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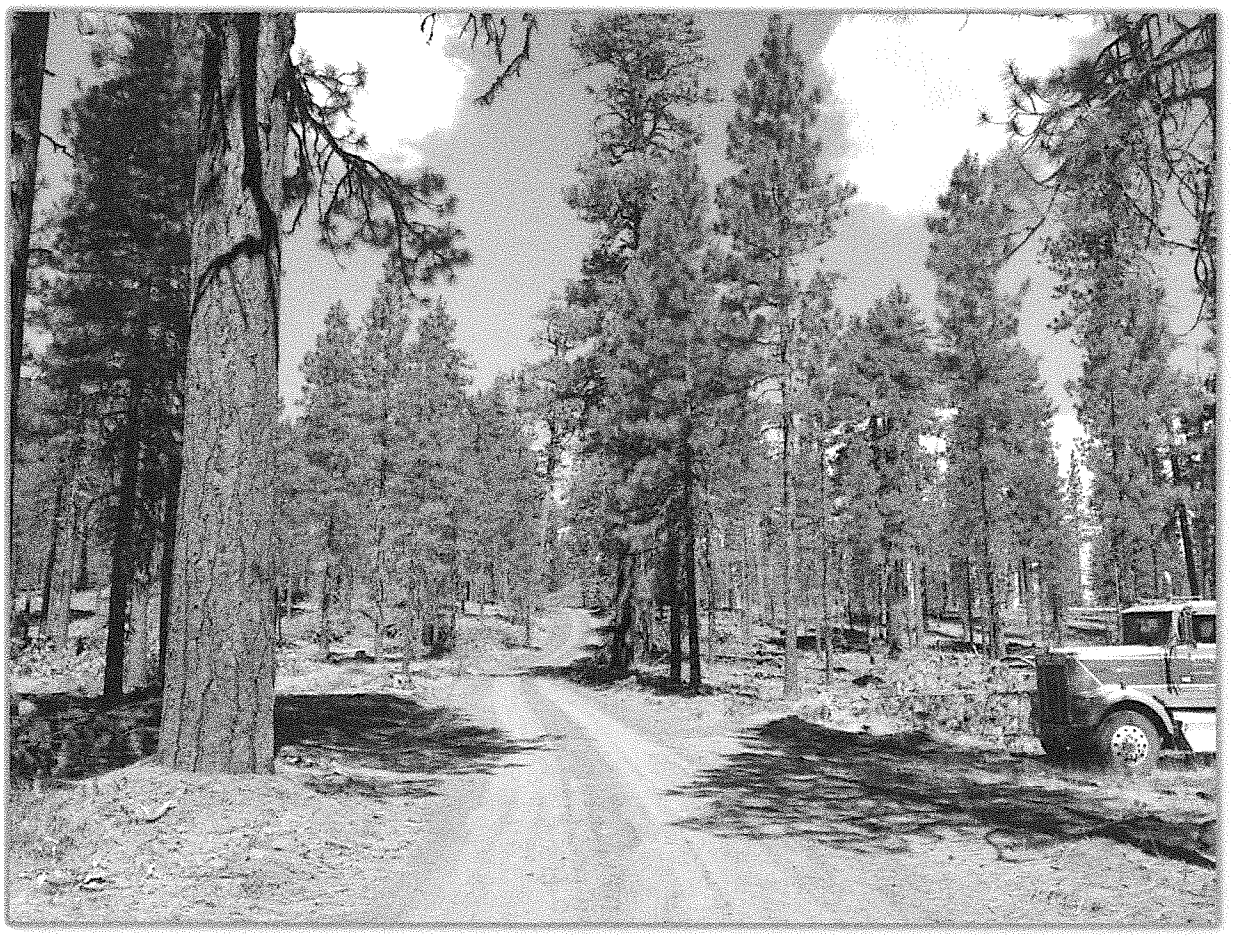
Modoc National Forest

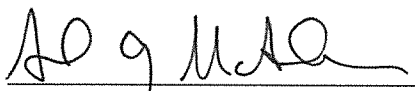
Travel Analysis Report



Modoc National Forest

Travel Analysis Report 2015

Prepared by: **Travel Analysis Process Team**

Approved by: 

Amanda McAdams,
Forest Supervisor

Date: **September 23, 2015**

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Executive Summary

The Modoc National Forest, with over 5,000 miles of national transportation system and user-defined roads, has completed its Travel Analysis Process (TAP) required under 36 CFR 212.5(b)(1) Subpart A and summarized the results in this Travel Analysis Report (TAR). As required by the Washington Office, the results of this analysis include classification of all system roads as either "likely needed" or 'likely not needed" with a data set and map identifying these roads. This analysis should be seen as the initial step in developing a road system that promotes sustainable ecosystems while continuing to support the transportation needs of public and private entities and organizations.

The primary goal of the TAP is to provide information to decision-makers for development of a safe, efficient, cost effective transportation system for all uses from recreation to timber hauling. It is important to understand that the **Travel Analysis Process is a planning tool, not a decision document.** Any proposed changes to the road system can be made only during a more rigorous project NEPA analysis and are subject to public review and comment.

The TAP is a "30,000-foot" strategic review of the Modoc National Forest's road system using existing data and GIS system applications. The general public and outside organizations were engaged early in the process through issue discussions and census. The Modoc National Forest plays a critical role in the local community and its economy. The community relies heavily on the National Forest Transportation System (NFTS) roads for commerce and recreation. Coupled with the gentle topography and stabile soils, the NFTS on the Modoc National Forest is a product of both system-authorized and user-created, (termed unauthorized) roads, which further enhances the community's sense of ownership and connection to the Modoc National Forest. This became very evident in the performance of Subpart B of Travel Management in 2007-2009 when the Forest Supervisor called for the cessation of cross-country travel while authorizing the conversion of 331 miles of non-system roads to NFTS roads and 512 miles of Maintenance Level 3 roads with vehicle class changed to mixed use. This authorization was not upheld through Region appeal review and additional analysis requirements were designated. Including the Subpart B roads in the TAP meets a portion of the analysis requirements and facilitates future project level decisions. One of the drivers for the TAP is the lack of funds for road maintenance. Financial review of annual road maintenance needs versus current road maintenance resource availability indicates only 43% of the necessary annual funds available to the Forest.

Predicated on a set of environmental and socio-political issues, the TAP scientific analysis was developed by the TAP team of forest specialists. This analysis was based on a series of benefit and risk related appraisals in order to populate an opportunity matrix (refer to Chapter 5) with the results of individual road segment values. Two analyses were run, one for authorized roads (4,357 miles) and, separately, one for the Subpart B roads (331 miles of non-system roads). This high, medium, low approach in a 3x3 matrix yielded summarized information on road action priority and road opportunity as "likely needed" and "likely not needed". The science analysis resulted in approximately 91 miles of road designated as high and medium risk with low benefit. The associated road opportunity for these roads is "likely not needed". After a strategic review, 53 miles of these roads were determined to be administratively required, leaving 38 miles of road as "likely not needed". The Subpart B roads TAP analysis revealed 3 miles of road as medium risk with low benefit and potentially "likely not needed". Based on the premise that these roads are under additional review from Subpart B for potential inclusion into the NFTS, it was counterintuitive to indicate "likely not needed" before a more thorough scientific and political review of the 17 segments totaling 3 miles of road.

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Introduction

It is both a privilege and a significant responsibility for the Modoc National Forest to provide road access to major portions of its public lands. In recent years, road systems have also become a focus of controversy. On the Modoc National Forest (see Appendix 2, Location Map), the diverse road system includes 4,320 miles of National Forest Transportation System (NFTS) roads, over 700 miles of non-system roads, county bi-ways, state highways, and both motorized and non-motorized trails (see Appendix 4, Existing Roads Map). This transportation network facilitates the management and protection of the national forest, provides access to diverse recreational opportunities, and contributes to the rural transportation infrastructure of surrounding private lands. At the same time, agency and public awareness of the maintenance costs and the environmental concerns associated with forest roads is increasing. As the Agency's priority shifts to an emphasis on sustainable ecosystems, the current configuration of the road system may not achieve the management objectives and public needs for forest roads.

The national forest road system of the future must continue to provide access for recreation and resource management, as well as, support for watershed restoration and resource protection to sustain healthy ecosystems. Agency regulations at 36 CFR 212.5(b)(1) Subpart A, Administration of the Forest Transportation System, direct the Forest Service, U.S. Department of Agriculture to identify the minimum road system needed for safe and efficient travel, as well as, for the administration, utilization, and protection of National Forest System (NFS) lands. Further direction was also provided in a letter from Leslie A.C. Weldon, Deputy Chief, National Forest System, dated March 29, 2012 (file code 2300/2500/7700), which required national forests to include, as part of the travel analysis, classification of all system roads as either "likely needed" or "likely not needed." Results of the analysis must be completed by September 30, 2015. Washington Office further noted that "...beyond FY2015, no Capital Improvement and Maintenance (CMCM) funds may be expended on NFS roads (maintenance levels 1-5) that have not been included in the TAP or RAP." (See Appendix 1: Definitions and Acronyms, page 64-65.)

The Travel Analysis Process (TAP) is a science-based review that relies on an integrated, interdisciplinary approach across multiple resource areas. Its role is to assist the Modoc National Forest in identifying and maintaining an appropriately-sized and sustainable transportation system that is responsive to ecological, economic, and social concerns. It is important to understand that the **Travel Analysis Process is a planning tool, not a decision document.** Any proposed changes to the road system can be made only during the more rigorous project NEPA analysis and are subject to public review and comment. Although future projects are informed by the TAP, they are not bound by the results of the TAP.

The results of the TAP on the Modoc National Forest are documented herein as the Travel Analysis Report (TAR). The TAR will be used to inform future planning efforts and project-level, site-specific decisions, which will include transportation analysis. The TAR is not subject to the National Environmental Policy Act (NEPA), but represents an important first step towards the development of a balanced future road system.

Chapter 1 – Setting Up the Analysis

The purpose of Chapter 1, Setting Up the Analysis, is to establish the level and type of information that the analysis will provide.

Objective

The objective of roads analysis is to provide decision-makers with critical information in managing road systems that are safe and responsive to the public needs and desires while insuring the Agency's ability to access, effectively manage, and protect NFS lands. The road system should be affordable and efficiently managed, have minimal negative environmental effects, and achieve balance with available funding for road maintenance.

Extent and Scale of the Analysis

This analysis is confined to the extent of the transportation system on the Modoc National Forest (see Appendix 2, General Location Map, page 66). All NFS roads, Maintenance Level 1 through 5 (see Appendix 1: Definitions and Acronyms), within the boundaries of the Modoc National Forest (see Appendix 4, Existing Roads Map, page 66) have been appraised. Additionally, 331 miles of non-system roads are also included based on honoring the intent of the decision of the 2008 Travel Management Plan, Subpart B (see discussion in Chapter 2, page 14).

Numerous State of California and Modoc County controlled roads occur within the boundaries of the Modoc National Forest. These roads, comparably Maintenance Level 3 or higher, are not included in the TAP analysis. Non-system roads or trails, generally established by users, with the exception of the 331 miles mentioned above, are also excluded from this analysis and will be addressed in project level NEPA decisions as discovered and reviewed.

As directed by Region 5 (Pacific Southwest Region), this analysis provides a "30,000 foot review" of the road system utilizing existing data. This TAP relied primarily on the Geographic Information System (GIS) and aerial photos to guide the analysis with only modest logistical review. More in-depth analysis will be performed coincidental to project-level NEPA analyses as projects are proposed.

Process Plan / Analysis Plan

The process plan for the Modoc National Forest TAP was followed as directed in the Region 5 "Travel Analysis Process: A Guidebook", November 2012. The "six-step process", as outlined in FSH 7709.55 Chapter 20, includes the following:

1. Setting up the Analysis
2. Describing the Situation
3. Identifying Issues

4. Assessing Risks, Problems, and Benefits
5. Describing Opportunities and Setting Priorities
6. Reporting

The steps taken in the analysis plan followed this general guideline:

1. Establish the Forest TAP team.
2. Identify preliminary access and resource issues, concerns, and opportunities through internal staffs.
3. Identify additional issues, concerns, and opportunities through public involvement.
4. Review and assemble existing data.
5. Develop a science-based risk-benefit review of the road system.
6. Balance opportunities from analysis against political and strategic road requirements.
7. Identify opportunities for making changes to the road system.

Timeline

General Schedule Summary:

- **Step 1: Setting up the Analysis** – The line officers and the TAP Team Lead assigned a Forest TAP Team using the guidelines in Step 1 of the Travel Analysis Process Guidebook (see Table 1-1, TAP Team Members, page 5). The TAP Team used information from the Road Analysis Report (RAR, 2002) along with existing GIS data. Step 1 was completed in February 2014.
- **Step 2: Describing the Situation** – The TAP Team used information available in the 2002 RAR, the current GIS database, and local knowledge to complete Step 2 in April 2014.
- **Step 3: Identifying Issues** – Step 3 ran concurrently with the first two steps allowing for public involvement through meetings, news releases, and mailings. This process began in January 2014 and was completed by the end of August 2014.
- **Step 4: Assessing Risks, Problems, and Benefits** – Step 4 demanded a large amount of time (several months) and resources in order to complete a usable product, resulting in completion in January 2015. This process included concurrent verification and updates of the roads database by the Roads Engineer.
- **Step 5: Describing Opportunities and Setting Priorities** – Because of the parallels between this step and the previous one, the majority of Step 5 was the benefit-risk assignments and mathematical scoring. The TAP Team completed reviews and revisions at the end of April 2015.

- **Step 6: Reporting** – Following up with the preceding steps and documenting the TAP Team progress led to the final review and summarization. A report ready for Washington Office (WO) / Regional Office (RO) use will be available in September 2015.

Modoc TAP Team

Table 1-1 displays the contributing resources and individuals who participated in this TAP review (i.e., the TAP Team). The initial interdisciplinary Team Lead was elected from the available forest staff by the Forest Supervisor and line officers. The TAP Team was then developed by consensus of the line officers and the TAP Team Lead and approved by the Forest Supervisor.

Communication Plan and Public Involvement

The experience gained through the Travel Management Process, Subpart B provided a successful model for inclusion of the public both within the early development of the analysis and also the final review and the output report. The TAP Team and Forest Leadership Team elected to include the public in the same manner within the early development of the TAP. As the TAP does not provide a decision the review process was truncated to an evening public meeting and providing information back to participants for their review.

Communication Plan

A public communication plan provided guidance for the Modoc National Forest to maintain proactive communications, offer public participation opportunities, and solicit valuable input during the TAP.

Pre-Analysis - Public Involvement

Four public meetings were held around Modoc County in pre-announced locations for early information and public involvement:

- Alturas, CA – February 5, 2014 – Modoc National Forest, Forest Supervisor's Office
- Cedarville, CA – February 27, 2014 – Café 22
- Adin, CA – March 11, 2014 – Community Center
- Tulelake, CA – March 12, 2014 – Captain Jack's Restaurant

During these meetings, the discussions included information about the TAP, the tremendous value of the road system, the increasing costs of road maintenance, and the need for public input regarding road needs, uses, and issues across the Modoc National Forest to help prioritize and assess the road system.

Table 1-1. TAP Team Members.

