutherodactylus unicolor	Burrow coqui	C	1, 2, 3
Eleutherodactylus locustus	Warty coqui	C	1, 2, 3
Eleutherodactylus richmondi	Ground coqui	C	1, 2, 3
Eleutherodactylus gryllus	Cricket coqui	C	1, 2, 3
Eleutherodactylus hedricki	Tree-hole coqui	C	1, 2, 3
Eleutherodactylus portoricensis	Puerto Rican coqui or upland coqui	C	1, 2, 3
Eleutherodactylus brittoni	Grass coqui	C	1, 2, 3
Eleutherodactylus wightmanae	Wrinkled coqui	C	1, 2, 3
Atya lanipes		D	5
Atya scabra		D	5
Epicrates inornatus	Puerto Rican boa	C	4,
Anolis cuvieri	Puerto Rican giant anole	C	2, 4
Amazona vittata	Puerto Rican parrot	A, C	Special Endangered species recovery, 2, 8
Anguilla rostrata	American eel	D	9

Group*:

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

Ecological sustainability evaluation crosswalk*:

1) Animal sensitive to parasites/pathogens
2) Animal sensitive to predation by non-native animals
3) Animal sensitive to recreational traffic disturbance

4) Animal sensitive to road mortality
5) Freshwater crustacean
6) Mature Tabebuia/Eugenia woodland associate
7) Novel Associates
8) Palo Colorado Associates
9) Rio Mameys Associates
10) Riparian Associates
11) Sierra Palm Associates
12) Tabonuco Associates

Ecological attributes are general terms that can be interpreted into different definitions. In this report the attributes will be known as abiotic factors. The abiotic factors known to the scientific community consists of temperature, sunlight, wind exposure, water and soil conditions, and finally periodic disturbances trends.

Past experiences and research confirms that if the construction of roads into untouched areas is permitted, the potential for the following can be expected: The ambient temperature will increase due to the amount of open canopy that would occur with the cutting of trees for the road's right-of-way. The increase in temperature would occur through enhanced sunlight that would penetrate to the forest floor. Normally a tropical rainforest has a closed canopy with diverse forest types consisting of different density scales of basal areas. Now with this open canopy, the forest floor will experience a new growth cycle of dominant trees in their specific forest type, but the presence of exotic plants would also increase and may out-compete most early successive endemic trees. Runoff would increase on the construction site, thus increasing transportation of sediment and soils into the stream ecosystem of the Forest. The addition of this sediment would reduce water quality and may contribute to landslides that are prevalent in tropical soil types. The accumulation of these negative effects will play a detrimental role when periodic disturbances such as hurricanes arrive on the Island of Puerto Rico. Any number of hurricanes in the Caribbean may have an ecological affect into an area with a new road in the Forest, which may cumulatively reduce the quality of robust habitats for endemic species.

There are four Forest types on the EYNF: Tabonuco, Palo Colorado, Sierra Palm, and Dwarf (Elfin woods) forests. The current road system has varying degrees of influence on the spread of exotic plant and animal species, insects, diseases, and parasites in each of these forest types. These tropical rainforest types are very different in spatial and temporal scales for ecological processes in comparison to temperate forests.

All roads maintained on the Forest that lie in the Tabonuco and Palo Colorado Forest types have contributed and in some cases promoted the access of exotic species into the Forest. When traveling on FS roads, except FR 15, the dense presence of Impatiens and Asiatic bamboo (*Bambusa vulgaris*) located in the right-of-way is evidence of the high success of these foreign plant species. Introduced mammals such as the Mongoose (*Herpestes auropunctatus*) and feral dogs and cats have used the roads as arteries into these Forest types. Studies in the past have shown that the Mongoose use human paths for migrating around the forest. Roads in the lower elevations of the Forest provide an ideal corridor to reach other areas of the forest not yet infiltrated. Developed areas are immense sources of non-native plants that are used as ornamental landscaping. Additionally, other governmental agencies in the region have used many of the invasive species as erosion control or as landscaping along roadways.

Maintained roads in the Sierra Palm and Dwarf Forest types for the most part have not shown a high degree of exotic elements that can change ecological attributes. The status of the endemic species is in good conditions, which researchers still use to study the Sierra Palm and Dwarf Forest types for long-term studies. Ecological processes such as water condensation levels are still being studied at various elevations and currently the roads allowing access to researchers may be used by exotic species. In the future, growing populations of exotic pests will definitely use the road system in both Forest types as conduits to high altitude areas. Sensitive species such as the Elfin Woods Warbler could be potentially threatened with an increase of exotic species activities.

Feral dogs and cats, mongoose and iguanas have a more negative direct effect to native terrestrial species than to ecological functions. The interactions over a long period may exhibit an adverse or unknown relationship between endemic and non-native invasive species. Most endemic terrestrial species will not use those areas on the road right-of-way for either shelter or foraging endeavors. There is a noticeable change of the species occurring on the road right-of-ways, which are of considerable concern. Exotic plants and animals are usually found along the passageway provided by the road system with little dispersal to other parts of the Forest.

The existing road system provides access for monitoring and control of insect, disease and parasite problems in tropical forest habitat. Given the high vegetation and terrestrial species diversity of the tropical rainforest insects, diseases and parasites have never attained a critical level that merits massive treatments such as in temperate forests. Thus the existing road system does not critically contribute to this issue.

The most common ecological disturbance at EYNF is hurricanes, heavy rain storms and subsequent landslides. Most of the landslides are associated with the road system, thus if there is any increase in the frequency of this type of disturbance there is an expectation of more sediment in the streams and rivers and more open canopy locations along these road routes.

The development, maintenance, and use of roads have resulted in some levels of urbanization effects at the lowest elevations of the mountain range. The main effects are currently those that are directly road-related, such as increased human recreational activity and associated noise levels, as well as reduced wildlife crossings. However, as the number of visitors continues to increase, there will likely be increased effects including soil compaction from pedestrian traffic outside of road right-of-ways, and the potential increase of loud music in the area.

Roads can fragment habitat and disrupt wildlife migration corridors. In addition to fragmenting the habitat and reducing habitat availability, high road density can translate to a higher incidence of vehicle-caused mortality.

The transportation analysis has taken potential for habitat damage into consideration throughout the EYNF, and FR 15 has been recommended for closure in order to prevent resource damage that could harm existing improvements that benefit wildlife, native vegetation, and aquatic species.

The following table describes the road system and how it facilitates human activities that affect habitat:

Road ID	Road Name	Human activities that affect habitat
FR 10	El Yunque Towers	FS roads 10, 11, 13, 14, 15, 915, and 9915 contribute to fragmentation; which is the most observable change in the habitat with a range of human activities, such as recreation and development that decreases the quality of habitat for any species' range. There is also the potential introduction of non-native terrestrial invasive species along with light and noise pollution which contributes to reducing the quality of the habitat. There is a potential increase of non-point and point source sedimentation into intermittent and perennial streams. Recreational use on the Forest is improved through the use of these roads. The cumulative recreational use on the Forest doesn't significantly affect wildlife habitat because of the designation of recreational sites. Other activities with special use permits may or may not occur on previously disturbed areas and the present road system provides routes to all of these usable locations on the Forest.
FR 11	Water Tank Road	
FR 13	La Mina	
FR 14	Stone House	
FR 15	Aserradero	
FR 915	Bisley	
FR 9915	Cristal	
FR 12	Palo Hueco Road (Sonadora Rd)	This road is closed to the public and is only open for administrative use for either water infrastructure or endangered species management. Therefore this road has very little direct, indirect and cumulative adverse effects through strict access control. It still has a degree of non-native invasive species introduction issues and poses minor habitat fragmentation issues. Sedimentation is controlled through maintenance and if maintenance ceases, it can result in reduced aquatic species habitat and quality issues.

The issue of illegal human activities revolves around the Rio Cristal, Bisley, and Palo Hueco (Sonadora) roads. Lack of monitoring and remoteness provide for an idyllic setting to conduct the following: illegal fishing, dumping of trash, abandonment and blazing of stolen vehicles, desertion of pets, and trespassing into sensitive areas. These illegal activities are made possible through the use of system roads on the Forest. Stewardship and public relations can curb the rate of illegal events on the roads, but construction of new roads for public use may bring more of these prohibited actions further into the core of the Forest.

EYNF has one road (FR10-El Yunque Towers) that significantly accesses the Dwarf Forest which is a unique ecosystem. Recreational visitation to these areas and its use as electronic communication sites may result in the introduction of non-native species of flora and fauna, or damage to special or small communities of rare or sensitive species present in this unique ecosystem. As an ecosystem, the Dwarf Forest (2,200 acres or 4% of EYNF) represents a rare

and unique vegetation type for which the Land Management Plan calls for protection and preservation.

Aserradero road (FR 15) is recommended for closure. This particular road lies within the floodplain of the tributary of the Rio Sabana watershed. The old unmaintained road is presently being used as a location for increased pollinators with the hope of collecting data on habitat effects; therefore the road does not require maintenance for pedestrian traffic. Cumulatively, there are individuals of Puerto Rican boa, an endangered species, that are known to occur within the area of route FR 15. Since the road is not used, movement by the boa has been adequate for the species' needs. Closure of this road would be beneficial to reduce management costs and any indirect, direct costs and adverse effects.

New roads are not currently planned for construction on the EYNF. Any future projects that would involve new road construction would be independently analyzed in order to minimize and/or mitigate effects. The fragmentation created from roads pose a threat to moving male boas searching for reproducing females during the breeding season. Nighttime road traveling has the potential of harming those species attempting to cross the road at the most vulnerable time of the year; breeding season.

All existing FS roads cross a body of water (stream or river). This due to the natural settings of a tropical rainforest; the only difference is whether the stream is intermittent (seasonal) or perennial (constantly flowing). The only locations where non-native invasive aquatic species can be introduced would be at a water crossing, such as a culvert for a natural flowing body of water. This is historically, the most accessible point for a person to reach a body of water. An individual would have to directly and intentionally release a non-native aquatic species and ensure that the organism can reach and stay within the water.

There is no specific location on FS roads that would be delineated as a known point of intentional release or introduction for an exotic aquatic species. If there was, it would be identified as the direct access point the road system facilitates for non-native aquatic species. The effects may result in a change in biological composition and over a long period of time either a change in algae density or other aquatic vegetation structure.

Areas of exceptionally high aquatic diversity or productivity or areas containing rare or unique aquatic species or species of interest are shown in the table below.