Resource	Lead Contact	Resource Support
Responsible Official	Amanda McAdams Forest Supervisor	Tim Davis, Chris Christofferson District Rangers
TAP Team Lead	Bill Moore Forest Vegetation Program Mgr.	Chris Bielecki Forest Engr., TEAMS Ent.
Recreation	Amy Hartell Recreation Specialist	Krys Smith Westside Recreation Technician
Roads	Teresa Morales Forest Engineer	Dianne Hayes, Dale Weaver Engineering - Roads
Hydrology	Chris Stewart Forest Hydrologist	Ruth Ann Trudell Detail, Ecosystems Staff Officer
Wildlife	Mary Flores Wildlife Biologist	John Clark Wildlife Biologist
Fire/Fuels	Ruth Johnson Forest Fuels Officer	Mark DePerro, Don Glenn Fuels Officer, Fuels Battalion Chief
Botany	Forest Gauna Forest Botanist	
Soils	Sue Goheen Forest Soil Scientist	
Aquatics	Marty Yamagiwa Forest Wildlife & Fisheries Biologist.	
Heritage	Gerry Gates Forest Archaeologist	Deb Peck Archaeology Technician
Vegetation	Roy Cuzick Eastside Timber Management Officer	John Zarlengo Westside Timber Management Officer
Lands & Minerals	Jayne Biggerstaff Forest Realty Specialist	Dan Munger Forest Geologist
Range Management	Adrian Cuzick Warner Mtn. Range Management Specialist	Barbara Raymond Westside Range Management Specialist
Extended Team		
Tribal	Weston Cain Tribal Liaison	Punky Moore Public Information Officer
Public Affairs	Punky Moore Public Information Officer	Ken Sandusky Public Information Officer
GIS support	Celia Yamagiwa GIS Specialist	
Forest Planner	Myrnie Mayville Environmental Coordinator	Susan Durham Eastside NEPA Coordinator

While unsuccessful at obtaining significant information about individual roads, the Forest did consistently hear several primary messages. These messages included the following:

- All roads on the Modoc National Forest are important and should be viable routes,
- The public is concerned about the potential number of roads to be closed on account of Subpart A analysis. (NOTE: Numerous outcomes and opportunities for the roads beyond simply open or closed are possible – see Table 5.3, page 55),
- The outcome of the Subpart B decision and the status of Subpart B may affect the Subpart A analysis. (See Travel Management: Subpart B, page 14.),
- The physical road system and the Forest visitor maps do not correspond and, therefore, the maps become a safety issue, and
- Implementation of Subpart B without signage for speed limits could result in ticketing.

Information received from the public was incorporated into both the benefit-risk analysis and the final roads opportunities section at the end of the roads review.

Pre-Analysis - Environmental Discussion

On December 18, 2014, the Forest Supervisor, the TAP Team Lead, and Eco-Staff Officer engaged in a conference call with members of Public Employees for Environmental Responsibility and The Wilderness Society. The groups shared information with regards to environmental concerns relevant to the TAP set-up and its outcome. Key issues included:

- Opportunity for public comment and review of the Draft Modoc National Forest TAR,
- Utilization of the TAP fiscal analysis to inform the road recommendations,
- Inclusion of all un-necessary roads on the list of "likely not needed" roads,
- Analysis of all motorized routes and road systems (NFS, State, County, City, local, and Tribal) when appraising risk to wildlife,
- Evaluating roads which transect or access heritage sites, and
- Implementation of the TAR recommendations by including road decommissioning in the purpose and need statement of future projects.

These concerns were taken under consideration in developing the TAP and the TAR.

Post-Analysis Discussions and Reviews

A public meeting was held June 18, 2015, at the Modoc National Forest, Supervisor's Office. Maps were posted for review and staff was available to answer questions. Only six individuals attended the event and questions and discussions were positive and informative in nature.

The Forest Supervisor also made presentation to the County Board of Supervisors informing the Board of the completion of the TAR and its ramifications.

The Travel Analysis Report was sent out for review to interested and participating parties including Tribal Representatives, Employees for Environmental Responsibility, The Wilderness Society, and Modoc County.

Information Sources

The TAP Team identified many different existing sources for physical data needed during the analysis. Additionally, the TAP Team and TAP Team Lead frequently referenced Forest Service Handbook (FSH) 7709.55, Chapter 20, Travel Analysis.

Other planning documents that were utilized include:

- Modoc National Forest Land and Resource Management Plan (LRMP) and amendments,
- Identification of routes designated to be added into the NFS under the Modoc National Forest Travel Management Final Environmental Impact Statement (FEIS) in compliance with Subpart B of the Travel Management Rule (TMR),
- Comments, maps, and databases displaying public areas of interest and concern from efforts in Subparts A and B,
- Modoc National Forest RAP (2002) and associated maps and appendices, and
- Road Management Objectives (RMOs) for all current NFS roads.

Physical data sources that were required include:

- GIS coverages (data as of Fall 2014) for Maintenance Level 1 to Maintenance Level 5 roads, watershed boundaries, streams, lakes, springs, slopes, slope stability hazard ratings, vegetation, range allotment boundaries, TES (threatened, endangered and sensitive) plants and animals, and noxious weeds,
- INFRA (Infrastructure Database) roads data,
- Visitor demographic data,
- Road maintenance costs and funding data,
- Rights-of-way (ROW) records,
- IMPLAN (economic analysis model) data,
- Available data on unauthorized roads that currently are prohibited for use by motorized vehicles and under review for potential addition to the NFTS or for decommissioning,
- Aquatic species maps,
- Identification of future vegetation and timber management activities and associated road access needs,

- Identification of future fire suppression and fuels management and associated road access needs,
- Current and planned special use permits and mining claims utilizing NFTS roads,
- Existing easements, private access, ROWs,
- Motorized trail locations, including dual system use,
- Other road systems and their locations,
- Soil, water resources, invasive species, environmental issues, and biological communities,
- Public access and recreational needs and desires in the area, including access for nearby landowners,
- Public and user group values and concerns,
- Cultural resources, and
- On-the-ground knowledge of Modoc National Forest employees.

Chapter 2 – Describing the Situation

The purpose of the second step of the analysis is to describe the existing road system in relation to the geologic, biological, and social components, as well as to the LRMP direction and status and funding of the road system within the affected environment.

Geology / Topography of the Area

The geology and topography of the Modoc National Forest has a tremendous influence on the current road system. The geology is strongly influenced by faulting, volcanic activity, and erosional activity. Vast quantities of lava, mainly basalt and associated pyroclastic materials, flowed or were deposited over the landscape in almost continuous masses. Three major geomorphic provinces evolved from these activities across the Modoc National Forest: The Cascade Range, The Great Basin, and The Modoc Plateau.

The Modoc National Forest is characterized by several landforms consisting of northwest- to north-trending mountain ranges on the east and southwest areas of the Forest, a broad basalt lava flow plateau throughout the center and most of the northern parts of the Forest, and the Medicine Lake Highlands, which is a shield volcano in the northwest corner of the Forest. Land areas of gentle slopes include lava plains that were formed by extensive basalt outflows, alluvial plains, and high alluvial terraces. Steeper areas include the dissected mountain ranges and the fault- or erosion-formed slopes. Numerous steep slopes drop from the Modoc Plateau level to the Alturas area alluvial valley floor below, an elevation difference of about 600 feet.

The sensitivity of an area to mass wasting depends on a combination of the interaction of the soils and underlying bedrock, slope steepness, and the subsurface hydrology. According to the LRMP, eighty-five percent of the Modoc National Forest has a low risk of slope movement because of gentle slopes (less than 30%), stable parent material (volcanic bedrock), and a preponderance of cohesive soils. The remaining fifteen percent has a high risk of slope movement. The majority of high risk areas are within wilderness or inventoried roadless areas and have limited roadways.

In essence, the geology and resultant gentle topography of the majority of the Modoc National Forest creates an ideal scenario for the development of a stable, easily designed road system. While the gentle slopes facilitate the designed roads, they also allow development of a substantial amount of unauthorized user-defined roads after decades of open travel across the landscape.

Biology of the Area

The Modoc National Forest is home to more than 350 species of wildlife that live in a wide variety of habitats. Each requires a particular combination of food, water, and shelter. Some wildlife species occur in all vegetation types on the Forest, while others are very limited in their habitat needs. Each species plays a role in the balance, persistence, and evolution of the ecosystem of which it is a part.

Four categories of species of special interest and management needs are known: Threatened and Endangered (T&E) species, Sensitive species, Management Indicator Species, and Watch list plant species.

T&E plant species have been listed as such under the provisions of the Endangered Species Act of 1973. They are federally designated due to low population levels and because the loss of habitat may eventually render them extinct. The Forest Service must manage habitat to achieve recovery levels of T&E species. The Modoc National Forest is required to consult with the US Fish & Wildlife Service whenever the Forest initiates any activity that may affect a federal T&E species. The Modoc National Forest's T&E wildlife species are Northern Spotted Owl, Modoc Sucker, Short nose Sucker, Lost River Sucker, Shasta Crayfish, Cow head Lake Tui Chub (proposed), Yellow-billed Cuckoo (candidate), and Oregon Spotted Frog (candidate). One federally Endangered plant specie, Tuctoria greenei (Greene's tuctoria), and one federally Threatened plant specie, *Orcuttia tenuis* (Slender Orcutt grass), are known to occur on the Forest.

Sensitive species have been formally determined by Region 5 as species whose populations require special management to ensure that Forest Service activities do not necessitate the species being listed as T&E. Forty Sensitive species (21 animal species, 19 plant species) may affect management activities on the Modoc National Forest.

Management Indicator Species include harvest species (game and fish), ecological indicator species, and special interest species. Twenty-one wildlife species are included in this category on the Modoc National Forest.

Watch list plant species are those species that are not listed under the Endangered Species Act, nor considered Sensitive by Region 5, but that have been identified by the Forest Botanist as uncommon plant species deserving attention as components of Forest biological diversity and potentially as indicators of uncommon habitat types. Species in this category are generally those with California Rare Plant Ranks but which are neither listed nor sensitive. Fifty Watch list plant species are recognized on the Modoc National Forest.

Noxious weeds include species that have been inadvertently introduced and grow out of their natural habitat. Since most have little or no food value for wild or domestic animals, they can reduce site productivity of rangelands, farmlands, and pastures. Many are alleleopathic, that is, they can inhibit growth of other plants in their area of influence through a build-up of toxins in the soil. In the past, the Modoc National Forest and counties have cooperated in treating noxious weeds. The Forest considers as noxious all weeds listed as such by the State of California, a list of over 150 plants. Fifteen of these species are known to occur on the Modoc National Forest, with the biggest concern being Mediterranean Sage, Dyer's Woad, Dalmatian Toadflax, non-native thistles, several species of Knapweeds, and Yellow Starthistle are also considered by Forest weed management staff to be particularly invasive.

Social Attributes of the Area and Road System

Forest management activities can influence individual residents and groups on a local, regional, and national basis. Residents living within the analysis area experience the effects of Forest Service policy and programs directly. Various groups participate in the planning process. These groups often have both local voices and affiliation with national organizations.

Residents in northeastern California are used to driving to their destinations because people and places are scattered and distant. Highways 299, 395 and 139 are important routes into and out of northeastern Lassen and Modoc Counties. These highways are important to local citizens and tourists in both summer and winter. Local citizens use these routes as a means to reach amenities not available in the small rural communities. As truck routes used for import and export of goods and services, these highways are essential to the economic well-being of the area. They also connect to the Forest and County roads that provide access to the Modoc National Forest as well as to other places favored by tourists and local residents.

The County road system within the interior of the Modoc National Forest provides public access and is valued for travel to recreation sites, mining sites, logging sites, and livestock allotments. These roads are primarily gravel or paved and most are safe and accessible by passenger cars. The most prominent County roads are Crowder Flat through Devil's Garden, Fandango Pass from the west side of the Warner Mountains east to Fort Bidwell, Tionesta Road from Highway 139 to Medicine Lake, and the Jess Valley road from the town of Likely to Blue Lake. Many NFTS roads are tributary to the County road system.

Many NFTS roads were constructed to permit access for fire suppression and to facilitate timber harvesting. These roads also provide access for resource protection and for commercial activities or public uses such as grazing, mining, and recreation outfitting and guiding. In addition, the road system provides access for recreation activities such as hunting, fishing, skiing, bird watching, camping, hiking, and driving for pleasure.

Roads also provide access for local residents including the Native American tribes. The roads bring a "connectedness" with areas such as spiritual and cultural sites, scenic vistas, hunting camps, gathering locations and historic sites. Roads also provide access for traditional rural activities such as woodcutting and hunting. Changes in road management can affect the social and economic value of an area. Altering road systems also can disrupt long-established access and use patterns and, at least in the short term, result in not meeting some visitor expectations.

Cultural patterns are important characteristics of communities. "Culture" generally refers to ways of thought and life, and to the social identities people develop in certain communities. Social associations and organizations are an important part of community and cultural life in this rural area. Important formal and informal associations connect people of diverse backgrounds, occupations, and cultures. Tribal governments, area businesses, schools, local government, the media and entertainment centers cross paths with the area residents. Agricultural organizations, like the Farm Bureau, agricultural suppliers, Cattlemen's Association, 4-H clubs, rodeos, etc. still influence much of the cultural life of the area. Other civic organizations like the Boy Scouts, Girl Scouts, and the Elks Club contribute to area residents' sense of identity. Roads bond the residents of rural communities to their environment and to each other through many associations made possible with access.

Road System Development and Forest Plan Direction

Few roads existed on the Modoc National Forest prior to and up through the 1940s. Much of the current road system was constructed in the 1950s and 1960s as a part of the Timber Sale Program, which required a reliable transportation system. During this period, roads accessed most of the available and suitable timber growing areas on the Forest. Timber sale purchasers built roads through "purchaser credits"; that is, they were credited with an amount

of timber equal to the cost of constructing the roads. Many of the roads constructed were high standard with an aggregate surface (Maintenance Levels 3, 4, or 5). The timber being sold at this time was high value, easily supporting the construction of an all-weather transportation system.

The Standards and Guidelines for the transportation system from the 1991 Modoc National Forest LRMP include:

1. Provide and manage a Forest transportation system to achieve resource management objectives while protecting resource values.
    - Plan, design, and construct local roads to the lowest standard commensurate with intended use.
    - Plan and construct arterial (connects highways to collector roads) and collector (connects arterial roads to local roads) roads to the standard appropriate for safe and economical use, and commensurate with the road development and multiple resource management.
    - Maintain all Forest roads to their objective maintenance levels.
    - Provide for signing in accordance with road management objectives and the Manual on Uniform Traffic Control Devices (MUTCD) (Federal Highway Administration, 2001) standards.
2. Cooperate with Federal, State, and County agencies, and private companies, to construct, reconstruct, and maintain roads under their jurisdictions, as needed. Review location and design specifications for roads built under permit or license, and require protection of all resources. Coordinate road management and closures with local agencies.
3. Manage and maintain the transportation system to protect soil, water, and all other resource values. Close local roads as needed to meet these objectives. Develop road closure and off-highway vehicle (OHV) plans.

Road Use Patterns and Trends

The transportation system on the Modoc National Forest serves a variety of resource management and access needs, including timber harvest, livestock grazing, private land access, fuel wood collection, monitoring of wildlife and other resources, and developed and dispersed recreation activities such as hunting, fishing, off-roading, snowmobiling, hiking, and camping,. Many of the roads on the Modoc National Forest were originally built to permit access for fire suppression or for timber operations and remain open for future timber operations along with other resource activities.