Road ID	Road Name	Exceptionally high aquatic diversity or productivity areas
FR 13	La Mina	These two roads are near the tributary of the Rio de la Mina. What makes this exceptional is they are located near the beginning of the wild and scenic section. There are multiple elements to this tributary that make it an ideal location for this designation, but these small roads are only in the area adjacent to this designated zone.
FR 14	Stone House	
FR 12	Palo Hueco Road (Sonadora Rd)	This road is closed to the public and is restricted to administrative use for either water infrastructure or

		endangered species management. The Rio Espiritu Santo occurs immediately adjacent to this road and provides multiple points of access to the river. This reach of the river is immediately downstream of an active dam for use by the Puerto Rico Water Authority for human consumption. Many different age-classes of all the aquatic species are congregated at the downstream section of this small dam. This area is fortunately out of access for any illegal fishing.

Wildlife viewing is the primary traditional use for wildlife species. No fishing is allowed on the forest until wildlife and fisheries management areas are designated and Puerto Rico Department of Natural Resources game wardens are assigned for patrols.

Currently, no major barriers to fish movement seem to exist as a by-product of road presence. Most culverts are occurring in small-order tributaries to streams. So no major movement is specifically identified, at this time.

No aquatic species are affected on this forest due to the existence of forest roads.

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Special Uses

How does the road system affect managing special-use permit sites (concessionaires, communications sites, utility corridors, and so on)? SU (1)

The road system in the El Yunque Forest provides access to various locations on the forest for special use activities. The PR 191 corridor is probably the road used by the majority of special use permit holders, especially for outfitter/guides, commercial photos and filming, non-commercial group events and some research activities. This non system road is the site of a food service concession (Palma de Sierra and Big Tree Trailhead). It also provides the main transportation route through the forest to connect to areas where the communication sites are located. In addition it provides access to utility lines and a hydroelectric facility on the south side of the forest. When PR 191 is closed, outfitter/guides tend to use state routes PR 988 and PR 186 for recreation opportunities.

Research special uses are dispersed throughout the forest and probably utilize the widest range of roads in the forest to access various locations (often more remote areas) for various types of research. Research permit holders usually combine the use of roads and trail systems.

There are two communications sites on the forest: one at El Yunque Peak, at the end of FR 10, and at Pico del Este, at the end of FR 27. The FAA maintains most of FR 27 under their special use permit for the site. Nine communications permit holders make use of the El Yunque Peak communication site. Though needed, there is currently no road maintenance agreement in place with the nine permittees.

The forest does issue several commercial photo and filming permits each year. The majority of this use is along the PR 191 corridor and along the El Verde (PR 186), Jimenez (PR 9966) and Sabana (PR 988) routes. The road system provides adequate access for film crews and equipment for small productions, but is not always suitable for major filming productions.

Most of the organizational camps under permit are located along the PR 186 corridor. The electrical utility system follows along portions of the PR 191 and PR 186 corridors and FR 10 at El Yunque Peak. Access to power lines is also available from the Pico del Este road (FR 27) and the Sabana Road (PR 988). There are also electrical lines that cross the forest in areas that are not accessible by roads.

The following table indicates the various roads and the types of special use authorizations utilizing the road systems.

Road ID	Name	Type of special use permits	Comments
FR 10	El Yunque Towers	9 Communication facilities permits; some research; electric ROW	Many keys have been issued for access behind gate
FR 12	Sonadora Road	Research, AAA use to access water Pump facility	

Road ID	Name	Type of special use permits	Comments
FR 27	Pico del Este	FAA Communication facility; Research; 2 Recreation residences; electric ROW	FAA to move gate from current location to location closer to intersection with highway 191. Most research in area is coordinated thru IITF. Recreation residences use area occasionally.
FR 915	Cristal	Research	
FR 9915	Bisley	Research	Mainly IITF coordinates research in this area
Routes under State Jurisdiction but with access to the forest			
PR 186	El Verde	Organizational Camp (Cuerpo de Voluntarios), PRASA, research some filming, electric ROW	
Hwy 191	Palmer-Naguabo	Outfitter/guides; research; non-commercial group events and commercial events, research; food service concession; electrical ROW, water ROW	
PR 903	Experimental Station	Research and admin permit by UPR for El Verde Field station	
PR 963	Girl Scout Camp	Organizational camp	
PR 988	Sabana/Catalina	Research, non-commercial group events; some filming	
PR 9966	Jimenez	Research, some filming	

Road ROW permits on the EYNF include:

Manuel Guzman – Easement – Hwy 191 Km 5.5 Rio Grande
Issued 1995 – expires 12/31/2015

Cultural Resources

Guidelines for conducting a Travel Analysis are given in the Forest Service publication *Roads Analysis: Informing Decisions about Managing the National Forest Transportation System* (Misc. Rep. FS-643, 1999). That report suggests three questions pertinent to cultural uses and heritage resources:

- *How does the road system affect access to paleontological, archaeological, and historical sites?*
- *How does the road system affect cultural and traditional uses (such as plant gathering, and access to traditional and cultural sites) and American Indian treaty rights?*
- *How are roads that are historic sites affected by road management?*

The Roads Analysis (p.25) guidelines note that these are examples of questions that can be asked, and that "These questions and associated information are not intended to be prescriptive, but they are here to assist interdisciplinary teams in developing questions and approaches appropriate to each analysis area." Given this direction, the following questions help evaluate the effects of the roads on cultural-resource sites:

- *How does the road system affect the physical condition and stability of cultural resource sites located in or adjacent to roads?*
- *How does the road system affect access to paleontological, archaeological, and historical sites?*
- *How does the road system affect cultural and traditional uses (such as plant gathering, and access to traditional and cultural sites) and American Indian treaty rights?*
- *How are roads that are historic sites affected by road management?*
- *How does the road system affect the physical condition and stability of cultural resource sites located in or adjacent to roads?*
- *Assessment of Effects on Roads Maintenance Level Status*
-

At a general level, the road system provides access to some of the historic and archaeological sites in the EYNF. Access provided by the road system in the area can affect archaeological and historical sites both positively and negatively. The primary positive affect of road system is the access provided for authorized visitation and site maintenance of a small number of sites. This includes the CCC era recreation sites in Pico del Yunque and La Mina Recreation Area. Lack of road access along FR 10, 13 and 14 can impact the maintenance of the sites they connect to PR 191, and might hinder future potential reuse of the structures. Without these roads it would be much more difficult to monitor sites and ascertain whether any damage is occurring. On the other hand, road access exposes sites to damage by unauthorized artifact collectors and vandalism.

No known paleontological sites are reported for the EYNF, thus none rely on Forest roads for accessibility, monitoring or research purposes.

- Significant roads related to Cultural Resources

  FR14 grants access to one historic site – Stone House. This small track of road connects PR191 to the house on the north site of the road and its use is restricted to administrative use by a gate with Forest Service lock. It is recommended that this road be retained as a ML3 to be used for monitoring and maintenance purposes of the site and to allow the future development of the location as a potential rental lodge. FR 10 gives access to five historic sites – *El Yunque Peak Bathrooms, El Yunque Peak Quarters, El Yunque Peak Tower, Mt Britton Tower and Army Barracks*. The first four are part of the active recreation offering of EYNF and are National Register Eligible as part of *the New Deal Era Multi-Property National Register Nomination*. They are also accessible using an existing trail system but the road serves as an alternative pedestrian access to visit the sites. The *Army Barracks* site is only accessible through FR10. It is recommended that this road be retained as a ML3.

  FR13 is a short loop road that grants access to one site -La Mina House, a CCC style residence considered eligible for inclusion in the National Register.

Puerto Rico has no federally recognized tribes. None of the regulations aimed at addressing Native American rights apply to the island.

Only a segment of road PR191 south has been determined eligible for inclusion in the National Register, while PR186 is considered potentially eligible pending on further evaluation. Both Roads are CCC era roads. None of them are been considered in this assessment as Forest Service Roads. None of the sections of forest system roads have been formally evaluated to determine their National Register Eligibility status. Only one associated feature along FR12 is cataloged as a cultural resource site (*Rock Wall La Hueca Road*). Routine maintenance does not affect qualities of these roads that make them of historic interest. Preservation and protection of surviving historic road features is considered important to maintaining their historic values.

It is important to consider the impacts the road system has had, continues to have, and could have in the future on heritage resource sites in the area. In general road systems affect archaeological and historical sites both positively and negatively. The primary positive affect of road is the access provided for authorized visitation and site maintenance of a small number of sites. On the other hand a large number of archaeological sites have been adversely affected through physical damage to sites and the greater access by unauthorized artifact collectors.

Decommissioning unneeded roads will in several cases have a beneficial effect on the long-term stability and preservation of cultural resource sites by making them less susceptible to damage by vehicular traffic, road maintenance or improvement activities, and less readily accessible to at least some potential artifact collectors and looters. It can also have a negative effect when decommissioning limits monitoring and maintenance access to the sites.

In EYNF, decommissioning FR15 near the Sabana Research Station might help conserve the old Saw Mill site area, which coincidently constitutes a wetland area, without adversely affecting the site condition, monitoring status or research possibilities of the resource.

On the other hand, the retention of FR 10, 13 and 14 will aid in the maintenance of the sites, their monitoring and potential future reuse. Decommissioning of these roads could have an adverse effect on the resources by reducing monitoring and maintenance opportunities of the site. Given that vehicular access in all those three roads is restricted to the public by Forest Service gates, it is believed they represent no threat to the archaeological and historical resources next to them. From the Cultural Resources management standpoint it is recommend that these routes be retained and designated as the same maintenance level (ML3).

Route FR12 contains one site which is pending an evaluation of National Register significance, but has never been considered as a significant asset in need of monitoring. If the maintenance level is downgraded, or decommissioning of the road is considered, then an assessment of the effects of the proposed action need to be completed prior to implementation. No action is necessary if the current road status is retained.

None of the other system roads (FR 11, 915 and 9915) have any direct link to significant cultural resources in the forest. Anny action on them will have no effect on cultural resources.

Road Number	Road Name	Description	Recommendation
FR 10	El Yunque Towers	Access to five significant sites	Retain as is
FR 11	Water Tank Road	No site access	Not relevant to cultural resources
FR 12	Sonadora Road	One site along the road	Partially relevant to cultural resources
FR 13	La Mina House Entrance Road	Access to one significant site	Retain as is
FR 14	Stone House Entrance Road	Access to one significant site	Retain as is
FR 15	Aserradero	Access to one potentially significant site	Recommend for decommissioning
FR 915	Cristal	No site access	Not relevant to cultural resources
FR 9915	Bisley	No site access	Not relevant to cultural resources

Fire Protection & Safety

The EYNF includes 28,000 acres of National Forest System land and is a dominant feature on the eastern half of the Puerto Rican Island. With its dense Rain Forest and steep, rugged terrain radiating in all directions from multiple peaks rising to almost 3,500 feet, it is host to a wide variety of flora and fauna. The temperature range on the forest is usually cooler than the lower elevations and can range from 78 degrees Fahrenheit at its lowest elevations to 65 degrees Fahrenheit at its peaks. Rain is usually a daily occurrence with about 1,700 showers per year, with an average rainfall amount of 200 inches at the higher elevations. With the amount of precipitation the forest receives, it might be obvious that the fire frequency on the forest is extremely low, with approximately 1 fire every 10 years. Although, in drought years, the potential for fires does exist with the amount of dry fine fuels that can sustain fire spread and could lead to large fire growth.

The goal of this transportation analysis is to retain roads necessary to meet the multiple use management objectives of the analysis area and retain the ability to access an area for search and rescue, fire suppression, and use of roads as a possible control feature for planning purposes. While it should be pointed out that the use of these roads for control and containment of a fire is very low and unlikely on the El Yunque, the roads continue to provide some very beneficial uses.

The retention of roads is especially important in the wildland urban interface, not only as possible strategy components to aid in fire suppression, they may also be important to public and firefighter safety because of their use as ingress and egress routes to and from private property and remote sections of the forest. Road access is a major issue for all emergency resources. Many roads on the EYNF do not provide access to large fire trucks. Firefighters are challenged by narrow roads and limited access. Most Municipal/Agency fire engines lack the clearance for maintenance level 2 roads, although these existing roads may prove adequate enough to give them the ability to have access to the fire, clear lines of travel for equipment and personnel. Roads that access trailheads should be kept. Existing roads may also provide access to desirable recreational areas and are also necessary

Minerals

How does the road system affect access to locatable, leasable, and saleable minerals?

The EYNF has an inactive mineral program and as a goal the LMP proposes to maintain it as inactive.

Range Management

How does the road system affect access to range allotments?

There are no grazing allotments within the EYNF.

Timber Management

How does road spacing and location affect logging system feasibility?
How does the road system affect managing the suitable timber base and other lands?
How does the road system affect access to timber stands needing silvicultural treatment?

The EYNF does not have a Timber Production and Sale program. Its LMP has approved a Timber Management Demonstration Program in a 1,200 acres land base. Most demonstration areas or sites are already access by existing roads, only minor spur roads will be needed to fully access the sites. Previous questions will be addressed at the project analysis process.

Step 5- Describing Opportunities and Setting Priorities

The purpose of this step is to:

- Describe the minimum road system
- Describe modifications to the existing road system that would achieve desirable or acceptable conditions

The Products of this step are:

- A map of the current and proposed road system

The Minimum Road System

36 CFR 2.2.5 (b) a portion of the Travel Management Rule states:

> "…b) Road system—(1) Identification of road system. For each national forest, national grassland, experimental forest, and any other units of the National Forest System (Sec. 212.1), the responsible Official must identify the minimum road system (MRS) needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. In determining the minimum road system, the responsible Official must incorporate a science-based travel analysis at the appropriate scale and, to the degree practicable, involve a broad spectrum of interested and affected citizens, other state and federal agencies, and tribal governments. The minimum system is the road system determined to be needed to meet resource and other management objectives adopted in the relevant land and resource management plan (Title 36 CFR part 219), to meet applicable statutory and regulatory requirements, to reflect long-term funding expectations, to ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance."

This step compares the current condition to a desired future condition to help identify the opportunities and need for change. This step provides the information to develop the forest's strategic intent for road management; that is, to balance the need for decommissioning or retaining unauthorized and authorized roads with the need to minimize risk to public safety and damage to natural resources. Before implementing any proposed actions the forest will complete the NEPA process. During the NEPA process, however, roads may be added or deleted from the recommended system.

Another consideration in developing the minimum road system is maintenance. However, some maintenance level 2 roads only need routine maintenance every few years rather than annually. Creating a road system to match the available funds by simply closing roads will not result in a road system that meets the access needs for public or for administrative purposes.

The IDT analyzed the extent and current condition of roads on national forest system lands within the project area. The IDT recommended the minimum road system for this analysis using

the direction in 36 CFR 212.5 (b). The recommendations and issues associated with the identified roads and motorized trails on this analysis are described in the table below.

Table 5.1 – Recommended Minimum Transportation System

Proposed Transportation System		Road Maintenance Levels And Lengths (miles)					El Yunque National Forest
Road Number ID	**Road Name**	**NFSR - ML 1 (closed)**	**NFSR - ML 2 (High clearance)**	**NFSR - ML 3**	**NFSR - ML 4**	**NFSR - ML 5**	**Description**
FR 10	El Yunque Towers			2.00			**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
FR 11	Water Tank Road		0.13				**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
FR 12	Sonadora Road		0.94				**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
FR 13	La Mina House Entrance Road			0.11			**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
FR 14	Stone House Entrance Road			0.04			**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
FR 15	Aserradero		(0.07)[1]				Recommend to **Decommission**. No longer needed to meet forest resource management objectives.

Proposed Transportation System		Road Maintenance Levels And Lengths (miles)					El Yunque National Forest
Road Number ID	**Road Name**	**NFSR - ML 1 (closed)**	**NFSR - ML 2 (High clearance)**	**NFSR - ML 3**	**NFSR - ML 4**	**NFSR - ML 5**	**Description**
FR 27	27					4.30	**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
FR 915	Cristal		2.95				**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
FR 9915	Bisley		0.81				**No Change.** Keep as NFSR and designate as "Restricted to Administrative and Permitted Use Only";
TOTALS		**0.00**	**4.83**	**2.15**	**0.00**	**4.30**	
Recommended minimum road system = 11.28 miles							

[1] – Road miles of decommissioning

Step 6- Reporting

The Purpose of this step is to report the key findings of the analysis.

The products of this step are:

- A written report for this forest and a Transportation Atlas showing existing routes and recommendations for the **minimum road system**.

Report

This report is available to the public, if requested and will become part of the file. A map depicting all recommendations is in Appendix F.

Key Findings and Recommendations

The key findings and recommendations of this analysis which are based on Interdisciplinary Team (IDT) discussion, specialist expertise, and public input, include:

The existing transportation road system on the EYNF was identified and consists of 11.35 miles. The existing system consists of

0.00 miles of ML 1 roads
4.90 miles of ML 2 roads
2.15 miles of ML 3 roads
0.00 miles of ML 4 roads
4.30 miles of ML 5 roads

All roads are currently restricted to Administrative and/or Special Use Permit use only. The general public does not use the existing transportation system for motorized travel. Route FR 27 is occasionally used by pedestrian hikers for a short distance.

Access to all recreational activities on the forest is via motorized state routes.

The recommendations from the IDT for the EYNF are to decommission the route called Aserradero (FR 15) and to retain all other NFS Roads.

The recommended minimum transportation system for the EYNF is 11.28 miles. See summary table below.

El Yunque National Forest Minimum Road System			
Road Number ID	**Road Name**	**Length (miles)**	**Recommendation**
FR 10	El Yunque Towers	2.00	Retain as NFSR and designate as "Open to all Vehicles". ML3
FR 11	Water Tank Road	0.13	Retain as NFSR and designate as "Open to all Vehicles". ML 2
FR 12	Sonadora Road	0.94	Retain as NFSR and designate as "Open to all Vehicles". ML 2
FR 13	La Mina House Entrance Road	0.11	Retain as NFSR and designate as "Open to all Vehicles". ML 3
FR 14	Stone House Entrance Road	0.04	Retain as NFSR and designate as "Open to all Vehicles". ML 3
FR 15	Aserradero	**(0.07)[1]**	No longer needed to meet forest resource management objectives. Recommend to decommission 0.07 miles of road.
FR 27	Pico del Este	4.3	Retain as NFSR and designate as "Open to all Vehicles". ML 5
FR 915	Cristal	2.95	Retain as NFSR and designate as "Open to all Vehicles". ML 2
FR 9915	Bisley	0.81	Retain as NFSR and designate as "Open to all Vehicles". ML 2
	Total	**11.35**	

[1] – Road miles of decommissioning

Appendix A: Definitions

Road Definitions (36 CFR 212.1)

Authorized Road - Roads wholly or partially within or adjacent to National Forest system lands that are determined to be needed for long-term motor vehicle access, including state roads, county roads, privately owned roads, NFSRs and other roads authorized by the Forest Service.

Unauthorized Road - Road on national forest system lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travel ways and off-road vehicle tracks that have not been designated and managed as a trail and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.

Temporary Roads - Roads authorized by contract, permit, lease, other written authorization or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management.

Road Decommissioning - Activities that result in the stabilization and restoration of unneeded roads to a more natural state or conversion to other non-road uses.

Road Reconstruction - Activities that result in improvement or realignment of an existing authorized road as defined below:

Road Improvement - Activity that results in an increase of an existing road's traffic service level, expansion of its capacity or a change in its original design function.

Road Realignment - Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway.

Access Rights: A privilege or right of a person or entity to pass over or use another person's or entity's travel way. (36 CFR 212.1, FSM 5460.5 - Rights of Way Acquisition)

Arterial Road: An NFS road that provides service to large land areas and usually connects with other arterial roads or public highways (7705 – DEFINITIONS).

Collector Road: An NFS road that serves smaller areas than an arterial road and that usually connects arterial roads to local roads or terminal facilities (FSM 7705 – DEFINITIONS).

Forest Road or Trail: A road or trail wholly or partly within or adjacent to and serving the NFS that the Forest Service determines is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1 – FSM 7705 – DEFINITIONS).

Local Road: An NFS road that connects a terminal facility with collector roads, arterial roads, or public highways and that usually serves a single purpose involving intermittent use (FSM 7705 – DEFINITIONS).

National Forest System Road: A forest road other than a road which has been authorized by a legally documented right-of-way held by a state, county, or local public road authority (FSM 7705 – DEFINITIONS – 36 CFR 212.1).

Public Road: A road under the jurisdiction of and maintained by a public road authority and open to public travel (23 U.S.C. 101(a) – (FSM 7705 – DEFINITIONS)).

Private Road: A road under private ownership authorized by an easement granted to a private party or a road that provides access pursuant to a reserved or outstanding right (FSM 7705 – DEFINITIONS).

Route: A road or trail (FSM 7705 – DEFINITIONS).

APPENDIX B– ROAD MANAGEMENT OBJECTIVES

The notes in this section are included in an effort to provide a brief summary of why the TAP recommendations for changes to the road system were made. They do not replace the discussion in under Step 4 of the TAP document. While discussing the recommendations, the Interdisciplinary Team (IDT) reviewed comments that were collected during public meetings and from letters and e-mails submitted by many interest groups, individuals and other agencies. These comments were used to identify issues that needed to be weighed, along with many other factors, in the formation of the recommendations.

The TAP is a living document and therefore will be updated regularly. Line officers and IDTs will continue to consult the TAP as they are planning future projects. Since the TAP contains only recommendations, future projects will continue to receive public input that pertains to the Forest transportation system and may recommend decisions which are not consistent with the initial recommendations of the TAP. Modifications to the TAP's recommendations as a result of final decisions will be incorporated, after the appropriate NEPA procedures have been completed.