Historically, traffic patterns tended to focus on the local roads within specific timber project areas, range allotment turnout/gathering locations, and the arterial and collector roads that connect those local roads to the County roads and highways. While range management activities occur each year during the grazing season, timber traffic is focused in one area for a few years and then reduces rapidly when the project is completed. Follow-up traffic related to silvicultural or fuels

treatments would be considered resource management activities rather than a continuation of the timber sale traffic.

The long-term trend of forest use is moving from heavy commodity production to recreation and resource management (including fuels reduction, surveys, inventories, and activities such as management of recreation sites). The priorities for available road maintenance funds are shifting from user comfort and maintenance of travel speed to traffic safety and resource protection. If current funding levels continue (see Road Maintenance Funding, page 15), it is anticipated that little work will be done to maintain road surfaces for travel speed and user comfort. Most of the effort will be directed toward safety improvements (e.g., brushing/tree trimming for sight distance, signs, and hazard tree removal) and resource protection activities (e.g., maintaining ditches and cleaning culverts). Over time, safe driving speeds will be reduced and roads will become rougher.

Compared to timber and range management traffic, both resource management traffic and recreation traffic would be expected to be considerably more dispersed spatially, with traffic concentrated on roads that access developed recreation sites such as trailheads, campgrounds, and reservoirs, and with the balance of traffic spread across a wide area. Recreation traffic would tend to have its highest concentrations during summer weekends and holidays, whereas resource management activities would be almost entirely limited to weekdays but would be fairly evenly spread throughout the spring (if snow or mud does not prohibit field access), summer and fall.

During the past 15 years, very few new road construction or road improvement projects have been completed on the Modoc National Forest. Since harvest levels have declined and purchaser credit for road construction has been eliminated, only a small amount of road construction and reconstruction has been included in timber sales in recent years.

Road Maintenance Funding

Road maintenance is accomplished on the Modoc National Forest by a combination of timber sale operators, contractors, and Forest Service and County road maintenance crews. The Forest Service crews and contracts are funded primarily by appropriated dollars and collection accounts. The collection accounts are made up largely of surface rock replacement (SRR) funds collected from commercial users of the road system. These commercial users are mostly timber sale operators (from both private lands and NFS lands) who are responsible for maintaining the roads they use during timber harvest. Timber sales typically have provisions for pre-haul, operational, and post-haul maintenance. The provisions may require activities such as brush removal, drainage cleaning, and surface blading. Additionally, timber sale operators are required to make any improvements needed to existing roads to accommodate their use.

As timber harvest levels have declined over the past 20 years, road maintenance performed by timber sale operators has also dropped along with SRR collections from timber sales. Appropriated funds for road maintenance have increased since a low point in 1994 and continue to fluctuate between $400 thousand and $800 thousand dollars per year. Table 12.1 (seen page 14) shows an estimate of the amount spent on actual road maintenance from appropriated funds and the amount spent each year from the SRR collections. The Forest does not maintain accounting data from previous years; therefore, much of this information is extrapolated from Regional data provided by the R5 Public Use and Facilities Staff (USDA Forest Service, 2001b).

Appropriated funds are expected to continue to fluctuate. The SRR collections available will depend upon commercial saw timber harvest, which has been in decline. Meanwhile, the RAP project review estimated that the nationwide average costs can be reduced by approximately 40% to more accurately reflect local costs for the Modoc National Forest. Even with this favorable cost structure, the data implies the Modoc National Forest is under-funded for the size of the road system it manages.

Table 2.1. Historical Road Maintenance Funding

Fiscal Year	Road Maintenance Appropriated Funds	Surface Replacement Collections	Total Road Maintenance in Year Collected
1996	$332,000	$194,602	$526,602
1997	$367,000	$30,000	$397,000
1998	$460,000	$40,000	$500,000
1999	$649,000	$17,641	$666,641
2000	$586,000	$2,912	$588,912
2001	$531,425	$69,419	$600,844
2001	$580,328	$133,090	$713,418
2003	$696,268	No Record	$696,268+
2004	No Record	No Record	No Record
2005	No Record	No Record	No Record
2006	$399,000	No Record	$399,000+
2007	$800,000	No Record	$800,000+
2008	$799,800	No Record	$799,800+
2009	$768,000	No Record	$768,000+
2010	$798,000	No Record	$798,000+
2011	$563,000	No Record	$563,000+
2012	$571,000	$0	$571,000
2013	$541,000	$0	$541,000
2014	$541,000	$12,465	$553,465
2015	$551,000	Incomplete	$551,000+

Travel Management: Subpart B

In 2007-2009 Travel Management, Subpart B, dealt with designating roads, trails, and areas for motor vehicle use and the cessation of cross-country travel. In order to comply with the associated regulations, Stan Sylva (Forest Supervisor) signed the Record of Decision (ROD)

approving the Modoc National Forest Motorized Travel Management Project FEIS in November, 2009. The decision was appealed by two groups: the California Association of Four Wheel Drive Clubs, Inc. (subsequently withdrawn) and The Wilderness Society. Upon internal review, the Forest Service regional review team upheld a portion of the decision and reversed a portion of the decision.

Upheld

- Prohibiting cross-country travel,
- Adopting seasonal restrictions on 312 miles of NFS roads,
- Restricting use on 1.45 miles of NFS Roads 44N08 and 44N01 (Glass Mountain Pumice Road) to highway-legal vehicles only,
- Closing NFS Road 46B29HB (Boles Creek Road) to public travel for resource protection, and
- Amending the LRMP to bring it into conformance with the Travel Management Rule (TMR) and to exclude Tionesta-area NFS Roads 44A19D, 44A19C, 44N19, 44N20, & 44N04Y from the winter road closure requirement for bald eagle winter roost habitat.

Reversed

- Adding 331 miles of non-system roads to the NFTS, and
- Changing the vehicle class on 513 miles of operational ML 3 roads to allow motorized mixed use (both highway-legal and non-highway-legal vehicles)

The reversals were mainly due to three issues:

- Lack of required analysis for the 331 miles of road additions with regards to riparian and aquatic resources,
- Lack of required analysis for the 331 miles of road additions and 513 miles of vehicle class changes with regards to ungulates, and
- Lack of required analysis for the 513 miles of vehicle class changes with regards to effects (associated with the need to conduct an engineering analysis for each of these roads to investigate safety concerns due to the new variety of traffic being allowed).

A Motor Vehicle Use Map (MVUM) was published and released by the Modoc National Forest in May 2012. The map designates those roads, trails and areas included in the upheld decision, decisions that are enforceable. However, because the map does not include the 331 miles of additional roads that some members of the public want, nor the 513 miles of road for non-highway-legal vehicles, the map does not reflect the intent and public expectation of the original decision. The Modoc National Forest justified the original decision, in part, due to the remote nature and low use of the forest, along with being responsive to public concerns.

A strategy is needed to outline a Forest process to improve travel management and to further analyze the decisions reversed from the ROD. The TAP presents an opportunity to inform these

subsequent Subpart B decisions. Two sets of tables resulted from the analysis work. In the first set, the authorized or NFTS roads are reviewed. In the second set, the unauthorized, non-system (often termed Alt-5) roads are reviewed. These are the 331 miles of roads from the Subpart B process that were analyzed for potential addition to the NFTS. In addition, separate engineering analyses of motorized mixed use are still required to inform future management decisions whether downgrading roads or where allowed vehicle classes would otherwise be changed.

It should be noted that through the ongoing process of road system reviews and updates (ex. utilizing GIS measurements rather than estimates from topographic maps), has led to an overall reduction of the mileage of the Subpart B roads from 331 miles to 315 miles in total length. This is the same set of roads and segments; but, they have now been accurately located and mapped.

Chapter 3 – Identifying Issues Surrounding the Existing Motorized Transportation System

Purpose

The purpose of the third step of travel analysis is to identify the most important road-related issues in the analysis area, determine the information needed to address those issues, and describe how the issues arose and how they have been dealt with in the past.

Environmental Issues

Adverse Effect on Environmental Resources

Although roads have existed since the first settlements and trails appeared, only in recent decades have the true impacts of roads on natural resources and the ecosystem begun to be understood. The state of this knowledge continues to expand, but road impacts have now become a well-recognized concern. Potential effects of roads on environmental resources include the following:

- Drainage or erosion problems that affect water quality and riparian conservation areas,
- Constraint of proper hydrologic function,
- Restriction of fish passage,
- Lowered water tables affecting streamflow, soil moisture, and plant communities, and
- Soil stability and mass wasting control.

Individual road/stream problems, such as plugged culverts or washed out road fills, are generally repaired on the ground as soon after they are identified as funding permits; therefore, there were no known site-specific road/stream problems to include in this analysis.

More commonly, however, road/stream interactions pose a concern for cumulative effects. For example, several small chronic erosion sites in a watershed can impact a downstream location. Similarly, insufficiently drained roadside ditches can function as an extension of the stream network by allowing concentrated flow to reach the stream channel.

Noxious Weeds Spreading Along Road Corridors

Only recently have noxious weeds been considered a serious problem. Although noxious weeds have been appearing and slowly increasing their distribution for many years, only in recent times has the extent of the problem and the potential for future adverse impacts been fully recognized. Weeds and weed propagules are often carried by vehicles along routes or by cross-country travel.

In the past, site-specific occurrences of weeds were treated with herbicides as the initial response. Now, with the unintended effects of herbicides becoming a concern, alternative

methods of treating weeds are being considered and the issue of weeds is receiving more attention.

Wildlife Habitat and Protection

Wildlife species, particularly owls, raptors, bats, and big game, are potentially susceptible to disturbance when found in close proximity to roads. Where habitats are known, mitigation measures can be employed to assist in moderating effects.

Social/Economic Issues

There are insufficient funds available to properly maintain and sign the Forest's road system. This issue has arisen in the past decade as the funds available for road maintenance have diminished. Before that time, roads were maintained to the level that was deemed appropriate using funds that included appropriated dollars as well as SRR funds from commercial users such as timber sale purchasers.

Safety risk to travelers or damage to vehicles from specific road conditions is recognized as a concern. Forest roads can pose risks to drivers from steep slopes, sharp curves, or unstable surfaces. Even roads that are properly constructed can have safety risks, such as erosion from storm damage that changes the road surface, missing or damaged signs, or traffic levels or other characteristics that change from those for which the road was originally designed.

There is also a public perception that road removal or closure may occur without public involvement; that road removal is a political act to deny access to the Modoc National Forest often at the regional or national level rather than at the local level. These decisions are often seen as detrimental to the local way of life. Consequently, some members of the general public, including local elected officials, question what the Agency is planning and what the true intent of many actions undertaken by the Agency might be.

The inadequacy of road access for future economic or recreation development needs (e.g., juniper management, woodcutting, tourist loops, and other economic opportunities) is another issue. This issue arises as the Modoc National Forest and the local economy begin to expand public use of NFS lands for economic stability. The current road system may not be sufficient to meet these other needs, whether recreation-oriented or commodity-focused, those have yet to be fully developed. The forest road system may need to expand in the future. Access is critical to numerous disciplines and factions within the Modoc National Forest and the surrounding communities. Consider:

- The need for prompt initial attack by fire suppression,
- Timber access and forest management,
- Cultural and Tribal access needs,
- Recreational opportunities,

- Access to high value sites (e.g., fire look-outs, mines, and timber stands) or roads with legal obligations to provide access,
- Adjacent private land access needs, and
- General administrative uses.

Chapter 4 – Assessing Benefits, Problems, and Risks of the Existing Motorized Transportation System

Introduction

The purpose of this step is for the TAP Team resource specialists to individually assess the current NFTS with relation to their resource area. Each specialist was tasked with developing criteria to address the important issues identified in Chapter 3. The developed evaluation criteria represent either a risk or a benefit.

Since the TAP was designed to use existing data and information gathered from the public, criteria were selected based on the following factors:

- Relevance of issues, concerns, and needs that could be translated into key questions;
- Ability to create evaluation criteria for each question with a measurable rating system that could be consistently applied; and
- Availability of existing data that could be geospatially referenced and thus analyzed using both GIS and traditional interdisciplinary team methods.

Evaluation Criteria

The resource evaluation criteria are documented below. The pink shading indicates risks and the green shading indicates benefits. The goal was to assign a value, whether risk related or benefit, to each road segment in the data base from 5, highly affected, to 1, not affected, or in between. Each evaluation utilized here is of equal value and no prioritization or compounding formula was used to distinguish one as greater value over another. When multiple variables were accepted for a given resource area, a discussion was involved to ascertain why a variable should not be incorporated into a summary resource value versus stand alone. Thus, some disciplines had more influence on the outcome than others when afforded the ability to use multiple values. Collectively there were more risk factors than benefits making this a more risk sensitive appraisal. A narrative discussion and assumptions, when provided by the TAP Team specialists, follow the applicable criteria.

Table 4.1. Resource Evaluation Criteria - Archaeology

Archaeology	
Adverse Effects of Access	
Risk	
Question to be addressed: How does the proximity of recorded archaeological or historical sites to routes create the potential for adverse effects? **Units of Measure:** o Presence of archeological sites accessed by, on, or adjacent to route. o Presence of archaeological sites within 30 meters of route. **Data Source:** o Heritage GIS Database o Forest Archaeologist professional experience and judgment	**5 (HIGH)** - The existing route poses a high potential to adversely affect two or more archaeological or historic sites; route either bisects or is immediately adjacent to numerous sites.
	4 (MOD-HIGH) - The existing route poses a high potential to adversely affect at least one archaeological or historic site; route bisects or is immediately adjacent to one site.
	3 (MODERATE) - The existing route poses a moderate potential for adversely affecting archaeological or historical sites; route is located within 30 meters of a site.
	2 (LOW-MOD) – Not used
	1 (LOW) - The existing route poses no known effect or an insignificant effect on archaeological or historical sites

The Forest's Heritage Database (GIS) and Master Atlas were used to develop the TAP archaeology summary table. These media are the standard for identifying archaeological site location information both by Modoc National Forest and Agency-wide staff. In addition, the professional judgment of the Forest Archaeologist and Heritage Database Manager were utilized in developing a matrix of potential risk from roads to archaeological resources. Proximity to travel routes has the potential for risk to archaeological sites through direct physical impact and from increased access, which may result in surface and, in some cases, subsurface collection of archaeological materials.

All archaeological sites evaluated and determined eligible for the National Register of Historic Places, as well as those that remain unevaluated (hence "potentially eligible") within the heritage database, were considered based on proximity to travel routes.

Table 4.2. Resource Evaluation Criteria – Botany, Noxious Weeds

Botany	
Noxious Weeds	
Risk	
Units of Measure: o Presence or absence of certain weed species within 1 car length of a road o More or less than half of a given road segment falls within sites of certain weed species. **Data Source:** o MDF Roads GIS layer o MDF Weeds GIS layer, based on MDF botany survey and weed treatment records	**5 (HIGH)** – Noxious annual grasses or rhizomatous weeds known from within 1 car-length of road edge - *Elymus caput-medusae (* Medusahead) - *Ventenata dubia* (North Africa grass) - *Cirsium arvense* (Canada thistle) - *Lepidium* spp. (pepperweed / white-top) - *Linaria dalmatica* (Dalmatian toadflax) OR 'Category 4' weed species infest more than 50% of a road segment.
	4 (MOD-HIGH) – Select broadleaved tap rooted weeds recorded from within 1 car-length of road edge. - *Acroptilon repens* (Russian knapweed) - *Centaurea* spp. (knapweeds and yellow starthistle) - *Crupina vulgaris* (bearded creeper) - *Cynoglossum officinale* (common hound's tongue) - *Isatis tinctoria* (dyer's woad) - *Onopordum acanthium* (Scotch thistle) - *Salvia aethiopis* (Mediterranean sage)
	3 (MODERATE) – Not used
	2 (LOW-MOD) – All other broadleaved tap rooted weeds recorded from within 1 car-length of road edge. For example, - *Hypericum perforatum* (Klamathweed) - *Cirsium vulgare* (bull thistle)
	1 (LOW) – No known noxious weeds within 1 car-length of road edge.