FR 10 - El Yunque Towers

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD

- Communications Site – SUP area
- Access for trailheads and historical sites (Rec Fac)
- Restricted to admin/SUP traffic
- Access to Aviary

DESIGN, OPERATION, AND MAINTENANCE CRITERIA

This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Service Life: C – Long Term
- Level of Service: J
- Operational Maintenance Level: 3
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 to 12 feet
Turnouts:	None
Surfacing:	Asphalt
ADT:	<5
Design Speed:	5 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	80% Permittee (SUP)
	20% Admin

FR 11 – Water Tank Road

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD

Road is used for administrative purposes only it gives access to the water treatment plant and to the temporary storage of the solid waste disposal bin (transfer station). The road has a gate at the intersection with Road 988.

DESIGN, OPERATION, AND MAINTENANCE CRITERIA

This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Service Life: C – Long Term
- Level of Service: J
- Operational Maintenance Level: 2
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	12 feet
Turnouts:	None
Surfacing:	Aggregate
ADT:	<3
Design Speed:	5 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	100% Admin.

FR 12 - Sonadora

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD

- Access to resource management activities – wildlife habitat
- Access research
- Access water used intake/dist. service line
- Access vegetation management

DESIGN, OPERATION, AND MAINTENANCE CRITERIA

This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Service Life: C - Long Term

- Level of Service: J
- Operational Maintenance Level: 2
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 feet
Turnouts:	One – Sta.
Surfacing:	Aggregate
ADT:	<5
Design Speed:	5 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	100% Administrative Use

FR 13 – La Mina House

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD

This road gives access to an administrative facility that presently provides support to an endanger species, recovery project (PR Parrot). It is closed to public traffic and access is controlled by an existing gate located on Highway PR 191.

DESIGN, OPERATION, AND MAINTENANCE CRITERIA

This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Service Life: C - Long Term
- Level of Service: J
- Operational Maintenance Level: 3
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 to 12 feet
Turnouts:	None
Surfacing:	Asphalt
ADT:	<5
Design Speed:	3 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	100% Administrative use

Roadbed section is in good condition, asphalt layer will need resurfacing approximately 7-10 years. Occasional landslides will be removed as to maintain access to the facility. Ditch line ends on existing ditch line on PR 191 and has cultural resource value. Most be protected from damaged caused by regular road maintenance work.

FR 14 – Stone House Entrance

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD
This road gives access to an administrative facility.

DESIGN, OPERATION, AND MAINTENANCE CRITERIA

This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Service Life: C – Long Term
- Level of Service: I
- Operational Maintenance Level: 3
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 to 12 feet
Turnouts:	None
Surfacing:	Crushed Aggregate
ADT:	<5
Design Speed:	3 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	100% Administrative use

Roadbed section is in good condition.

FR 15 – Aserradero

Does not meet the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD
This road is no longer used for its intended purpose. The road is naturally disappearing.

DESIGN, OPERATION, AND MAINTENANCE CRITERIA

This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Traffic Service Level: N/A
- Level of Service: N/A
- Operational Maintenance Level: 2
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 to 12 feet
Turnouts:	None

Surfacing:	Aggregate
ADT:	<5
Design Speed:	3 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	100% Administrative use

Roadbed section is returning back to natural.

FR 27 – Pico del Este

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD

- FAA Site – SUP Navy site
- Restricted to admin/SUP traffic

DESIGN, OPERATION, AND MAINTENANCE CRITERIA

This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Traffic Service Life: C – Long Term
- Level of Service: G
- Operational Maintenance Level: 5
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 to 12 feet
Turnouts:	None
Surfacing:	Asphalt
ADT:	<5
Design Speed:	5 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	80% Permittee (SUP) 20% Admin

FR 915 - Cristal Road

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD

This Road was originally used as access from neighboring communities from and to private land tracts. Presently is closed to public traffic at the intersection with PR 988. It is used as access to integrated resource activities such as research, Forest inventory, vegetation management, timber demo projects, and some dispersed recreation.

DESIGN, OPERATION, AND MAINTENANCE CRITERIA
This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Traffic Service Life: C- Long Term
- Level of Service - J
- Operational Maintenance Level: 2
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 – 12 feet
Turnouts:	One at Sta 0 + 87
Surfacing:	Crushed aggregate
ADT:	<3
Design Speed:	3 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	95% Administrative research
	5% Administrative recreation

Roadbed Section will require continuous annual maintenance to maintain its functionality of providing all-weather access year-round to the Long Term Ecological sites (LTER). Road shall be mowed annually or as needed to provide adequate safe sight distance and to reduce unsafe conditions. Road ditches, culverts and drop inlets shall be maintained clean and open to reduce roadbed erosion and resource damage.

FR 9915 - Bisley

Meets the criteria set forth in the Land Management Plan

INTENDED PURPOSE OF ROAD
This Road was originally used as access from neighboring communities to the towns of Fajardo and Luquillo. Presently is closed to public traffic. It provides access to long term Hydrological Research Projects and monitoring weather stations. The road has a control gate at the intersection with State road PR 988.

The road also gives access to the Bisley and Carrillo Trailheads. Those two trails are used on regular basis for recreational visitors.

DESIGN, OPERATION, AND MAINTENANCE CRITERIA
This Road Management Objective (RMO) depicts our objectives in managing our lowest standard road. They reflect:

- Traffic Service Life: C – Long Term
- Level of Service - J
- Operational Maintenance Level: 2
- Functional Class: Local

DESIGN, OPERATION, AND MAINTENANCE STANDARDS

Traveled Way:	10 to 12 feet
Turnouts:	Has two along the Road: Sta: 0 + 00 Sta: 13 + 03 (mts.)
Surfacing:	None, Gravel Surface
ADT:	<3
Design Speed:	3 MPH
Highway Safety Act:	N/A
Estimated traffic mix:	95% Admin. (Research) 5% Rec. Admin

Roadbed Section will need regular recondition work. To maintain functionality of the Road (Service Level) and to avoid resource damage periodic road maintenance is needed. Ditch lines, culverts and drop inlet will be maintained open and clean as to protect resources and research projects.

Road will be mowed on yearly basis. Gate will be kept operational at all times.

Safety considerations are addressed in the overall maintenance plans and hazards are dealt with as they are discovered.

APPENDIX C – INTERDISCIPLINARY TEAM

SO- SUPERVISOR'S OFFICE El Yunque National Forest	
Pedro Rios	Ecosystem Management Team Leader; Forest Planner; Soils, Water, Air & Forestry
Manuel Ortiz	Customer Services & Property Team Leader; Forest Lands, Recreation, & Engineering Program Manager
Raymond Feliciano	Archaeologist; Cultural Resources
Jose Ortega	Recreation Program Leader
Felipe Cano	Forest Biologist
Christina Henderson	Forester; Special Uses
David Bihr	Acting AFMO – Assistant Fire Management Officer on detail from R1, RO Fire aviation & Air
Elijio Curiel Jr.	Editor on detail from the Coronado National Forest, Tucson AZ; Transportation Planning Engineer

APPENDIX D – ISSUES

Identifying Issues

Issues were generated from ID Team meeting with several other members of EYNF and IITF Staff. The forest scale issues will be addressed through this roads analysis project. Subforest scale issues will be recommended for addressing at a scale below the forest level. Examples of subforest analyses are watershed or geographic area assessments or specific project proposals.

The following issues were discussed:

1. Use of Off-Road Vehicles on Forest Roads

The operation of these vehicles on Forest Service roads is prohibited. The EYNF does not allow the operation of these vehicles on FS lands. The damage to the Ecosystem, including noise, pollution, and property damage by such units is well documented. At present time the use of FS Roads and Lands by these units is known and public notification by means of closure orders has been used to reduce the overall FS liability. But the illegal practice is happening to a lower level.

2. Rio Cristal

Some issues were defined in terms of research needs and public access to the area by means of Rio Cristal Forest Road. The research unit wants full access and to maintain this road open to vehicular traffic as far as possible. This will reduce traveling time and improve work-site accessibility. On the other hand, the use by general public of the road to collect Forest products or to entering for disperse recreational activities will increase in the road if it is maintained as needed by research users. Presently this public use is totally controlled by the road gate at the intersection with State Highway 988. It has been proposed to maintain the entrance and the road first mile only, and to open and maintain a pedestrian trail on the remaining length of the Rio Cristal Road. The trail will provide the necessary access for the research unit.

3. Molindero

Several groups use this road. The Defense Department has overall control on the up keeping of the existing road, except the first mile. This section is under the jurisdiction and responsibility of the Puerto Rico Departamento de Transportación y Obras Públicas (PRDTOP). Presently, work is taking place,to transfer the overall jurisdiction to the Department of Defense to improve the overall road maintenance condition.

This transfer of responsibilities will not prohibit the access for the local summer residence users and the research units that poses active projects in the area as well as access for Administrative use and occasional disperse recreational use, this disperse use is limited to pedestrian use only. The proposal includes the relocation of the access control gate to the intersection with State Highway 191.

4. Bisley (FR 9915) /Sonadora (FR 12)

The road to Sonadora (FR 12) will provide access only to Ecosystem management, Research, Cooperative agencies, and to the State Potable Water Managers (ONDEO/AAA) to their work areas. Public access for recreational use is not encouraged and at this time, the road is under a formal closure order (closure order #2013-6).

Bisley gives access to research plots as well as to trailheads under the Recreational Trail System. The access is and will remain pedestrian access. The vehicular access will only be allowed for research projects and for Search and Rescue efforts if needed.

5. Need for Gated Roads

The EYNF is visited, due to its proximity to the metropolitan area, by millions of visitors every year. The Forest is under the category of Urban Forest due to the proximity of a large population with less than one hour of travel time.

The relative remote environment, and the easy road access to the Forest, in congruence with the increment of criminal incidents on the overall population, makes the Forest a place to commit violent acts and to abandon trash and stolen property, such as large household equipment and cars.

The use of gates as access controls in the Forest helps reducing the number of these violent acts. In addition, they protect the ecosystem and property from permanent damage caused by Forest visitors.

On the negative side, the use of gates on some roads has created opposition from a minority of Forest users who will like to experience the Forest at night. The large group of opponents to the gated roads is those who are left behind the closed gate after closing time. These incidents only happen on Highway 191 since other gated roads are kept closed and can be open only by key holders, who gain access for administrative and/or special uses only.

Funding/Budgeting

The existing road maintenance budget is not based on benefited program or users. Only the access roads to the communication sites (FR 10 & FR 27) have a collection fee program with the primary purpose being road maintenance.

Jurisdiction of roads
(FS, PRDTOP, Municipal and Local roads)

Most programs in the EYNF use roads that are under the jurisdiction of PRDTOP and receive occasional maintenance from this state agency. It is well documented that the level of this maintenance and well as the periodicity is not up to the desired level. The Forest management team is under continuous dialog with the State agencies to define new ways to improve the overall roads condition.