Vehicles travelling along roads may spread weeds by picking up weed seeds (or other propagules) from an infested location and later depositing them in un-infested locations. The greatest risks are posed by those weeds which are practically impossible to eradicate once established: such as annual grasses and rhizomatous weeds. High risks also exist in places where weeds are so abundant that picking up seeds is very likely. Moderate to high risks are posed by certain broadleaf weeds that have shown themselves to be particularly invasive and persistent on the Modoc National Forest, but are easier to treat than the highest risk weeds. Moderate to low risks are posed by certain broadleaf weeds that have not shown themselves to be as invasive or as persistent on the Modoc National Forest as the higher risk weeds.

Vehicles may disperse seeds from weed occurrences within one car length of a road edge.

GIS assumptions for the previous and the following botanical criteria include:

1. The road layer buffer will be 82 feet:
   - 12 feet on either side of the centerline, to account for full road width (County road requirement: maximum width of a single-lane road with turnouts. A single-lane road is 12 feet wide and has additional 12-foot wide turnouts at regular intervals. A two-lane road is 22 feet wide. Per Dale Weaver, C&M Crew Leader);
   - 20 feet beyond the full road width, to account for a car length (Length of a parking spot stripe in our parking lot);
   - 50 extra feet, to account for GIS mapping error (equivalent to the estimated mapping error buffer for rare plants and noxious weeds)
2. The weed/rare plant/special habitats buffer will be 50 feet, to account for possible Garmin GPS error. (Garmin website describes typical maximum error of Garmin GPS unit as 15 m. Most noxious weed and rare plant sites in recent years have been mapped with recreation-grade Garmin GPS receivers or similar technologies.)

Table 4.3. Resource Evaluation Criteria – Botany, TES and Watch list Plants

Botany	
Threatened, Endangered, Sensitive, and Watch list (TESW) Plants and their Habitats	
Risk	
Units of Measure: o Presence or absence of TESW plants within 1 car length of a road o Presence or absence of a mapped special botanical habitat (vernal pool or fen) within 1 car length of a road **Data Source:** o MDF Roads GIS layer o MDF Rare Plant GIS layer, based on MDF botany survey records o MDF Vernal Pool GIS layer o MDF Fen GIS layer	**5 (HIGH)** – A population of a Threatened, Endangered, or Sensitive plant species is known to occur within one car-length of road edge.
	4 (MOD-HIGH) – A special botanical habitat is known to occur within one car-length of road edge.
	3 (MODERATE) – Not used
	2 (LOW-MOD) – A population of a watch list plant species is known to occur within one car-length of road edge.
	1 (LOW) – No known TESW plant occurrence nor special botanical habitat within one car-length of road edge.

Threatened and Endangered plant species have been listed as such under the provisions of the Endangered Species Act of 1973.

Sensitive plant species have been formally determined by Region 5 as species whose populations require special management to ensure that Forest Service activities do not necessitate the species being listed as Threatened or Endangered.

Watch list plant species are those species that are not listed under the Endangered Species Act, nor considered Sensitive by Region 5, but that have been identified by the Forest Botanist as uncommon plant species deserving attention as components of Forest biological diversity and potentially as indicators of uncommon habitat types. Most species in this category are those with California Rare Plant Ranks (http://cnps.org/cnps/rareplants/ranking.php) but which are neither listed nor sensitive.

Special botanical habitats are relatively uncommon landscape features that are frequently associated with rare plant species. Attempts have been made to map two of these habitat types: vernal pools and fens. Our Vernal Pool and Fen GIS layers were created by Dr. Robert Holland in 2006 based on aerial photos, and have been irregularly updated with botany field data since.

Occurrences or special habitats within one car-length of a road are subject to the direct impacts of vehicles. Direct impacts may include crushing, submerging, or uprooting of plants by vehicle tires, harming plants by breaking off stems or leaves, altering the flow and distribution of water to rare plants, introducing pollutants, *etc.*

Evaluation criteria for each question were established to facilitate the initial GIS analysis for both benefit and risk key questions. We used a rating system based on a common scale of 1-5.

Methods – Botany TAP Analysis

1. Create appropriate buffers on the *TAP_ROADSCORE* layer (82 ft), *TAP_TMAlt_Road* (82 ft) layer, TAP_*ModocNF_Weeds_2014* layer (50 ft), *TAP_ModocNF_RarePlants* (50 ft) layer and TAP_Bot_PotentialHab_4 (50 ft) layer as outlines in the Botany matrix.

2. Using 'Select by Attribute' and "Export Data (Selected Features)" on the *MDF Weed* layer, create a new shape file for each respective risk group (5, 4, 2). Repeat this process for the *MDF Rare Plants* layer. The result is five new shapefiles (*TAP_ModocNF_Weeds_2, TAP_ModocNF_Weeds_4, etc.*) that contain only the records containing plants that fall in the specific risk category. *TAP_Bot_PotentialHab_4* is already its own layer and, therefore, does not need this step.However, the 4 at the end of the title indicates that this layer is a 4 risk factor.

3. In the *TAP Road* layer, create two new short integer fields (NoxWeed and RarePlant); using 'Field Calculator' populate both of these fields with "1".

4. Using 'Select by Location', use the *TAP_ROADSCORE_82BUF* as the Target Feature and *TAP_ModocNF_Weeds_2* as the Source Layer and use the spatial selection method of "intersect the source layer feature". This should select only the records in *TAP_ModocNF_Weeds_2* that come in contact with the roads. Keeping these records selected, use the Field Calculator on the NoxWeed field and populate the selected records with "2". Repeat this process for the remaining risk layers, making sure to start with the lowest risk and working your way up to the highest risk (so that any records with more than one risk factor will take the higher risk factor).

5. In order to determine if a road segment is more than 50% covered by noxious weed, the "Intersect" tool is needed. But **first**, open the attribute table for *TAP_ROADSCORE_82BUF* and make sure that the Shape Length and Shape Area fields are updated by using Calculate Geometry. Update them both for Area using acres; this is important because the Shape Area field seems to disappear in the next step and the Shape Length will be what you use to reference the area of the road segments.

6. Next, use the "Intersect" tool with input features of *TAP_ROADSCORE_82BUF and TAP_ModocNF_Weeds_2.* This will create a new shape file, *TAP_ModocNF_Weeds_2interc,* that reflects the overlapped area between the two input layers. All of the attributes from the two parent layers will be in the attribute table, including the Shape Length field with the area of the road segments. The attributes from the *TAP_ModocNF_Weeds_2* also have a Shape Length field so don't get confused! One will be near the beginning of the attribute table and the other will be near the end, depending on the order that you input the layers into the Intersect dialog box. For simplicities sake, use the field named Shape Area that is grouped with the other Weed attributes as your new Area field. Calculate Geometry on this field and it will update to reflect the size of the new shape file records.

7. In *TAP_ModocNF_Weeds_2interc,* create a new field and name it PercentCov. Short integer is fine since we only need a binary answer to the question of percent. Using Field Calculator, divide Shape Area (the updated field near the weed attributes!) by Shape Length (the field near the road attributes that still reflects the old area of the roads). This will populate the field with 1's and 0's, depending on whether the percent rounded up to 1 or down to 0.

8. The records containing "1" need to be bumped up to the next risk category in *TAP_ROADSCORE_82BUF,* so use Select by Attribute to highlight those records.

9. Keeping those records highlighted, use Select by Location [use the *TAP_ROADSCORE_82BUF* as the Target Feature and *TAP_ModocNF_Weeds_2* (use selected features) as the Source Layer and use the spatial selection method of "intersect the source layer feature"]. Start editing and open up the attribute table for *TAP_ROADSCORE_82BUF,* updating the highlighted features. NOTE: *If more features are highlighted after the most recent selection that was highlighted after selecting for "1", then use the Unique ID to determine which records need to be updated (this should substantially narrow it down).*

10. Repeat steps 7-10 for the *TAP_ModocNF_Weeds_4 layer.*

11. At this point, all of the risk factors should be up-to-date and easily accessible in the *TAP_ROADSCORE_82BUF* layer, specifically in the NoxWeeds and RarePlants fields.

The above process was repeated for the TAP_TMAlt5_Road layer.

The shape files for botany are named:

TAP_RoadsCORE_MDFBotany112614, and

TAP_TMAlt5Road_MDFBotany112614.

Table 4.4. Resource Evaluation Criteria – Engineering and Minerals

Engineering and Minerals	
Road Access to High Value Sites	
Benefit	
Question to be addressed: Does the road provide access to mining, engineering, or administrative sites and facilities? **Units of Measure**: o Presence of inventoried sites & facilities o Direct access to the above **Data Source:** o MDF transportation atlas: spatial + tabular data o MDF GIS site & facility inventory o MDF engineering & minerals specialists' professional judgment to verify access routes	**5 (HIGH)** – Road provides primary access to a managed facility, administrative site, Bureau of Reclamation managed dam, geothermal well, or individual mine
	4 (MOD-HIGH) – Road provides access to a quarry, gravel pit, cinder pit, or water source used and/or managed by engineering
	3 (MODERATE) – Road provides access to a mining district or known geothermal resource area (KGRA)
	2 (LOW-MOD) – Not used
	1 (LOW) – Road does not provide primary access to a known facility as described above

This benefit ranking demonstrates the road access value with relation to authorized engineering, minerals, and geological facilities. Known sites were manually identified and then the access routes were delineated from the site through the NFS network, out to the expected County or State public access road. Specific points, such as geothermal wells, were given a higher priority than managed areas, such as mining districts and geothermal resource areas. Points were further prioritized, with managed NFS facilities, administrative sites, BOR-managed dams, geothermal wells, and individual mines being prioritized over other features such as rock quarries, gravel pits, cinder pits, or known water sources used or managed by the Forest Service.

Table 4.5. Resource Evaluation Criteria – Fire and Fuels

Fire and Fuels	
Management Access	
Benefit	
Questions to be addressed: o Where do routes provide ingress and egress for fire suppression and fuels management activities o How does closure affect risk to firefighter and public safety? **Units of measure:** o Existing access along routes and features **Data source:** o MDF GIS transportation, streams, springs, lakes, guard station, lookout, WUI, and power line layers. o Forest and District fire management staff's professional experience and judgment	**5 (HIGH)** – The route provides critical access to guard stations, lookouts, WUI areas, and power lines. The absence of this access presents an unacceptable risk.
	4 (MOD-HIGH) – The route provides critical access to potential water sources on the Forest.
	3 (MODERATE) – The route provides necessary access to the Forest along roads that currently are accessible only to high clearance vehicles.
	2 (LOW-MOD) – The route provides access to the Forest along roads that have not been maintained in the past.
	1 (LOW) – The route provides access to areas that can be accessed by other routes that will be maintained.

Fire Management's primary concern is to maintain access across the Modoc National Forest to suppress fires. The Modoc National Forest averages 83 fires per year and the primary mode of travel to those fires is by engines along forest roads.

Priority 5 (High) – The most critical routes of access are those leading to fire suppression facilities (e.g., guard stations and lookouts), wildland urban interface (WUI) areas, and critical infrastructure (e.g., power lines). Without access to these areas, fire personnel would be unable to locate or respond to fires. Ingress and egress for WUI areas would be limited, thus increasing risk to individuals living in those areas. Access to power lines is also critical for both the local power supply as well as part of the larger west coast power grid.

The guard station and lookout GIS layers were analyzed. A1000-foot buffer was used to select road segments close to these areas. Extensions of the route numbers were added, considering ingress and egress needs. Those extensions that did not connect with a logical ingress/egress route were not considered. The WUI layer was analyzed using a 100 foot buffer, and a 400-foot buffer on the power line layer.

Priority 4 (Moderate-High) – These routes lead to potential water sources (i.e., streams, springs, lakes, wells, and stock ponds). Without access to water sources, water fill times would increase dramatically, which could limit suppression actions. Fifty and one hundred foot buffers were considered where a road segment crossed a water source. For lakes, this was increased to 250 feet as many of the road segments leading to lakes were located more than 100 feet away on the GIS layer. There was not a significant difference in the number of road segments affected between 50 and 100 feet for streams or springs.

Priority 3 (Moderate) – Moderate routes provide access to large areas of the forest. Priority 3 routes are currently accessible only to high clearance vehicles and provide a large network throughout the forest. Without adequate vehicle access, a significant increase in the average fire size could be expected. These routes are currently maintained at Maintenance Level 2 to Maintenance Level 5.

Priority 2 (Low-Moderate) – These routes do not provide access to large areas of the forest and are currently maintained at Maintenance Level 1 (closed).

Priority 1 (Low) – These routes access areas that can be accessed by other routes that will be maintained.

Table 4.6. Resource Evaluation Criteria – Fisheries and Aquatic Species

Fisheries and Aquatic Species	
Habitat	
Risk	
Questions to be addressed: ○ How and where do routes affect aquatic federally listed Threatened and Endangered and Forest Service Sensitive (TES) Species and their habitat? ○ To what extent does the route system overlap with areas containing TES aquatic species? ○ How and where does the route system restrict the movement of TES aquatic organisms? **Units of Measure:** ○ Proximity to Aquatic Habitat ○ Hydrologic Connectivity ○ Subwatershed route density **Data Source:** ○ GIS layer identifying subwatersheds (7th field), ○ TES species current and historical known locations, ○ GIS USGS streams layer with RHCA buffers applied to them; ○ GIS transportation layer identifying NFS classified routes, unclassified route transportation layer ○ District Aquatics Specialist professional experience and judgment.	**5 (HIGH)** - Portions of route located within or crossing TES habitat, with potential to contribute sediment, and with direct connectivity to perennial aquatic habitat. **4 (MOD-HIGH)** – Not used **3 (MODERATE)** - Portions of route located within or crossing TES habitat, with potential to contribute sediment to but with no direct connectivity to perennial aquatic habitat, or with direct connectivity to intermittent aquatic habitat. **2 (LOW-MOD)** - Not used **1 (LOW)** - Route located outside of TES habitat.

Routes and road systems were analyzed based on effect to federally listed Threatened and Endangered aquatic species, and Forest Service Sensitive aquatic species (TES). Specifically, the risks to be assessed would be:

- Does the route restrict movement or migration of aquatic TES species?
- Does the route have the potential to contribute sediment to aquatic habitat?
- Does the route have the potential to compromise riparian microclimate conditions?

Routes within Riparian Habitat Conservation Areas (RHCAs) have the potential to compromise riparian microclimate conditions due to soil compaction and reduced vegetative capacity, and the potential to contribute sediment into aquatic habitat. Subwatersheds with high route densities increase the risk of sediment delivery into aquatic habitat. A route with hydrologic connectivity that has the potential to deliver sediment into perennial waters is rated with a higher risk rating than a route with similar sediment delivery potential but located where sediment would likely not reach these habitats.