On those gated roads in where many research projects are held, the maintenance provided at the present time is not funded by the benefiting resource. As of today, the research unit at the WO Level is presently studying this issue. Those roads are under the NF road inventory system and no budget is allocated from the research program for the maintenance of those roads.

The El Yunque NF average annual road budget allocation totals $37, 000 and is used on the Forest priorities. In the average year, this amount does not meet the road program needs.

Traditionally, the Forest has been able to work closely with the PRDTOP office to meet, to the best possible, the Forest road's needs. These efforts have created a real sense of cooperation in both agencies. It is intended to share the final Transportation Analysis Process (TAP) with the local DTOP office.

1. Recreation impact on certain roads:

    a. Impacts of use, congestion, security, noise issues…high visitation periods

    All roads that have and maintain an access control gate are experiencing low use impact; the gates provide a workable security in terms of damage to the resources as well as overall security to the Forest visitors. Vehicular congestion is only experienced on special dates every year. On those dates, the overall recreational experience is impacted and affected by the congestion of vehicular traffic, by the noise and the visitor's security.

    Gated roads are not affected by unusual traffic congestion; the same can be said about the noise.

    During high visitation periods, Highways PR 191and PR 988 are heavily impacted on the general road use, congestion, noise levels and overall security. On those high visitation days, additional traffic control will be used as on previous years. The Health and Safety of the visitors as well as the FS employees is a key factor at all times, and on high visitation days it becomes critical to maintain open access and emergency access routes.

    b. Night closure

    At this time, only Highway PR 191 is under a night closure order. Previous incidents involving criminal activities and the need to protected the facilities and ongoing projects have forced the use of traffic control during the night hours. This practice has an impact on the Forest human resources and the Forest visitors in terms of the recreational experience but it has been successful in the reduction of reportable incidents.

    c. Future shuttle system

As part of the Forest Transportation Plan, a shuttle system has been considered as an alternative to transport visitors in and out the recreational areas during the high visitation days. This plan is under research and development stage at this time but it is very possible as a solution to the existing condition.

d. Fee Demo for Hwy 191

It is also considered to use the Fee Demo program as a mean to raise funds for the overall maintenance of the facilities including the roads. Under the feasibility study, Hwy PR 191 is being considered as a toll road.

2. The need to maintain FR 27 and FR 10 for protection of Rio Mameyes wild classification in the Wild & Scenic River System.

3. The need to maintain FR 9915 for protection of Rio Mameyes recreational values according to the Wild & Scenic River system.

4. The effect of 2.95 miles of FR 915 road reconstruction on Rio Sabana water quality.

APPENDIX E – FSM 7700

FOREST SERVICE MANUAL
NATIONAL HEADQUARTERS (WO)
WASHINGTON, DC

FSM 7700 - TRANSPORTATION SYSTEM

CHAPTER 7710 - TRANSPORTATION ATLAS, RECORDS, AND ANALYSIS

Amendment No.: 7700-2003-2

Effective Date: December 16, 2003

Duration: This amendment is effective until superseded or removed.

Approved: ABIGAIL KIMBELL
Associate Deputy Chief

Date Approved: 09/24/2003

Posting Instructions: Amendments are numbered consecutively by title and calendar year. Post by document; remove the entire document and replace it with this amendment. Retain this transmittal as the first page(s) of this document. The last amendment to this title was 7700-2003-1 to 7730.

New Document	7710	23 Pages
Superseded Document(s) by Issuance Number and Effective Date	7710 (Amendment 7700-2001-2, 01/12/2001) id_7710-2003-1, 06/12/2003	28 Pages 22 Pages

Digest:

7710 - This amendment incorporates the direction previously issued in interim directive (ID) 7710-2001-3 (and subsequently reissued in ID 7710-2003-1), with minor clarifications. Notice of the issuance of this amendment was published in the Federal Register on December 16, 2003 (68 FR 69986).

The major changes incorporated from the IDs include the removal of the interim requirements previously issued by ID 7710-2001-1 and ID 7710-2001-2, which addressed road management activities in inventoried roadless and contiguous unroaded areas and reserved to the Chief the decision authority over some road construction and reconstruction in roadless and unroaded

Digest--Continued:

areas (formerly in FSM 7712.16 through FSM 7716d). Some of the interim requirements in ID 7710-2001-2 removed from FSM 7710 were revised and issued to FSM 1920 by ID 1920-2001-1. Notice of issuance of ID 7710-2001-3 and ID 1920-2001-1 was published in the Federal Register on December 20, 2001 (67 FR 65796); notice of issuance of ID 7710-2001-1 had been previously published on August 24, 2001 (66 FR 44590).

This amendment also makes minor editorial and style changes, and replaces the terms "transportation facilities" with "forest transportation facilities," "transportation system" with "forest transportation system," "transportation atlas" with "forest transportation atlas," and "road atlas" with "forest road atlas" throughout the chapter to be consistent with the terms as defined and described in 36 CFR 212.1 and 212.2 and in FSM 7705. Additional specific changes are as follows:

7710.2 - Revises paragraph 1 to include user safety, efficiency of operations, and sustainable access, which is consistent with direction in FSM 7702.

7710.42 - Revises direction to remove responsibilities of the Regional Forester regarding the interim requirements (formerly in FSM 7712.16). Adds a monitoring requirement for Regional Foresters to oversee and evaluate implementation of roads analysis in the Region. Removes the requirement for traffic surveillance and classification (former para. 4), which has been moved to FSM 7733.2. Revises the direction on coordination with State and other Federal agencies on transportation planning to "considers" Forest plans rather than "has the benefit of" (para. 3). Removes the direction formerly in paragraph 5 for the Regional Forester's responsibility to review and approve Forest Supervisor requests for time extensions for completion of forest scale roads analysis, because the January 13, 2003 timeframe previously provided for extension requests, as previously provided in ID 7710-2003-1 at FSM 7712.15 has passed.

7710.43 - In paragraph 3, clarifies that the Forest Supervisor's responsibility to complete and maintain an inventory of classified and unclassified roads applies to National Forest System lands only.

7711.03 - Adds a requirement in paragraph 2 to comply with the current spatial data standards described in the Office of Management and Budget (OMB) Circular A-16 and Executive Order 12906.

7711.1 - Clarifies activities that constitute changes in road management status in paragraph 4.

7712.01 - Removes the quoted text of 36 CFR 212.5 previously set out in this Authority section.

7712.02 - In paragraph 2, removes the specific reference to roadless and unroaded areas.

Digest--Continued:

7712.1 - Adds project scale as one of the scales of roads analysis to be considered by the Responsible Official, as provided in FSM 7712.13c. Replaces the term "science-based analysis" with "science-based roads analysis."

7712.11 - Replaces the term "relevant scientific literature" with "appropriate scientific literature."

7712.12 - Removes "and Resource" from the caption.

7712.12b - Adds the conversion of roads to other uses to the list of road management options in paragraph 2, as displayed in FSM 7712.11, exhibit 01.

7712.13 - Removes all references to interim requirements (FSM 7712.16) in exhibit 01. Adds the conversion of roads to other uses to exhibit 01 of this section as a potential project activity, as displayed in FSM 7712.11, exhibit 01.

7712.13b - Clarifies the scope of the road inventory at the Forest scale, as provided in FSM 7712.14.

7712.13c - Clarifies and reorganizes direction; enumerates the paragraphs; and clarifies the scope of the road inventory at the watershed or project scale, as provided in FSM 7712.14. Clarifies in paragraph 4 that the roads analysis process shall be conducted in accordance with policy set forth in FSM 7712.03 and replaces the term "area-scale" with "project-scale" to be consistent with the scope of this section. Adds the conversion of roads to other uses as a potential site-specific priority and opportunity (para. 4c).

7712.13d - Removes the previous exemption for the Columbia River Basin large-scale ecosystem planning effort from conducting roads analysis. The analysis used in the Columbia River Basin planning effort may be used to inform future decisions, and Responsible Officials have the discretion to conduct additional analysis of roads as needed (FSM 7712.1 and FSM 7712.13).

7712.14 - In paragraph 1, adds area scale to the list of inventories providing information for broader assessments. Clarifies that road condition information for multi-Forest, Forest-scale, and area-scale classified road inventories would be needed for "other routes" of key importance, as well as arterials and collectors (para. 1a). Replaces the term "area scale" with "project scale" in paragraph 2 and replaces "lower scales" with "project scale" under analysis and inventories at the watershed scale in exhibit 01. Clarifies that the use of the Infra database is to store physical attribute information for all roads, which is consistent with the information in exhibit 01.

Digest--Continued:

7712.15 - In the caption, replaces the term “deadlines” with “timeframes.” Revises and reorganizes direction; renumbers paragraphs; and incorporates direction previously set out in ID 7710-2001-1, ID 7710-2001-3, and ID 7710-2003-1. Extends the timeframes for requiring roads analysis for road management decisions (para. 2a and 2b) and forest plan revisions or amendments (para. 1a) from July 12, 2001, to January 12, 2002. Clarifies the direction on the timeframes applicable to those units that began a plan revision or amendment but did not complete them on or before January 12, 2002 (para. 1a). In paragraph 1b, permits Forest Supervisors to request that the Regional Forester grant an extension for completion of Forest-scale roads analysis.

Table of Contents

This chapter contains objectives, policies, responsibilities, and requirements for analyzing transportation needs and issues and for documenting the forest transportation system. Direction for forest trails is in FSM 2350 and FSH 2309.18, Trails Management Handbook.

7710.2 - Objectives

The objectives of transportation analysis are:

1. To determine the minimum forest transportation facilities needed for sustainable public and agency access to achieve the goals in the forest land and resource management plan; to safeguard ecosystem health; and to provide user safety and efficiency of operations in an environmentally sensitive manner, within the context of current and likely future funding levels.

2. To incorporate forest transportation facility system needs into the forest land and resource management planning process.

3. To direct the orderly improvement and management of the forest transportation system and to ensure the documentation of decisions affecting the system.

4. To interact with and involve the public, State, local, and Tribal governments, and other Federal agencies in transportation analysis.

7710.3 - Policy

1. Conduct transportation system planning and analysis using the best available science at the appropriate scale and in conjunction with other analyses to inform transportation management decisions. Specifically, transportation analysis can assist transportation planners in:

    a. Determining the need for access to National Forest System lands;

    b. Identifying the infrastructure required to provide that access; and

    c. Considering and minimizing effects of transportation facility construction, reconstruction, maintenance, and decommissioning on ecological processes and ecosystem health, diversity, and productivity.

2. Involve, interact, and coordinate with adjacent landowners; citizens groups; State, local, and Tribal governments; and other Federal agencies. This collaboration is fundamental to effective transportation analysis and planning.