When addressing routes and road systems, hydrologic connectivity was factored in as a major risk to habitat quality. This risk was greatest in areas with perennial aquatic habitat. Areas with direct connectivity, but with intermittent aquatic habitat, were factored as a lower risk. The lowest risks were those with sediment delivery potential that would not reach habitat, and those located outside of TES habitat.

Table 4.7. Resource Evaluation Criteria – Hydrology, Culvert Impacts

Hydrology	
Culvert Impacts	
Risk	
Question to be addressed: How and where do culverts affect water quality? **Units of Measure:** o Risk assigned to the highest risk culvert. **Data Source:** o MDF INFRA inventory o Stream Buffers o MDF hydrology, fisheries biologist and engineering specialist professional judgment to verify conditions **Data Limitations:** Only culverts entered into INFRA were used and, of those, only those selected with a buffer of 15- and 300- feet from intermittent and perennial streams, respectively.	**5 (HIGH)** – Culvert diameter ≤ 18" AND Native Surface
	4 (MOD-HIGH) – a. Culvert size > 18" And Native Surface OR b. Culvert size ≤ 18" AND Improved Native Material, Cinder Surface, Scoria or Crushed Aggregate or Gravel.
	3 (MODERATE) – a. Culvert size > 18" AND Improved Native Material, Cinder Surface, Scoria or Crushed Aggregate or Gravel b. Culvert size ≤ 18" AND Asphalt
	2 (LOW-MOD) – Culvert size > 18" AND Asphalt
	1 (LOW) – No inventoried culverts

How and where do culverts affect water quality? The question correlates the impact of culverts on water quality and stream habitats (scour/fill). The highest risk culvert along the segment determined the value of the segment. Culverts less than or equal to 18" culverts are assumed to meet minimum diameter size as required by Forest Service policy but may not have been sized based on site-specific hydrology. As such these culverts may be potentially undersized and, therefore, affect surface flow (and potential sediment loading) at those locations with a buffer of 15' and 300' from intermittent and perennial streams, respectively. Culverts greater than 18" were assumed to be sized based on their site-specific hydrology and are assumed to have less impact on surface flow and less risk of sediment loading.

The following criteria are utilized to determine the extent that the road system modifies surface hydrology of the area:

- Culvert size
- Road surfacing type (native, crushed aggregate or gravel, or asphalt)
- Hydrologic connectivity
- Channel proximity

Table 4.8. Resource Evaluation Criteria – Hydrology, Riparian Conservation Areas

Hydrology	
Riparian Conservation Area Loss	
Risk	
Questions to be addressed? How and where do routes affect Riparian Conservation Areas? **Units of Measure:** o Percent of road segment prism occupied by SNV RCA. **Data Source:** o MDF INFRA inventory o SNV RCA o MDF hydrologist, fisheries biologist and engineering specialist professional judgment to verify conditions **Limitations:** Only NFTS Roads in watersheds clipped to FS boundaries were used because those are the only roads where FS can have influence.	**5 (HIGH)** – (i.e. % road segment prism occupied by stream buffer) > 184.07 percent
	4 (MOD-HIGH) – 108.01 - 184.07
	3 (MODERATE) – 57.91 - 108.01
	2 (LOW-MOD) – 18.40 - 57.91
	1 (LOW) – 0.00 - 18.40

How and where do routes affect Riparian Conservation Areas (RCA)?

The question correlates loss of the riparian habitat and function due to presence of road prism in riparian corridor area. The presence of the road prism is assumed to have an effect on the RCA. Risk to the RCA is based on the percent of road segment prism occupied within the stream buffer. The higher the percent of road segment within the RCA, the higher the risk. Maintenance Level 4 and 5 roads are assumed to have a 30-foot wide road prism (18-foot wide road surface + 6-foot wide shoulders). Maintenance Level 2 and 3 roads are assumed to have a 24-foot wide road prism (14-foot wide road surface + 5-foot wide shoulders). ML 1 roads are assumed to have 14-foot wide road prism (10-foot wide + 2-foot wide shoulders). For purposes of analysis, perennial and intermittent streams are combined with perennial streams, with perennial receiving a weight of two times that of the intermittent.

The following criteria are utilized to determine the extent that the road system modifies surface hydrology of the area:

- 'Typical' road prism based maintenance levels

- Roads with Forest Service boundary
- Stream type (intermittent vs. perennial) channel proximity

Table 4.9. Resource Evaluation Criteria – Range

Range	
Range Allotment Access	
Benefit	
Question to be addressed: How does the road system affect access to range allotments for semi-truck and trailer and stock truck access needed for gathering, loading and unloading of livestock? **Units of Measure:** o Road access to allotments o Livestock management o Accessibility to range improvements **Data Source:** o District Range Specialists' professional experience and judgement o MDF GIS data o Livestock Allotment Records for each district	**5 (HIGH)** - The road system provides the only access to the allotment(s) and its improvements, or minimal access to most of the allotment necessary for livestock management. Cross-country travel by foot or horseback is necessary for allotment management or minimal access to existing and planned structural range improvements necessary for livestock management. Cross-country travel by foot or horseback is necessary for range improvement inspection and maintenance.
	4 (MOD-HIGH) – Not used
	3 (MODERATE) - The road system provides adequate access to the allotments, to all parts of the allotment necessary for livestock management, or to existing and planned structural range improvements for inspection and maintenance.
	4 (LOW-MOD) – Not used
	1 (LOW) – There are no range allotments in the area or the road system provides redundant access to the allotment(s), or within the allotment(s) necessary for livestock management, or to existing or planned structural range improvements.

Of the 89 range allotments on the Modoc National Forest, 75 are active and must be serviced by State and County public roads and the NFTS. The Forest has an obligation to the permittee to maintain adequate access to the range allotments and the authorized improvements within them.

Technique for Ranking
For each road, each criteria described above was rated using GIS layers with information about the range allotments. The GIS Specialist ran a 500-foot buffer and a 1320-foot buffer on the roads that provided access to an allotment and range improvements. If a range improvement or access to an allotment fell within 500 feet, then the road was rated High (5); if one fell between 500 and 1320 feet, then the road was rated moderate (3); and if no range improvement or access to an allotment fell within 1320 feet, then the road was given a low rating (1). The Range Specialists reviewed the results to validate the ratings.

Table 4.10. Resource Evaluation Criteria – Recreation, OHV

Recreation	
Off-Highway Vehicle Recreation – OHV	
Benefit	
Question to be addressed: Does this road offer a unique off-highway vehicle (OHV) recreation opportunity? **Units of Measure:** o Route provides access to OHV trailhead or is part of a loop system. o Route has future potential use related to OHV recreation. **Data Source:** o LMRP o MDF Roads layer o Established multi-user routes	**5 (HIGH)** - Road is deemed for decommissioning/storage (ML* 1), part of a loop system, or one that should be converted to a motorized trail. ML 2 roads greater than one mile long and ML 2 roads that are within a one-mile radius of an established recreation site.
	4 (MOD-HIGH) – ML 2 roads that are greater than one mile long and within a 10-mile radius of a recreation site point.
	3 (MODERATE) - Road is part of a loop system or a ML 2 road that is greater than 1 mile long and intersects a ML 3 road.
	2 (LOW-MOD) – Not used
	1 (LOW) - Road is not part of a loop system nor in close proximity to a known OHV area. All ML 3, 4 and 5 roads except those that are part of a loop system.

*ML is Maintenance Level; refer to Appendix 1: Definitions

Table 4.11. Resource Evaluation Criteria – Recreation, Roaded Recreation Access

Recreation	
Roaded Recreation Access	
Benefit	
Question to be addressed: How does the route provide access to recreational opportunities, including: Roaded/Developed recreational opportunities; Roaded/General Forested Area recreational opportunities; and Primitive/Wilderness recreational opportunities? **Units of Measure:** o Presence or absence of recreational opportunities o Direct access to above opportunities **Data Source:** o LRMP o Forest Service GIS corporate database survey for recreation sites.	**5 (HIGH)** – Route is within or is required to access developed and non-developed recreational opportunities, or is required to access trailheads. Roads within ¼-miles of developed recreation sites and ML 3, 4 and 5 roads and scenic byways. ML 3, 4 and 5 roads that intersect a water feature.
	4 (MOD-HIGH) –Not used
	3 (MODERATE) - Route accesses a popular area where no site has been established.
	2 (LOW-MOD) – Not used
	1 (LOW) - Route is not connected to any developed, non-developed, dispersed recreation site or trailhead.

Table 4.12. Resource Evaluation Criteria – Recreation, Unroaded Recreation

Recreation	
Unroaded Recreation	
Risk	
Question to be addressed: What are the adverse effects of noise and other disturbances caused by developing, using, and maintaining roads on the quantity, quality, and type of unroaded recreation opportunities? **Units of Measure**: o Proximity of motor vehicle routes and unroaded recreation opportunities. o Direct access to above opportunities **Data Source:** o LRMP Management Prescription Area for Unroaded Recreation Areas. o National Forest Service GIS corporate database survey for recreation sites.	**5 (HIGH)** - Road is within ½ mile or crosses Wilderness Areas (roads that lead to a wilderness trailhead are excluded), Inventoried Roadless Areas, Research Natural Areas and National Recreation Trails.
	4 (MOD-HIGH) – Not used
	3 (MODERATE) - Road is located within ¼ mile of non-motorized trails within areas managed for motorized activities.
	2 (LOW-MOD) – Not used
	1 (LOW) – Road is used to access trailheads or other specified trail access points not known as problems for illegal use of motorized vehicles.

Table 4.13. Resource Evaluation Criteria – Soils

Soils	
Soil Managability Ratings	
Risk	
Question to be addressed: How and where do routes affect watershed conditions and soil manageability? **Units of Measure:** o Soil Manageability Group: Slope gradient, slope stability, maximum erosion hazard, soil depth, Available Water Capacity (AWC) in top 20" of soil, wetness, rock outcrop or surface boulders. **Data Source:** o Soil Survey of the Modoc National Forest Area, California o Natural Resources Conservation Service (NRCS) Web Soil Survey o Forest soil scientist's professional experience and judgment	**5 - (HIGH)** – >10% of the route is in Soil Manageability Group IV. The majority of soils in this Manageability Group have slopes that are greater than 60%. Soils are considered very difficult to manage.
	4 (MOD-HIGH) – 6-10% of the route is in Soil Manageability Group IV and >10% is in Soil Manageability Group III. The majority of soils in this Manageability Group have slopes that are 30% to 60% or have a substantial management problem, or both. Soils are considered moderately difficult to manage.
	3 (MODERATE) – 3-5% of the route is in Soil Manageability Group IV and 6-10% is in Soil Manageability Group III. The majority of soils in this Manageability Group have slopes that are less than 30%. Soils have a moderate management problem. Soils are considered readily manageable.
	2 (LOW-MOD) – 2% of the route is in Soil Manageability Group IV and 4-5% is in Soil Manageability Group III. The majority of soils in this Manageability Group have stable slopes that are less than 30%. Soils have no more than a slight management problem. Soils are considered easy to manage.
	1 (LOW) – 1% of the route is in Soil Manageability Group IV and 1-3% is in Soil Manageability Group III. The majority of soils in this Manageability Group have stable slopes less than 30%. Soils have no more than a slight management problem. Soils are considered easy to manage.

The Soil Manageability Group was used to develop the TAP soil summary table. The rationale for using the Soil Manageability Group was the applicable interpretive components that affect watershed conditions and road management. The interpretive components are slope gradient, slope stability, maximum erosion hazard, soil depth, available water holding capacity (AWC) in top 20" of soil, wetness (i.e. drainage class), and rock outcrop or boulder. Soil Manageability Group is a Region 5 soil interpretation.

The Soil Manageability Groups are defined by the taxonomic units characterized in the soil manageability classes. Soil Manageability Group is a composite rating for a mapping unit, based on limitations of individual taxonomic units.

Risk was broken down by the percentage of Soil Manageability Groups in each of the five risk categories (Table 4.13).

Table 4.14. Resource Evaluation Criteria – Special uses

Special Uses	
Utility Corridor Access	
Benefit	
Question to be addressed: How does the route system allow permittees and lessees to meet their contractual obligations? **Qualifiers**: o Does the route facility provide required or reasonable access to uses of public health and safety or law? o Does road facility provide reasonable access to other permitted facilities? o Does road facility provide reasonable access to permissible use areas? **Data Source:** o Requirements outlined in Special Use Permits, Rights-of-Way, and Leases o MDF transportation system and GIS data o MDF professional judgment for required or reasonable access	**5 (HIGH)** – Road provides primary access to permit location/facilities including utilities, inholdings, communications, and dams/reservoirs.
	4 (MOD-HIGH) – Not used
	3 (MODERATE) - Road provides reasonable access to permitted location/features of permitted uses.
	2 (LOW-MOD) – Road provides access to location/feature for permissible uses.
	1 (LOW) – Not used

Table 4.15. Resource Evaluation Criteria – Vegetation Management

Vegetation Management	
Timber and Resource Management Access	
Benefit	
Question to be addressed? How does the route system affect the ability to manage timber stands and extract wood products? **Units of Measure:** o Vegetation type and slope class that is traversed by the highest percent of the road segment **Data Source:** o MDF vegetation layer, road routes, and 10m DEM layer products o Local knowledge of road conditions	**5 (HIGH) – Vegetation/Slope Class 5** - Road segments that provide access to timber stands that are dominated by ponderosa pine or mixed conifer vegetation types and the dominate slope class (>50% of the stand) is less than 45%.
	2 (MOD-HIGH) – Not used
	3 (MODERATE) – Vegetation/Slope Class 3 - Roads that provide access to areas dominated by western juniper. Roads that provide primary access to areas dominated by ponderosa pine and mixed conifer vegetation types in stands where the majority of slopes are 45% or greater.
	2 (LOW-MOD) – Not used
	1 (LOW) – Vegetation/Slope Class 1 - Roads that do not provide access to commercial wood products or conifer dominated stands.

Selection of Criteria

Slope Steepness

Roads typically provide a benefit to vegetation management activities and the associated extraction of commercial wood products. In order to quantify the level of benefit each road segment provides to these activities, a discrete level of measurable criteria was developed. Per the LRMP (page 4-24), ground-based logging systems should generally be utilized on slopes of 40% or less. For this analysis a terrain slope of 45% was used to represent the delineation between the possible use of ground-based logging systems versus cable or helicopter logging systems. The additional 5% slope steepness above the LRMP guidelines was utilized for analysis purposes in order to account for possible inconsistencies between the GIS data and actual field conditions.

Due to the higher costs of cable and helicopter logging and the geographic challenges of Modoc County, these logging systems have not typically been utilized in recent years without substantial financial subsidy. The economic and geographic challenges of utilizing these logging systems in Modoc County include a long distance to market, low value timber species (relative to logging system and haul distance), lack of existing road systems designed for non-ground based systems and a lack of local operators with cable or helicopter system capabilities.

Road segments that provide access to forest stands of commercial value with a majority of slope (greater than 50% of stand) below 45% were assumed to be accessible to ground-based logging. These forested stands will have a higher potential of being managed for both ecosystem restoration and production of wood products due to their economic viability and logistical access. Therefore, these road sections were given the maximum benefit rating of 5. Road segments that

provide access to commercial value forested stands with the majority of slope at 45% or greater were given a moderate benefit rating of 3 due to the economic and geographic management restrictions listed above.

Vegetation Type

Ponderosa pine and mixed conifer vegetation types comprise the forested stands of commercial value on the Modoc National Forest. These vegetation types were combined with the slope requirements listed above to provide a discrete measurement of road access benefits. In addition, the future management needs of areas dominated by western juniper were considered. Although this species is not considered commercially valuable (other than use as firewood), it is managed for ecosystem restoration purposes. Therefore, roads that provide access to areas dominated by western juniper were given a moderate benefit rating of 3. This species is often hand felled and is not typically yarded over the terrain. Therefore, a slope parameter was not used for rating these areas.

Quaking aspen is also managed for ecosystem restoration purposes. However, this species typically occupies moist microsites within larger conifer dominated stands. In addition, restorative management techniques for this species typically revolve around reducing conifer encroachment within the identified microsites. Therefore, analysis of road segments accessing conifer-dominated stands also captures the management access benefits for quaking aspen.

Roads that do not provide access to conifer-dominated forest stands were given a low benefit rating of 1. These road segments provide little benefit to the management of tree species on the Modoc National Forest.

Table 4.16. Resource Evaluation Criteria – Wildlife - Raptor Species, Sandhill Crane, Sage Grouse, and Cave Dwelling Bats

Wildlife	
Raptor species, Sandhill crane, Sage-grouse, cave dwelling bats	
Risk	
Units of Measure: o Presence or absence of certain species within critical distance of a road o Presence or absence of 'dense' vegetation cover around the documented species site **Data Source:** o MDF Roads GIS layers o MDF Wildlife GIS layers o MDF EvegForestCover GIS layer	**5 (HIGH)** – Nest site (raptor species and sandhill crane), telemetry points (sandhill crane and sage-grouse), or habitat (bats) is within 100 meters of a road segment. -Northern goshawk -Bald and golden eagles -Osprey -Prairie falcon -Swainson's hawk -Sandhill crane -Sage-grouse -Cave dwelling bats
	4 (MOD-HIGH) - Nest site (raptor species and sandhill crane), telemetry points (sandhill crane and sage-grouse), or habitat (bats) is within 200 meters of a road segment. -see 'Category 5' high risk species listed above OR 'Category 5' species is in densely forested area [using California Wildlife Habitat Relationship (WHR) land cover data for 'dense' and 'moderately dense'].
	3 (MODERATE) - Nest site (raptor species and sandhill crane), telemetry points (sandhill crane and sage-grouse), or habitat (bats) is within 400 meters of a road segment. -see 'Category 5' high risk species listed above OR 'Category 4' species is in densely forested area [using California Wildlife Habitat Relationship (WHR) landcover data for 'dense' and 'moderately dense'].
	2 (LOW-MOD) - 'Category 3' species is in densely forested area [using California Wildlife Habitat Relationship (WHR) landcover data for 'dense' and 'moderately dense'].
	1 (LOW) – No known nest sites or documented presence of the species within 400 m of the road segment.

Human disturbance causing abandonment of young, lowered reproductive rates, and higher stress levels to animals is extensively documented in the literature. In order to provide some means of quantification about potential impacts to roads. A District Wildlife Biologist, developed the following matrices for animals where: 1) LRMP direction for Limited Operating Seasons exist;

2) where no plan direction exists, but the animals are Forest Service Sensitive Species; or 3) where animals have a status as big game species.

A British document, "Reducing disturbance to goshawks during the breeding season" by Steve Petty was used as a basis for defining the variable disturbance buffers for the species covered in bullet number one (Research Information Note 267, Research Division of the Forestry Commission, 1996). After discussion with the District Wildlife Biologist on the east zone, we used these buffers for the raptors, sage grouse, bats, and sandhill cranes in lieu of different matrices for each species (due to similar Limited Operating Period affected area distances for the various species). The rating in the matrix was further modified on the basis of whether dense vegetation existed between the road and the nest/roost site. Dense vegetation was used to offset the potential effects from the roads since it can provide both visual and audio buffers to disturbance. The potential negative effects from dense vegetation to animals such as sage grouse were determined to be beyond the scope of the analysis. In those cases, it was anticipated that the birds would probably avoid areas of dense vegetation.

Table 4.17. Resource Evaluation Criteria – Wildlife - Owls

Wildlife	
Owls	
Risk	
Units of Measure: o Presence or absence of certain species' documented habitat bordering roads **Data Source:** o MDF Roads GIS layers o MDF Wildlife GIS layers	**5 (HIGH)** – Documented owl habitat intersects road segment. -California spotted owl -Northern spotted owl -Great grey owl
	4 (MOD-HIGH) – Not used
	3 (MODERATE) – Not used
	2 (LOW-MOD) – Not used
	1 (LOW) – No documented owl habitat intersects road segment.

Where polygons existed for basic life requirements (e.g. nesting territory, winter range), the area within these polygons was used to determine potential disturbance. Due to the built-in buffer from the polygons for the nest sites the biologists delineated during the establishment of the territories, the risk was categorized in terms of a yes or no.

Table 4.18. Resource Evaluation Criteria – Wildlife – Pronghorn Antelope, Elk, and Mule Deer

Wildlife	
Pronghorn Antelope, Elk, Mule Deer	
Risk	
Units of Measure: o Presence or absence of documented habitat bordering roads (elk) o Presence or absence of documented critical (winter and fawning grounds) habitat bordering roads (pronghorn antelope and mule deer) **Data Source:** o MDF Roads GIS layers o MDF Mule Deer Habitat o MDF Mule Deer Range o MDF Pronghorn Antelope Habitat o MDF Pronghorn Antelope Range o ElkRange_MDF	**5 (HIGH)** – Documented habitat intersects road segment. -Pronghorn Antelope -Mule Deer -Elk
	4 (MOD-HIGH) – Not used
	3 (MODERATE) – Not used
	2 (LOW-MOD) – Not used
	1 (LOW) – Documented habitat does not intersect road segment.

Where polygons existed for basic life requirements (e.g. fawning grounds or winter range), the area within these polygons was used to determine potential disturbance. Due to the ambiguity of concentration areas associated with the large- scale polygons, risk was categorized in terms of yes or no like the owl matrix.

Table 4.19. Resource Evaluation Criteria – Wildlife: Recreation – Viewing / Hunting - Access

Wildlife	
Recreation - Viewing/Hunting - Access	
Benefit	
Units of Measure: o Presence or absence of a wildlife recreation area within a certain distance of road o Presence or absence of a large game habitat along a road **Data Source:** o MDF Roads GIS layer o MDF Recreation Site Point layer o MDF Waterbodies layer o Basin Range Birding Trail layer o GoosebumpsRehab_201440103 o MDF Mule Deer Habitat o MDF Mule Deer Range o MDF Pronghorn Antelope Habitat o MDF Pronghorn Antelope Range o ElkRange_MDF	**5 (HIGH)** – Road provides year round access to wildlife recreation areas (Developed recreation sites, Basin and Range designated birding trails, and Reservoirs/Wetlands). -Developed recreation sites, birding trailheads, reservoirs or wetlands within 0.25 mile of road segment
	4 (MOD-HIGH) – Road provides seasonal access ["OPER_MAINT" = '1 - BASIC CUSTODIAL CARE (CLOSED)' OR "OPER_MAINT" = '2 - HIGH CLEARANCE VEHICLES'] to wildlife recreation areas (Developed recreation sites, Basin and Range designated birding trails, and Reservoirs/Wetlands). -Developed recreation sites, birding trailheads, reservoirs or wetlands within 0.25 mile of road segment OR Road provides year around access to large game habitat (Mule deer, Pronghorn antelope, Elk) -Mule deer and Pronghorn antelope summer and fall range -Elk range
	3 (MODERATE) - Road provides seasonal access ["OPER_MAINT" = '1 - BASIC CUSTODIAL CARE (CLOSED)' OR "OPER_MAINT" = '2 - HIGH CLEARANCE VEHICLES'] to large game habitat (Mule deer, Pronghorn antelope, Elk) -Mule deer and Pronghorn antelope summer and fall range -Elk range
	2 (LOW-MOD) – Road does not provide access to a specific wildlife recreation area, but still holds the potential for some wildlife recreation opportunities (all forest roads are eligible).
	1 (LOW) – Not used

The District wildlife biologist made the assumption that roads would provide access to people to hunt, bird watch, or otherwise enjoy wildlife. Although the data is older, a US Fish and Wildlife study concluded 87 million people older than 16 years of age hunt, fish, or observe wildlife. These people spent $120 billion pursuing these activities. To determine potential benefits, a combination of developed birding sites and recreational areas was used in conjunction with the ease of access provided by the road. The assumption was made that hunters would enjoy more solitude while hunting, so lower level roads that intersected summer and holding areas were rated at Category 3 rather than Category 2.

Table 4.20. Resource Evaluation Criteria – Wildlife: Habitat Improvement Access

Wildlife	
Habitat Improvement Access	
Benefit	
Units of Measure: o Presence or absence of a habitat improvement area within a certain distance of road **Data Source:** o MDF Roads GIS layer o MDF EvegForestCover GIS layer	**5 (HIGH)** – Road provides year round access to habitat improvement areas (Wetland nesting islands, Aspen stands, Juniper stands). -Wetlands, within 250 feet of road segment -Aspen and Juniper within 1 mile of road segment
	4 (MOD-HIGH) –Not used
	3 (MODERATE) - Road provides seasonal access ("OPER_MAINT" = '1 - BASIC CUSTODIAL CARE (CLOSED)' OR "OPER_MAINT" = '2 - HIGH CLEARANCE VEHICLES') to habitat improvement areas (Wetland nesting islands, Aspen stands, Juniper stands). -Wetlands, within 250 feet of road segment -Aspen and Juniper within 1 mile of road segment
	2 (LOW-MOD) – Not used
	1 (LOW) – Road does not provide access to a habitat improvement area.

The District Wildlife Biologist developed this matrix to address the benefits a transportation system provides to our habitat improvement program. The underlying assumption for this matrix was that roads would provide access and ease of treatment for our various aspen, sage steppe and wetland enhancement projects. A one-mile buffer for future sage steppe and aspen improvement projects was used since the USFS can build up to one mile of road for the CE Category 6 - Wildlife Habitat Improvement. Currently, no wetland development is planned for any of the Ranger Districts.

Methods – Wildlife TAP Analysis

Risk to Raptor species, Sandhill crane, Sage-grouse, Pallid bats

1. The first step was to export the roads layers (TAP_RoadsCore and TAP_TMAlt5_Road) as shapefiles and rename to TAP_RoadsCore_Risk and TAP_TMAlt5_Road_Risk). Then, for each of the road layers, six new fields (short integer) were created: Raptors, Bats, GroundBird, RapGrBat, Owls, LgGame, AllRisk. Using "Field Calculator". These fields were populated with a value of "1".
2. The assumption was made that dense vegetative screening (a.k.a., cover) could act as both visual and audio buffers to shield reproductively active animals. Using the S_R05_MDF.ExistingVegetation layer, 'Select by Attribute' was used to select for WHR

Density "M" and "D". Once these records were highlighted, the selected data was exported as a new shape file. The product, "EvegForCov_Dens_M_D", contains only the densely vegetated areas.

3. Using the 'Merge' geoprocessing tool, all of the point layers for raptors (S_R05_MDF.BaldEagleNest, S_R05_MDF.GoshawkNest, S_R05_MDF.Osprey, S_R05_MDF.PrairieFalconNest, S_R05_MDF.Swainson) were combined to create "Raptor_merge" shape file. Also the 'Merge' tool was used to combine the layers for the birds that nest on the ground (S_R05_MDF.SageGrouseTelemetry, S_R05_MDF.SageGrouseTelemetry_2000_2002, S_R05_MDF.SageGrouseTelemetry_2005_2009, S_R05_MDF.SandhillCraneNest, S_R05_MDF.SandhillCraneActivity) creating "GroundBird_merge". Additionally, the S_R05_MDF.Cave layer was used for the Townsend's big eared bat analysis.

4. The next steps were to assess the roads in terms of potential sources of disturbance to reproductively active birds and mammals. The document "Reducing disturbance to goshawks during the breeding season" by Steve Petty was used as a basis for defining the buffers noted below (Research Information Note 267, Research Division of the Forestry Commission, 1996). Based on discussion with the District Wildlife Biologist, the Wildlife Biologist combined the buffers to simplify the process, since many of the raptors had similar Limited Operating Period (LOP) buffers.

   Using "Select by Location" with a target layer of "TAP_RoadsCORE_Risk", a source layer of "Raptor_merge", a spatial selection method of "intersect the source layer feature". a search distance of 400 meters was applied to select the road segments that are within 400 meters of a raptor nest. Keeping these records highlighted, the "Field Calculator" was used to populate the "Raptors" field in the roads layer with a value of "3". The process was then repeated, changing the search distance to 200 meters (producing values of "4") and then 100 meters (producing values of "5"). Starting with the lowest value ("3") and working up ensures that, if a road fits more than one search criteria, it receives the highest of the values.

   Now, using "Select by Location" with a target layer of "Raptor_merge", a source layer of "EvegForCov_Dens_M_D, and a spatial selection method of "intersect the source layer feature" all the raptor records that are located in densely vegetated areas were selected. This new shape file was named "RaptorPoint_MD". Once the selections were cleared,"Select by Location" was used with a target layer of "TAP_RoadsCORE_Risk", a source layer of "RaptorPoint_MD", a spatial selection method of "intersect the source layer feature", and a search distance of 400 meters was applied to select the road segments that are within 400 meters of a densely forested raptor nest. Keeping these records highlighted, the "Field Calculator" was used to populate the "Raptors" field in the roads layer with a value of "2". Then the selections were cleared and this process was repeated, changing the search distance to 200 meters (producing values of "3") and then 100 meters (producing values of "4"). Starting with the lowest value ("3") and working up ensures that, if a road fits more than one search criteria, that road receives the highest of the values.

   At this point, the "Raptors" field is populated in line with the criteria outlined in the matrix. Then this process was repeated for both roads layers.

5. All of Step 4 was repeated for the "GroundBird_merge" layer (populating the "GroundBird" field in the roads layers) and the "S_R05_MDF.Cave" layer (populating the "Bats" field in the roads layers).

6. Finally, to populate the "RapGrBat" field (the combination of the previous three animal groups), "Select by Attribute" on the "TAP_RoadsCORE_Risk" layer was used, using the Boolean query "("Raptors" =2) OR ("Bats" =2) OR "(GroundBird" =2)". Keeping these records selected and using the "Field Calculator", the "RapGrBat" field was populated with a value of "2". The process was repeated for the values of "3"-"5".

Risk to Owls

1. Since polygons were used as a basis for determining the risk to Great Gray and California/Northern spotted owls, the following simplified method was used to determine risk values for them. The 'Merge' geoprocessing tool was used to combine all of the polygon layers for owls (S_R05_MDF.CASpottedOwlHomeRngCoreArea, S_R05_MDF.CASpottedOwlPACAndBase, S_R05_MDF.NorthernSpottedOwlRange). The product is named "Owls_merge". *Because there was no layer available for Great Gray Owls, new polygons for this species were created using editing on the "Owls_merge" layer, relying on previously collected field data, National Agriculture Imagery Program (NAIP) imagery and the expertise of the wildlife biologist to determine the placement of the polygons.