3. Identify and determine the priority areas where detailed transportation analysis, including roads analysis (FSM 7712.1), is essential for achieving land and resource management direction.

4. Ensure that road construction, reconstruction, and maintenance standards or criteria are guided by roads analysis (FSM 7712.1) and documented through the use of road management objectives (FSM 7712.5).

7710.4 - Responsibility

7710.41 - Deputy Chief, National Forest System

The Deputy Chief, National Forest System, has the authority to approve or rescind roads analysis processes for field use.

7710.42 - Regional Forester

It is the responsibility of the Regional Forester to:

1. Ensure that roads analysis is a component of sub-basin, multi-Forest, and sub-regional scale assessments.

2. Develop multi-year Regional schedules of proposed forest transportation facility projects (FSM 1920).

3. Coordinate with State and other Federal agencies on transportation planning and involvement in land and resource management planning to ensure that these agencies' plans are addressed in land management policy development and that the other agencies' policy development considers Forest plans.

4. Oversee and evaluate the use of the roads analysis process within the Region (FSM 7712.1).

7710.43 - Forest Supervisor

The Forest Supervisor is delegated the authority and assigned the responsibility to:

1. Consult and involve Federal, State, local, and Tribal transportation agencies in land and resource management planning to ensure coordination of the overall transportation system.

2. Develop and maintain a forest transportation atlas in compliance with FSM 7711 and with part 212 of Title 36 of the Code of Federal Regulations (36 CFR part 212).

3. Complete and maintain an inventory of classified and unclassified roads on National Forest System lands.

4. Assign transportation analysis to personnel with skills in engineering, hydrology, biology, and other related knowledge and skills.

5. Accomplish roads analysis at the appropriate scale as directed in FSM 7712.1 and FSM 7712.15, and document the results.

6. Develop and recommend to the Regional Forester annual and multi-year schedules of proposed road construction, reconstruction, and decommissioning projects.

7710.44 - District Rangers

Unless reserved by the Forest Supervisor, the District Ranger has authority to approve road management objectives (FSM 7712.5).

7710.5 - Definitions

For other definitions relevant to Transportation Atlas, Records, and Analysis, see FSM 7705.

Network Analysis. A technique in the planning, scheduling, and solution of problems involving a large number of interrelated decision points, events, or parts.

7711 - FOREST TRANSPORTATION ATLAS AND RECORDS

7711.01 - Authority

The regulations at part 212 of Title 36 of the Code of Federal Regulations (36 CFR part 212) address how the Forest Service is to administer the forest transportation system. Section 212.2 requires an atlas as a component of the forest transportation program, as follows:

> **§ 212.2 - Forest transportation program.**
>
> **(a) For each national forest, national grassland, experimental forest, and any other unit of the National Forest System as defined in § 212.1 and listed in 36 CFR part 200, subpart A, the Forest Supervisor or other responsible official must develop and maintain a forest transportation atlas, which is to be available to the public at administrative headquarters units. The purpose of the atlas is to display the system of roads, trails, and airfields of the unit. The atlas consists of the geo-spatial, tabular, and other data to support analysis needs and resource management objectives identified in land management plans. The atlas is a dynamic document that changes in response to new information on the existence and condition of roads, trails, and airfields of the unit. The atlas does not contain inventories of temporary roads, which are tracked by the project or activity authorizing the temporary road. The content and maintenance requirements for the atlas are identified in the Forest Service directive system (36 CFR 200.1).**

7711.03 - Policy

The transportation atlas is the official repository of forest transportation facility decisions for each National Forest and National Grassland.

1. Building the Forest Transportation Atlas. The initial transportation atlas for each National Forest and Grassland consists of those maps, inventories, plans, and associated information available as of January 12, 2001. Units are to add to this initial information in accordance with direction in this chapter and other chapters of FSM Title 7700.

2. Maintaining the Forest Transportation Atlas. Maintain a current record of forest transportation facilities in the atlas. Use the ongoing real property and condition survey updates (FSM 6446) as appropriate. Use the Forest Service Infrastructure (Infra) database and the transportation layer of the geographic information system (GIS) for the storage and analysis of information in the

transportation atlas. All spatial data must be compliant with national standards in conformance with Office of Management and Budget (OMB) Circular A-16 and Executive Order 12906, which sets out the current Federal Geographic Data Committee (FGDC) Standard.

7711.1 - Forest Road Atlas

1. The forest road atlas is a key component of the forest transportation atlas and, consistent with the road inventory, includes all classified and unclassified roads on National Forest System lands.

2. The forest road atlas includes, at a minimum, the location, jurisdiction, and road management objectives for classified roads and bridges and the location of unclassified roads and any management actions taken to change the status of unclassified roads.

3. Data and other information contained in the forest road atlas should be used to support roads analysis.

4. Unit transportation managers shall document changes in road management status. Such changes may include roads that are decommissioned, converted to other uses, added to the system, or transferred to other jurisdictions.

5. Temporary roads are not intended to be included as part of the forest road atlas. They are managed by the projects or activities under which they are authorized and decommissioned at the conclusion of the authorized activity.

7712 - TRANSPORTATION ANALYSIS

Conduct transportation analysis at appropriate scales using the best available science that considers access needs and concerns. Coordinate the analysis with other ecosystem assessments and analyses.

7712.01 - Authority

Section 212.5 of Title 36 of the Code of Federal Regulations (36 CFR 212.5) establishes the minimum requirements for the road system on National Forest System lands.

7712.02 - Objectives

The objectives of transportation analysis are as follows:

1. To identify transportation management opportunities and priorities.

2. To assess transportation management needs, long-term funding, and expected ecosystem, social, and economic effects.

3. To establish transportation management objectives and priorities.

7712.03 - Policy

Forest Service regulations implementing the Forest and Rangeland Renewable Resources Planning Act, as amended by the National Forest Management Act, require integration of transportation planning into an interdisciplinary effort that produces Regional, Forest, and site-specific project plans. In planning for and analyzing the transportation system, perform the following:

1. Assess economic costs and benefits along with social and ecological factors when identifying forest transportation facility options.

2. Assess effects of forest transportation facility options on ecological processes and ecosystem health, diversity, and productivity.

3. Consider the needs of all parties when developing transportation system opportunities in areas of intermingled ownership.

4. Consider long- and short-term uses, including possible mechanized, non-mechanized, and off-highway vehicle uses, when analyzing forest transportation facilities.

5. Actively engage the public in transportation analysis.

6. Use the forest transportation atlas as a record of forest transportation facility decisions, including:

    a. Documenting road management objectives,

    b. Identifying all classified and unclassified roads,

c. Documenting the results of transportation analysis, and

d. Documenting road management project priorities.

7712.1 - Roads Analysis

The Responsible Official shall incorporate an interdisciplinary science-based roads analysis into multi-Forest, Forest-, area-, watershed-, and project-scale analyses and assessments to inform planners and decision makers of road system opportunities, needs, and priorities that support land and resource management plan objectives. Conducted by an interdisciplinary team, the science-based roads analysis process provides Responsible Officials with critical information needed to identify and manage a minimum road system that is safe and responsive to public needs and desires; is affordable and efficient; has minimal adverse effects on ecological processes, ecosystem health and diversity, and productivity of the land; and is in balance with available funding for needed management actions.

Units are to use an authorized science-based roads analysis process, such as that described in the report Roads Analysis: Informing Decisions About Managing the National Forest Transportation System (USDA Forest Service, 1999, Misc. Report FS-643). Pursuant to FSM 7710.41, the Deputy Chief, National Forest System, may approve other science-based roads analysis methods for field use through amendments to this chapter. Although concluding an initial roads analysis is important, conduct additional iterations of analysis as needed to address changes in conditions, such as available funding, inventory and monitoring results, severe disturbance events, or new regulatory requirements.

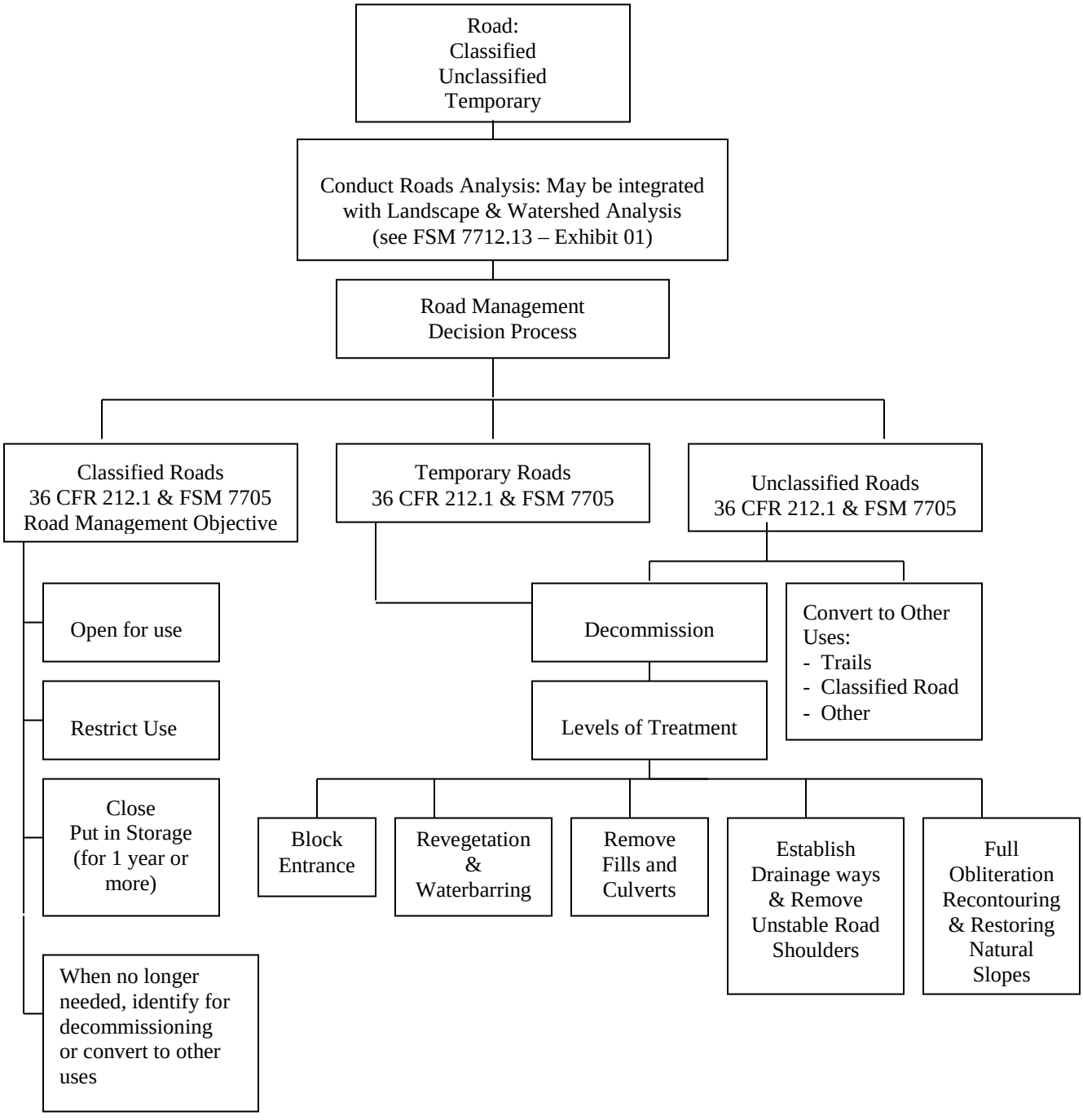
7712.11 - Outcomes

Roads analysis results in a report and accompanying maps that document the information and analysis methods used to identify social and environmental opportunities, issues, risks, and priorities for future road management. The report documents the key findings of the analysis and contains graphical, tabular, and geo-spatial displays of the transportation system options, including a minimum road system. It is important that the roads analysis identifies access needs and opportunities that are based on current budget levels and realistic projections of future funding. Analysts should locate, interpret, and use appropriate scientific literature in the analysis and disclose assumptions on which the analysis is based. See FSM 7712.12 for detailed guidance on the various scales of analyses and their findings.