2. Using "Select by Location" with a target layer of "TAP_RoadsCORE_Risk", a source layer of "Owls_merge", and a spatial selection method of "intersect the source layer feature" the road segments that intersect the owl habitat were selected. Keeping these records selected, "Field Calculator" was used to populate the "Owls" field in the road layer with a value of "5". This process was repeated for the second roads layer.

   At this point, the "Owls" fields should reflect appropriate ratings in accordance with the criteria outlined on the matrix.

Risk to Pronghorn Antelope, Elk, Mule Deer

1. To determine the critical habitat, "Select by Attribute" was used on the "S_R05_MDF.PronghornAntelopeHabitat" layer using the Boolean query "("HAB_TYPE" = 'winter range') OR ("HAB_TYPE" = 'kidding area')". Keeping these records selected, the data was exported as a new shape file to create "PronghornCritHab". This process was repeated for S_R05_MDF.PronghornAntelopeRange", "S_R05_MDF.MuleDeerHabitat", and "S_R05_MDF.MuleDeerRange_CADFG" layers, adjusting the Boolean query as needed to reflect the winter habitat and fawning/kidding grounds. Using the 'Union" geoprocessing tool, all four of these new shape files were combined to create "Deer_Pronghorn_CriticalHabandRange".

2. Using the "Union" tool, "Deer_Pronghorn_CriticalHabandRange" was combined with "ElkRange_MDF" to create a new shapefile, "TAP_LgGame".

3. Using "Select by Location" with a target layer of "TAP_RoadsCORE_Risk", a source layer of "TAP_LgGame", and a spatial selection method of "intersect the source layer feature", the road segments that intersect the large game habitat were selected. Keeping

these records selected, "Field Calculator" was used to populate the "LgGame" field in the road layer with a value of "5". This process was repeated for the second roads layer.

At this point, the "LgGame" fields should reflect appropriate ratings in accordance with the criteria outlined on the matrix.

4. Now that all of the other fields were complete, to populate the "AllRisks" field (the combination of the all of the animal groups), "Select by Attribute" was used on the "TAP_RoadsCORE_Risk" layer, using the Boolean query "("Raptors" =2) OR ("Bats" =2) OR "(GroundBird" =2) OR ("Owls" =2) OR ("LgGame" =2)." Keeping these records selected, the "AllRisks" field was populated with a value of "2" using the "Field Calculator". This process was repeated for the values of "3"-"5".

Benefit of Habitat Improvement Access

1. First, the roads layers (TAP_RoadsCore and TAP_TMAlt5_Road) were exported as shape files and renamed to TAP_RoadsCore_Benefit and TAP_TMAlt5_Road_Benefit. Then, for each of the road layers, four new fields (short integer) were created: Aspen, Juniper,Wetland, HabImprov. Using "Field Calculator", all these fields were populated with a value of "1".

2. Using the S_R05_MDF.ExistingVegetation layer, 'Select by Attribute' was used to select for WHR Type "Aspen". Once these records are highlighted, the selected data was exported as a new shape file. The product, "EvegForCov_Aspen", contains only the areas vegetated with Aspen. Repeat the same process using WHR Type "Juniper" to create a layer named "EvegForCov_Juniper".

3. The "Buffer" geoprocessing tool was used to create a 1-mile buffer on "EvegForCov_Aspen" to create "TAP_Aspen_1mileBUF". This process was repeated for "EvegForCov_Juniper" to create "TAP_Juniper_1mileBUF". The "Buffer" tool was used on the "GoosebumpRhab_20140103" layer as well, but only using a 250 foot buffer, to create "TAP_Wetland_250ftBUF".

4. Using "Select by Location" with a target layer of "TAP_RoadsCORE_Benefit", a source layer of "TAP_Aspen_1mileBUF", and a spatial selection method of "intersect the source layer feature", the road segments within 1 mile of an aspen stand were selected. Keeping these records highlighted, the "Field Calculator" was used to populate the "Aspen" field in the roads layer with a value of "3". Next, keeping these records highlighted, "Select by Attribute" was opened. The Boolean query: ""OPER_MAINT" = '1 - BASIC CUSTODIAL CARE (CLOSED)' OR "OPER_MAINT" = '2 - HIGH CLEARANCE VEHICLES"' was used,making sure to choose "**Remove from current selection**" as the method. The remaining records are only those that are on roads that are suitable for passenger cars, at varying comfort levels. The "Field Calculator" was used to populate the "Aspen" field in the road layer. This process was repeated for the Juniper and Wetlands.

5. After all the other fields were completed, the "HabImprov" field (the combination of the all of the habitats) was populated byusing "Select by Attribute" on the "TAP_RoadsCORE_Risk" layer and using the Boolean query "("Aspen" =2) OR ("Juniper" =2) OR "(Wetlands" =2)". Keeping these records selected, the "HabImprov"

field was populated with a value of "2" using the "Field Calculator". This process was repeated for the values of "3"-"5"

Benefit of Recreating/Wildlife viewing/hunting

1. In each of the roads layers, a new field (short integer): **RecWLDLF** was created. Using 'Field Calculator', these fields were populated with a value of "2".

2. The 'basin and range birding trail' map was geo-referenced to create a new point shape file, and "Editor" was used to create points to reflect the birding sites chosen by the wildlife biologist. This shapefile is named "BasinRangeBirdTr_MDF".

   Using the S_R05_MDF.Waterbodies layer, 'Select by Attribute" was used to select all the records that have an FCODE type of "Reservoir". This data was exported as a new shapefile named "Reservoirs_MDF".

   Using the "Buffer" tool in geo-processing, a .25-mile buffer was created around the following four shape files: S_R05_MDF.RecreationSitePoint, BasinRangeBirdTr_MDF, Reservoirs_MDF, and GoosebumpRehab_20140103. These new shapefiles were added to the mxd.

   The "Union" tool was used to create a shape file with all four of the buffered recreation opportunities (Reservoir_quartmile_buf, Goosebump_quartmile_buf, BasinRangeBird_buffer, RecreationSitePoint_Buffer). This file is named "**RecreateAllWLDLF**".

3. One at a time, "Select by Attribute" was used to select the records from each of the large game files (MuleDeerHabitat, MuleDeerRange_CADFG, PronghornAntelopeHabitat, PronghornAnteloperange_CADFG) that are associated with summer range, migration corridors, or holding areas.

   Using export data for each of the layers, new shape files were created from each of these selections and named appropriately: MuleDeerHab_Ben, MuleDeerRng_Ben, PronghornHab_Ben, PronghornRng_Ben) . Next, a "Union" was performed, combining all these shape files along with "ElkRange_MDF". The resulting shape file is named "LgGame_Benefits".

4. Using "Select by Location" with a target layer of "TAP_RoadsCORE_Risk", a source layer of "LgGame_Benefit", and a spatial selection method of "intersect the source layer feature", the road segments that intersect the large game habitat were selected. The "Field Calculator" was used to populate the "RecWLDLF" field in the road layer with a value of "3".

   Next, keeping these records highlighted, "Select by Attribute" was opened. The Boolean query: ""OPER_MAINT" = '1 - BASIC CUSTODIAL CARE (CLOSED)' OR "OPER_MAINT" = '2 - HIGH CLEARANCE VEHICLES'" was used, making sure to choose "**Remove from current selection**" as the method. The remaining records are only those that are on roads that are suitable for passenger cars, at varying comfort levels. The "Field Calculator" was used to populate the "RecWLDLF" field in the road layer with a value of "4".

5. The selection was cleared. Using "Select by Location" with a target layer of "TAP_RoadsCORE_Risk", a source layer of "RecreateAllWLDLF", and a spatial selection method of "intersect the source layer feature", the road segments that intersect the recreation sites were selected. The "Field Calculator" was used to populate the "RecWLDLF" field in the road layer with a value of "4".

   Next, keeping these records highlighted, Select by Attribute" was opened. The Boolean query: ""OPER_MAINT" = '1 - BASIC CUSTODIAL CARE (CLOSED)' OR "OPER_MAINT" = '2 - HIGH CLEARANCE VEHICLES'" was used, making sure to choose "**Remove from current selection**" as the method. The remaining records are only those that are on roads that are suitable for passenger cars, at varying comfort levels. The "Field Calculator" was used to populate the "RecWLDLF" field in the road layer with a value of "5".

   This process was repeated for the second roads layer, assuming that all of the roads in this layer are OPER_MAINT 1 or2.

   At this point, the roads layers should reflect appropriate ratings in accordance with the criteria outlined on the matrix.

Summary of Resource Evaluations

A summary of the mileages and number of road segments by rank and by discipline is given below in Table 4.21 and includes risks and benefits. This provides a summary of how the roads rated out in the relative scheme of the five-point ranking system described above.

Table 4.21. Resource Evaluation Criteria – Summary

Rating Values	Miles of Road												
Road Risk Ratings	Wildlife Owl	Wildlife Game	Wildlife RGB	Culverts	Watershed	T&E Plants	Noxious Weeds	Soils	Aquatic Life	Riparian Zone	Heritage	Rec. Unroaded	Totals
Authorized (Core) Roads (4,357 miles)													
5	272	2174	253	5	1129	326	311	28	136	31	48	853	5565
4			303	233	173	544	586	1511		100	109		3559
3			278	36	1954			118	91	307	725	70	3580
2			107	0	998	414	77	118		679			2393
1	4086	2184	3417	4084	104	3073	3384	2582	4131	3242	3475	3435	37196
Unauthorized (Alt5) Roads (315 miles)													
5	13	124	124		14	2	5	1	2	0		30	315
4					17	20	17	62		0			116
3					107			3	1	2	66	2	181
2					74	15	4	1		0			94
1	302	191	191	NA	103	278	289	248	312	312	249	283	2757
Road Benefit Rating:	Wildlife Habitat	Wildlife Rec.	Range	Veg. Manage.	Engin.- Minerals	Special uses	Fire - Fuels	Rec. OHV	Rec. Roaded				Totals
Authorized (Core) Roads (4,357 miles)													
5	422	88	2229	1522	311	1604	1302	167	1051				5957
4		605		691	337		1956	619					3603
3	3177	2675	578	598	522	2604	1046	1486	1167				7422
2		989		640		150	54						844
1	758		1550	906	3188			2086	2140				8320
Unauthorized (Alt 5) Roads (315 miles)													
5			82	81	1	23							105
4		19		47	9		75						132
3	236	258	73	56	42	18	240	149	258				763
2		38		42		274							316
1	79		159	89	262			165	57				574

Chapter 5 – Describing Opportunities and Setting Priorities for Potential Transportation System Changes

Introduction

This step develops opportunities for change to the current NFTS based on the combined results of the individual risks and benefits analyzed in Chapter 4.

Developing Opportunity Matrices

Once reviewed and validated by specialists, the resource rating results for each road were combined into overall risk and benefit ratings per segment using a simple numeric sum – total risk and total benefit. This becomes the base data set (see Data Analysis Tables, Appendix 3, page 66). The risk and benefit ratings were utilized to array the road segments within high, medium, and low ranges established for the 3 x 3 decision matrices of benefit over risk. The high, medium, and low range separations were initially set based on equal divisions of the full value range available for the benefit or risk variables. Interestingly, when it was discovered that no roads achieved a "high risk" rating, range adjustments for that variable were made based on a successful review of the graph of the data looking for inflection points on the histogram. Once applied, this provided separation of the individual road "risk" variables for the relative priority of action as high, medium, and low. The roads could also be set within the opportunity matrices. The preliminary management opportunities were set for review by the TAP Team. Two decision matrices were used, one for the current NFTS roads and the second for non-system routes previously identified as beneficial for access to NFS lands and chosen for addition to the NFTS during the previous Subpart B process.

The opportunity matrices were reviewed and approved by the Modoc National Forest Leadership Team. There was a trend of generally low risks and moderate benefits, which the Leadership Team felt was representative of the Modoc National Forest road environment in rural northeastern California with relatively low use rates. The relative priority of action for each of the nine groups of road segments was also identified as information to be carried forward to project NEPA decisions. These suggest an order of addressing the TAP opportunities across the Forest.

Defining Opportunities for Transportation System Changes

The Forest Leadership Team directed that only basic levels of change opportunity would be identified within this TAP. Therefore, the roads within the Modoc National Forest were separated into only two management change categories: "likely needed" and "likely not needed". These opportunities provide a beginning point for more thorough environmental analyses during subsequent NEPA projects.

"Likely needed" roads (4,266 miles initially identified) are those road segments that through the combination of benefits and risks are acceptable for continued management. At this time, these roads are suitable for continued utilization and management by the Modoc National Forest.

"Likely not needed" roads (91 miles initially identified, 53 of those miles reviewed later as 'strategically needed' leaving 38 miles "likely not needed") are roads with generally higher risks and lower benefits. These represent opportunities for decommissioning and rehabilitation, or perhaps for conversion to other uses – such as non-motorized access. Due to the resource risks associated with these roads, they are also assigned the highest priority for being addressed through a future management decision.

In addition to the "likely not needed" roads, "likely needed" roads with higher benefits and higher risks (top-right area of the matrices) were given a high priority – in this case representing opportunities for future maintenance or reconstruction projects to mitigate resource concerns while continuing important access. A more detailed list of opportunities and future management options follows the matrices outlined on the next two pages.

Table 5.1. Preliminary TAP opportunity matrices

Preliminary TAP opportunity matrix for NFS roads		BENEFITS								
		Low 9-21			Medium 22-33			High 34-45		
RISKS	High 33-60	benefit 21 risk 34	HL 1 roads 13 mi	Likely Not Needed Priority High	benefit 26-32 risk 33-41	HM 15 roads 63 mi	Likely Needed Priority Medium	benefit 34-40 risk 33-43	HH 18 roads 90 mi	Likely Needed Priority High
	Medium 25-32	benefit 16-21 risk 25-29	ML 76 roads 78 mi	Likely Not Needed Priority High	benefit 22-33 risk 25-32	MM 326 roads 702 mi	Likely Needed Priority Medium	benefit 34-41 risk 25-32	MH 61 roads 227 mi	Likely Needed Priority High
	Low 12-24	benefit 14-21 risk 12-24	LL 1,261 roads 578 mi	Likely Needed Priority Medium	benefit 22-33 risk 12-24	LM 2,469 roads 2,422 mi	Likely Needed Priority Low	benefit 34-43 risk 13-24	LH 126 roads 185 mi	Likely Needed Priority Low

Preliminary TAP opportunity matrix for unauthorized routes previously identified for addition to the Forest transportation system

RISKS	BENEFITS: Low 9-21			BENEFITS: Medium 22-33			BENEFITS: High 34-45		
High 33-55	benefit risk	HL 0 roads 0 mi	Likely Not Needed Priority High	benefit 27 risk 33	HM 1 road 0.4 mi	Likely Needed* Priority Medium	benefit risk	HH 0 roads 0 mi	Likely Needed* Priority High
Medium 25-32	benefit 15-21 risk 25-31	ML 17 roads 3 mi	Likely Not Needed Priority High	benefit 22-28 risk 25-30	MM 50 roads 28 mi	Likely Needed* Priority Medium	benefit risk	MH 0 roads 0 mi	Likely Needed* Priority High
Low 11-24	benefit 15-21 risk 11-24	LL 473 roads 110 mi	Likely Needed* Priority Medium	benefit 22-32 risk 11-24	LM 552 roads 174 mi	Likely Needed* Priority Low	benefit risk	LH 0 roads 0 mi	Likely Needed* Priority Low

The data set (Appendix 2), a full road segment map (Appendix 4), and a benefit-risk display map (Appendix 5) are listed as Appendices (with link to the internet location of these data) and reveal the outcome of the TAP review on the Modoc National Forest. The data set indicates the road segments, their individual risk and benefit values, and the priority established for each for opportunities for change (Appendix 6). The road segment map (Appendix 4) displays all the road segments by the number corresponding to the data set. The benefit-risk map (Appendix 5) provides a colorized representation of the risk-benefit matrices by road segment. This information is designed to assist in the location and identification of TAP values for the various roads.