While the report contains factual information concerning the transportation system, road management decisions are not a product of roads analysis. Although road management decisions must be informed by roads analysis, they are to be disclosed in an appropriate NEPA document (FSM 1950 and FSH 1909.15). FSM 7712.11, exhibit 01, illustrates road management options. The forest transportation atlas is to be updated, as appropriate and in accordance with FSM 7711.03 and FSM 7712.5.

7712.11 - Exhibit 01

Road Management Options



7712.12 - Integration with Land and Resource Management Plans

Roads analysis evaluates road system opportunities and needs within the context of land and resource management plan direction. Roads analysis includes opportunities for public participation and emphasizes interdisciplinary team identification and evaluation of road issues and opportunities.

7712.12a - Roads Analysis as Part of Forest Plan Revision or Amendment

The Responsible Official must use the results and findings of the roads analysis process with other ecological assessments when addressing issues raised in forest planning. Conducting a forest-scale analysis does not compel a forest plan amendment or revision.

7712.12b - Road Management Project Planning

1. New Road Construction. Consistent with the direction in FSM 7703.1, ensure that the addition of new roads serves a documented need and that the decision is informed by a roads analysis (FSM 7712.1).

2. Maintenance, Reconstruction, and Decommissioning. Use roads analysis (FSM 7712.1) to evaluate opportunities and priorities for road reconstruction, decommissioning, or conversion to other uses and to provide the context at a scale and intensity commensurate with the scope of the road management issue or concern. Implementation of road maintenance activities does not require a roads analysis before proceeding; however, roads analysis is a useful management tool to help set maintenance priorities.

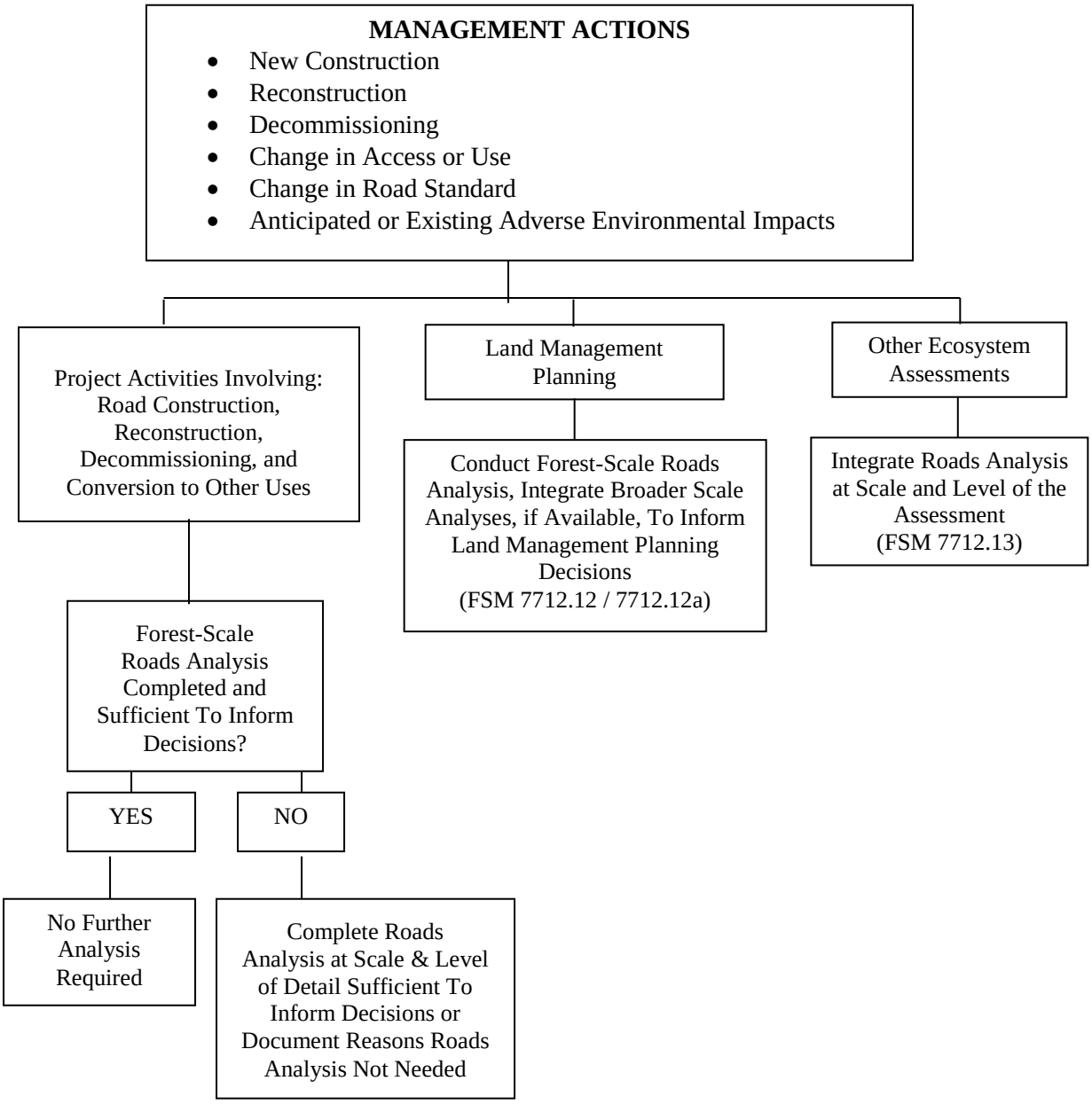
7712.13 - Scope and Scale of Roads Analysis

There are multiple scales at which roads analysis may be conducted to inform road management decisions. Generally, road management decisions should be informed by roads analysis at a broad scale. Accordingly, all units of the National Forest System must conduct a Forest-scale roads analysis (FSM 7712.13b and FSM 7712.15).

The Responsible Official has the discretion and duty to determine whether or not a roads analysis below the Forest scale is needed and the degree of detail that is appropriate and practicable. Guidance on selecting the appropriate scale and those proposed actions which may trigger a need for a roads analysis is set forth in FSM 7712.13a through 7712.13c.

7712.13 - Exhibit 01

Scope and Scale of Roads Analysis



7712.13a - Roads Analysis for Large-Scale Assessment

1. Roads analysis is an integral part of multi-Forest or eco-region assessments. At this scale, consider the following:

    a. Broad scale issues, such as habitat connectivity, strongholds for aquatic and terrestrial species, sources of clean water, cumulative effects, and other ecosystem values.

    b. Integration of other Federal agency, State, county, local, and Tribal transportation systems, and their multi-year transportation plans with the forest transportation system.

    c. Potential program opportunities for new or revised forest highways, public lands highways, and public Forest Service roads.

    d. Current and likely future funding levels available to support road construction, reconstruction, maintenance, and decommissioning.

7712.13b - Roads Analysis at Forest or Area Scale

Roads analysis at the Forest scale is critically important, as it provides a context for road management in the broader framework of managing all forest resources. Close coordination with broader scale ecosystem assessments and analyses is essential. Area-scale assessments may be appropriate on Forests with assessment areas composed of islands or groups of islands, on Forests with widely separated units, or in areas where watershed boundaries do not make logical or effective assessment boundaries. Examples include Forests with large physically or ecologically discrete subdivisions, such as the large islands in southeast Alaska; or widely separated units of National Forests, such as the National Forests in Texas, Mississippi, Florida, Missouri, and Louisiana; or Forests where watershed boundaries do not make logical or effective assessment boundaries, such as the coastal plains of the eastern United States.

1. Consider the following at this scale:

    a. Environmental issues potentially affected by road management proposals, such as soil and water resources, ecological processes, invasive species spread, and biological communities.

    b. Social issues potentially affected by road management proposals such as socio-economic impacts, public access, and accessibility for handicapped persons.

    c. An evaluation of the transportation rights-of-way acquisition needs.

    d. The interrelationship of State, county, Tribal, and other Federal agency transportation facility effects on land and resource management plans and resource management programs.

    e. Transportation investments necessary for meeting resource management plans and programs.

f. Current and likely future funding levels available to support road construction, reconstruction, maintenance, and decommissioning.

2. Prepare a report with accompanying map(s) that documents the information and analysis methods used to identify access and environmental priorities, issues, and guidelines for future road management and the key findings. At a minimum, the report shall:

a. Inventory and map classified roads, as identified in FSM 7712.14, and display how these roads are intended to be managed.

b. Provide guidelines for addressing road management issues and priorities related to construction, reconstruction, maintenance, and decommissioning.

c. Identify significant social and environmental issues, concerns, and opportunities to be addressed in project-level decisions.

d. Document coordination efforts with other government agencies and jurisdictions.

7712.13c - Roads Analysis at Watershed and Project Scale

1. Roads analysis at the Forest scale generally provides the context for informing road management decisions and activities at the watershed, area, and project level. Where a Forest-scale roads analysis has been conducted, the Responsible Official must consider the decision(s) to be made and determine how to apply the results of the Forest-scale roads analysis to best inform management decisions. It is generally expected that road inventories and road condition assessments for all classified, unclassified, and temporary roads, as identified in FSM 7712.14, would be completed as part of the watershed- or project-scale roads analysis, not the Forest-scale.

2. Roads analysis below the Forest scale is not automatically required, but may be undertaken at the discretion of the Responsible Official. When the Responsible Official determines that additional analysis is not needed for a project, the Responsible Official must document the basis for that conclusion. Examples where roads analysis may not be necessary include: temporary roads for short-term access or a minor extension of a campground road.

When higher scale analyses are not available to inform a project decision, the Responsible Official must consider the decisions to be made (FSM 7712.13) and the potential environmental and access effects and must determine whether or not additional analysis is needed at the watershed or project scale.

3. When proposed road management activities (road construction, reconstruction, and decommissioning) would result in changes in access, such as changes in current use, traffic patterns, and road standards, or where there may be adverse effects on soil and water resources, ecological processes, or biological communities, those decisions must be informed by roads analysis (FSM 7712.1). Site-specific projects may be informed by a watershed roads analysis, if the Responsible Official determines that the scope and scale of issues under consideration warrant such use. FSM 7712.13, exhibit 01, provides a snapshot of the scope and scale of roads analysis and its integration into planning and decision making.

4. When needed, the roads analysis shall be conducted in accordance with FSM 7712.03, and the outcomes of roads analysis at the watershed and project-scale should result, at a minimum, in the following:

a. Identification of needed and unneeded roads.

b. Identification of road-associated environmental and public safety risks.

c. Identification of site-specific priorities and opportunities for road improvements, decommissioning, and conversion to other uses.

d. Identification of areas of special sensitivity, unique resource values, or both.

e. Any other specific information that may be needed to support project-level decisions.

7712.13d - Special Implementation Considerations

Ongoing, large-scale ecosystem planning efforts of the Sierra Nevada Framework assessment are exempt from the requirements of FSM 7712.1 to conduct a roads analysis.

7712.14 - Road Inventory

Road inventories support roads analysis and road decisions at various scales and consist of geo-spatial data (maps, aerial photos, and so forth), physical attribute data, and an assessment of the road condition to determine if a road is meeting resource management objectives and access needs. The inventory information to be gathered varies by the scale of assessment.

1. Inventories at Multi-Forest, Forest, and Area scale. Inventories at these scales provide information needed to conduct broader assessments of road management needs and, therefore, require less site-specific information.

a. Classified Road Inventory. Geo-spatial and physical attribute information is needed for all classified roads, whereas the assessment of individual road conditions

would be most important for the major transportation routes (arterials and collectors) or other routes determined to be of key importance by the Forest.

b. Unclassified Road Inventory. Information needed for unclassified roads is usually that obtained from existing data and other readily available sources of information, such as aerial photographs.

2. Inventories at Watershed and Project Scale. At these scales, a comprehensive and complete inventory of all classified, unclassified, and temporary roads is required in order to conduct analyses that inform site-specific decisions, to set priorities for road management actions, and to identify special situations.

Use the Infra database to store data on the physical attributes of all roads. FSM 7712.14, exhibit 01, Road Inventory Necessary at Various Scales of Road Analysis, illustrates the roads analysis objectives and the inventory data to be collected at various scales.

7712.14 - Exhibit 01

Road Inventory Necessary at Various Scales of Roads Analysis

Analysis and Inventory Scale	Selected Roads Analysis objectives supported by road inventories	Inventory Information Needed								
		Geospatial data (maps, aerial photos, etc.) ①			Physical attributes ①			Assessment of road condition ②		
		classified	unclassified	temporary	classified	unclassified	temporary	classified	unclassified	temporary
Multi-Forest, Forest, & Area Scale	• Identification of key routes for accessing NFS lands (including public roads) • Identification of strategic road management issues & priorities • Identification of key issues to be addressed at lower scales • Coordination with other government agencies and jurisdictions	Y	Y ③	N	Y	N ③	N	Y ④	N ③	N
Watershed & Project Scale	• Identification of needed & unneeded existing roads and identification of environmental and public safety risks for all roads • Identification of site-specific priorities for road improvement and decommissioning • Identification of areas of special sensitivity, resource values, or both • Providing information needed to inform decisions at the project level	Y	Y	Y	Y	Y ⑤	Y ⑥	Y	Y	Y

7712.14 - Exhibit 01--Continued

① **Geospatial data and physical attributes:** This category includes inventory information from other road jurisdictions as appropriate.

② **Condition assessments**: This category includes information needed to determine if the road is meeting resource management objectives and access needs.

③ **Forest scale - unclassified roads:** This category relies on existing data and/or readily available tools to identify unclassified roads if necessary to inform forest-scale-level decisions.

④ **Forest scale - classified roads - condition assessments:** This includes only major transportation routes determined to be of key importance by the forest (generally maintenance level 3, 4, and 5 roads).

⑤ **Watershed scale - unclassified roads - physical attributes**: The minimum inventory information is location, length, condition, and any associated environmental or public safety risks or impacts.

⑥ **Watershed scale - temporary roads - physical attributes:** This category consists of the same data required as for unclassified except condition information is not necessary.

7712.15 - Timeframes for Completing Roads Analyses

1. Forest-Scale Roads Analyses. Every National Forest System administrative unit must have a completed Forest scale roads analysis, except as follows:

a. Those units that have begun revision or amendment of their forest plans but did not adopt a final revision or final amendment by January 12, 2002, must complete a roads analysis prior to adoption of the final plan revision or amendment.

b. Where additional time is needed for completion of forest-scale roads analysis, a Forest Supervisor may request approval from the Regional Forester for an extension. In making such a request, the Forest Supervisor must provide a statement of the reason(s) the extension is needed.

2. Analysis Needed To Inform Road Management Decisions. FSM 7712.13 identifies proposed road management decisions other than forest plan revisions or amendments that require roads analysis and provides guidance on the scope and scale of various levels of analysis that might inform those decisions. The following deadlines govern the application of roads analysis to the proposed road management decisions identified in FSM 7712.13 through 7712.13c:

a. Decisions made on or before January 12, 2002, do not require a roads analysis.

b. Decisions made after January 12, 2002, must be informed by a roads analysis, except as provided in FSM 7712.13c.

7712.3 - Network Analysis

Network analysis may be conducted as part of the roads analysis to identify access alternatives. Network analysis shall establish four important types of transportation cost data:

1. Environmental effects and possible ecosystem restoration opportunities.

2. Construction, reconstruction, decommissioning, and maintenance costs of a road system to a specific area.

3. Variable user- and travel-related costs over a road system for a resource activity on a unit or output basis.

4. Life-cycle costs of operating and maintaining the road network.

Re-analyze networks and cost estimates when management practices or management area direction change.

7712.4 - Economic Analysis [Reserved]

7712.5 - Road Management Objectives

Validate, revise, or establish road management objectives for all classified NFSRs to be consistent with forest land and resource management plan direction, project decisions, and the results and findings of roads analysis. Road management objectives establish the design criteria (FSM 7720) and operation and maintenance criteria (FSM 7730.3) for each road. The road

management objectives require approval by the Responsible Official (usually the District Ranger) and are included in the forest road atlas (FSM 7711.1).

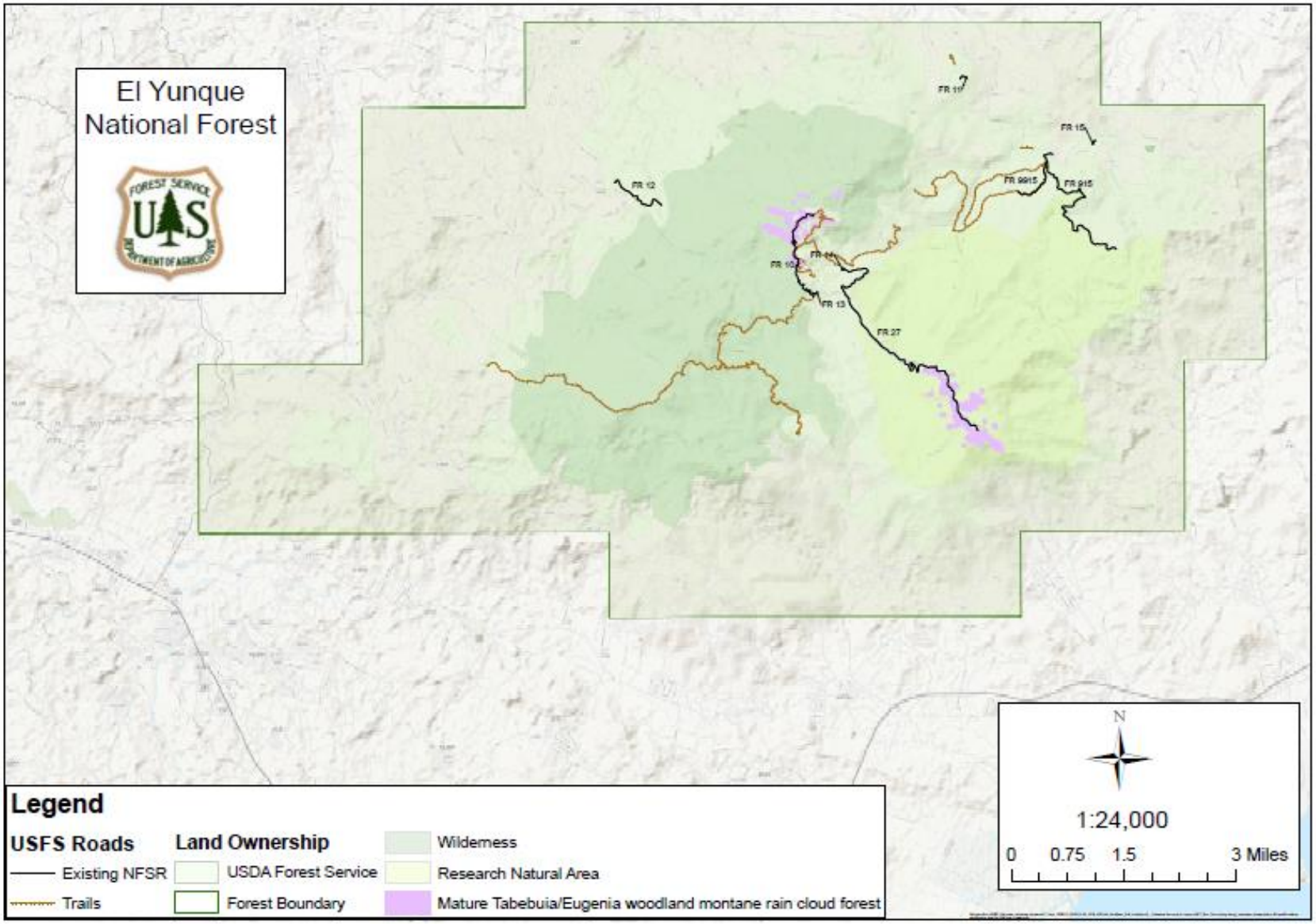
7712.6 - Scheduling Projects

Integrate the scheduling of decommissioning, reconstruction, and construction project activities with other resource activities in a timely manner (FSM 1920).

7713 - AIRFIELDS [RESERVED]

APPENDIX F – FOREST TRANSPORTATION ATLAS

Existing Transportation System



Recommended Minimum Transportation System