Future Options

The TAR provides technical recommendations within the larger context of the forest-wide transportation system. Only likely needed and likely not needed routes were identified during the TAP. Subsequent management decisions and implementation of any of the opportunities identified in this TAP would only be made after environmental analyses in compliance with NEPA. Table 5.3 below outlines a list of detailed management opportunities that should be considered for road management opportunities.

Table 5.3 Detailed recommendations available for future management

Detailed Recommendation	Simplified Mapping Display	Definition
Convert:		*"Recommend road segment be removed from Forest transportation system and converted to another use such as NFS trail."*
Convert to Motorized Trail	Convert to Motorized Trail	Trails will be open to motorized vehicles as specified in future NEPA route designation documents.
Convert to Non-Motorized Trail	Convert to Non-Motorized Trail	Trails may be open to pedestrian, equestrian, or bicycle traffic as identified in future project NEPA documents.
Decommission:		*The stabilization and restoration of unneeded roads to a more natural state. The routes are then removed from the FTS.*
Decommission – Natural	Decommission	After a NEPA decision, the route will be allowed to "self-decommission" to a more natural state, there are no known drainage problems.
Decommission – with Drainage Work	Decommission	After a NEPA decision, the route will be obliterated and drainage restored to a more natural function.
Keep – then Decommission Post-Project	Decommission	The route is currently needed for a project in the planning or implementation stage, but likely will not be needed in the future. The NEPA document will define how and when the road is to be decommissioned as described above.

Detailed Recommendation	Simplified Mapping Display	Definition
Store:		*"Roads .. placed in storage for a year.. The period of storage must exceed 1 year". These roads are considered to be operational maintenance level 1 roads and are closed for motorized travel without written permission, except in case of emergencies.*
Store	Store	Roads recommended for or already in "storage" as ML 1 road.
Store – then Decommission Post-Project	Store	Roads that should be put into storage as soon as possible for resource protection, then later used for a project in the planning or implementation stages, and likely not needed after the project. The NEPA document will define how and when the road is to be decommissioned.
Store – with Mitigation	Store	After a NEPA decision, put the road into "storage" to be closed with remedies for drainage problems.
Keep:		*Routes recommended "needed for long term management and remain as NFSR". Available for public or administrative use. In this Forest TAP these recommendations apply to operational maintenance level 2, 3, or 4 roads.*
Add to the system	Add to the system	Within an OHV concept area, there are several unauthorized routes which may be brought forward for NEPA analysis. They are included in this TAP to facilitate the NEPA proposal development process.
Keep – Increase Maintenance Level	Keep	Upgrade the route to a higher standard of service for safety, resource protection, or other reasons. This may or may not require NEPA.
Keep – Reconstruct (repair or relocate)	Keep	Keep the road, but remedy problems with the location, surface, or drainage.
Keep – Reduce Maintenance Level	Keep	Reduce the service level of the road. This may affect OHV designation and may require an engineering analysis and NEPA.
Keep – Restrict Use (administrative use only)	Keep – admin only	Road is for administrative use only. Public use is by written permission only. New administrative use designations will require NEPA.
Keep – Restrict Use (seasonal closure)	Keep – seasonal	Road use is limited to prevent resource damage. NEPA is required for new seasonal closures.
Keep – Retain As is	Keep	Retain the road for public and administrative use.

Economic Analysis

The following table presents an economic analysis of the existing NFS road network. Using existing mileage, broken out by operational maintenance level, this provides an analysis based on long-term funding expectations. Unit costs per mile were provided by the Modoc National Forest engineering department and reflect the estimated annual costs to manage the road in full accordance with the assigned maintenance level. These annual costs are higher than what the Modoc National Forest is currently spending per mile.

Table 5.3. Region 5 Economic Analysis Calculator – Annual Road Maintenance

PART 1 - Existing Road Situation: Determine Funds needed for Annual Road Maintenance

Current System:

ROUTE STATUS	EX - EXISTING
JURISDICTION	FS - FOREST SERVICE
SYSTEM	NFSR - NATIONAL FOREST SYSTEM ROAD
PRIMARY MAINTAINER	FS - FOREST SERVICE
FOREST (SECURITY ID)	Modoc (0509)

Operational Maintenance Level	Sum of SEG_LENGTH	Cost to Maintain/ Mile	Mtce Cycle	Total Annual Cost
1 - BASIC CUSTODIAL CARE (CLOSED)	234.1	$2	Included	$ 468
2 - HIGH CLEARANCE VEHICLES	3324.8	$105	Included	$ 349,104
3 - SUITABLE FOR PASSENGER CARS	645	$980	Included	$ 632,100
4 - MODERATE DEGREE OF USER COMFORT	12.1	$1,800	Included	$ 21,780
5 - HIGH DEGREE OF USER COMFORT	16.8	$3,900	Included	$ 65,520
Total System Mileage:	**4232.8**			**$ 1,068,972**

Estimated Annual Funds Available for Road Maintenance by funding source

Total estimated supplemental funds available for Road Maintenance (timber sales, cost share, and other program projects)		$ 150,000
annual CMRD allocation to Forest	Avg FY10 to 14	$ 605,293
% CMRD directly available for Road Maintenance	50%	$ 302,647
Estimated Total Funds Available for Annual Road Maintenance (all sources)		**$ 452,647**
Estimated Additional Funds Needed (RED) or Surplus (BLACK) for Road Maintenance		$ (616,326)

Is this sustainable? No, only 42.3% **of the road system is supported using Annual Road Maintenance costs and cycles above**

Part 2 - Adjust Mileage, Operational Maintenance Level, and/or Funding Assumptions

Recommended System:

Operational Maintenance Level	Recommended Total by Operational Maintenance Level (miles)	Cost to Maintain /Mile	Forest's Projected Annual Road Maintenance Needs by Maintenance Level
1 - BASIC CUSTODIAL CARE (CLOSED)	233.990	$ 2	$ 468
2 - HIGH CLEARANCE VEHICLES	3286.730	$ 105	$ 345,107
3 - SUITABLE FOR PASSENGER CARS	645.000	$ 980	$ 632,100
4 - MODERATE DEGREE OF USER COMFORT	12.100	$ 1,800	$ 21,780
5 - HIGH DEGREE OF USER COMFORT	16.800	$ 3,900	$ 65,520
Total System Mileage:	**4194.6**		**$ 1,064,975**
Estimated Total Funds Available for Annual Road Maintenance from above	**$ 452,647**		

Is this sustainable? No, only 42.5% **of the road system is supported using Annual Road Maintenance costs and cycles above**

This calculator is not intended to analyze or include associated costs to add roads, decommission roads, convert roads to trails, change maintenance levels, put roads in storage, or to acquire needed Right of Way for access. Deferred maintenance is not included. The calculator is intended to show a Forest's ability to sustain the recommended minimum road system within expected funding levels.

It is concerning to suggest that the Modoc National Forest is functioning on 43% of the required annual financial resource to maintain its road system. It is also vexing to suggest that we require $1.1 million dollars to sufficiently fund road maintenance per year. A review of historic funding levels (based on nominal, uninflated yearly costs) shows that the highest level of annual funding from a period when substantial timber volume was moving was still below one million dollars in the early 1990's. It is no mystery that we have a large road system and that it requires substantial funding to maintain it while providing public access and administering 1.7 million acres of forest lands. By observation and review, it does not appear that we have serious resource issues occurring with current funding at approximately $452 thousand per year. The implication from the TAP review is that there is little need to substantially reduce the road system based on resource risk. Modoc National Forest leadership and engineering will need to cope with funding adjustments or road system modifications through other venues.

Based on these results, it will be important for the Modoc National Forest to take advantage of other funding opportunities when they arise to supplement the limited expected annual road maintenance appropriations. The Modoc National Forest will take advantage of additional road stabilization techniques to help reduce the frequency of maintenance needs, especially on the majority of the road network managed for high clearance vehicles (Operational Maintenance Level 2). Low maintenance level roads may also be reclassified as motorized trails when appropriate as an option for reducing maintenance costs.

This economic analysis is one of many tools used to assess the NFTS. It does not reflect the cost of implementing recommendations made in this travel analysis, nor does it directly correlate with the current physical condition of the road network. It does provide a tool to assess how the Travel Analysis opportunities can affect the long-term financial sustainability (increase or decrease) of the NFTS.

Chapter 6 – Opportunities for Road System Change

This chapter presents and summarizes the final route opportunities, completing the 6th step in the Travel Analysis process.

Strategic Review

A final review of those roads labeled "not likely needed" was performed as a functionality check. Effectively, this was a strategic evaluation of each designated segment as to location and adjacent functions that are not otherwise captured in the TAP formal GIS review. The result of the formal scientific review indicated that there were 77 road segments, totaling 91 miles of NFTS roads that were high or medium risk with low benefit; thereby, "not likely needed" and subject to decommissioning or some form of storage. A good number of these roads were found to be sole, maintenance level 2 roads into 2 to 4 square mile areas without any other access. Other road segments were connectors to more highly beneficial segments. In either case, a good portion of the roads initially designated "not likely needed" were in fact required for fire control or administrative access. An "opportunity revised" column was added to the data set to sustain the integrity of the initial science review and still be able to re-designate the opportunity of certain road segments for functionality. The final opportunity list for change was reduced to 61 segments and 38 miles. (See Table 5.1, below.)

Also under consideration, in the non-system roads there were 17 road segments with 3 miles of "likely not needed" road. The "TMA Alt 5 Roads", or non-system roads, are those that were chosen for addition to the NFTS through the previous Modoc National Forest Subpart B process – route and area designation for motor vehicle use. Because the decision to add these routes was supported by the local community, but later reversed by the Regional Office due to concerns about the environmental analysis, the Forest Leadership Team requested to have these routes further investigated during project NEPA review. These roads were not subject to "likely not needed" at this time and were removed from consideration. (See Table 5.1, below.)

Recommendation Summary

Table 5.1. Opportunity for change to the road system – likely needed and likely not needed roads

Likely Needed*		Likely Not Needed	
# of Segments RoadsCORE	Miles	# of Segments RoadsCORE	Miles
4292	4319.60	61	38.18

# of Segments TMAlt5Road*	Miles	# of Segments TMAlt5Road	Miles
1093	314.79	0	0.00

TMAlt5Roads - if NEPA planning supports addition of roads to NF System*

A map with the final opportunities (*likely needed* and *likely not needed*) is presented on the following page as Figure 6.1 and Appendix 6, Road Opportunities Map, page 66.

In Summary

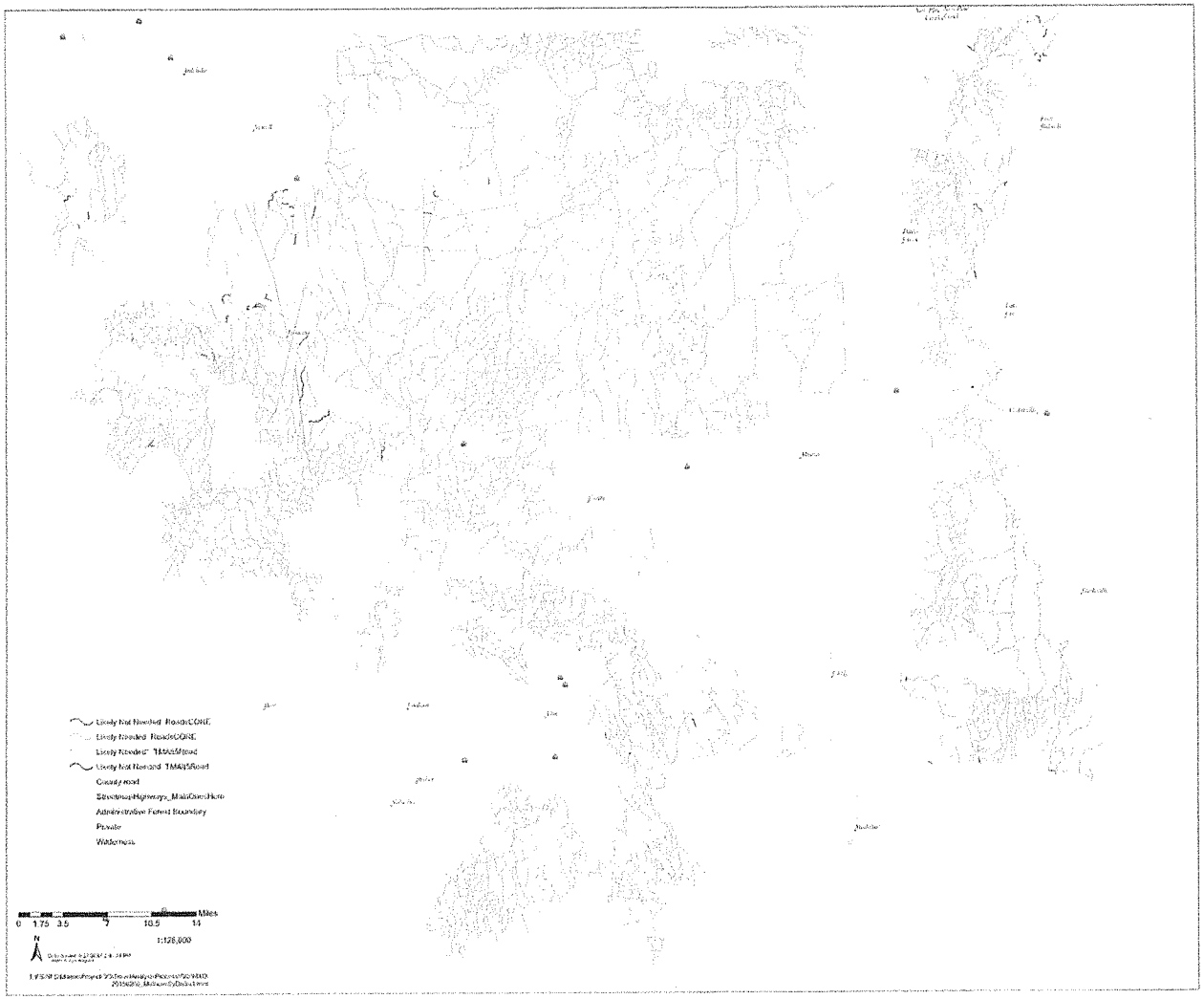
The Modoc National Forest completed its Travel Analysis Process as directed by both the Washington Office and Region 5. It is important to distinguish that this TAP is a strategic, 30,000-foot view of the road system developed from our Geographic Information System (GIS) and the various layers within this computer-generated analysis tool. However, there was very limited field review involved in the development of the TAP. As such, we reiterate, this is a planning tool, not a decision document. This thought drove our Forest Leadership Team's decision to limit outcome opportunities to the designations of "likely needed" roads and "likely not needed" roads. The specific actions to be taken on the various road segments will be driven by the outcome of future in-depth, ground-based, project-level NEPA.

What we did accomplish through the TAP was:

- An initiation of steps toward a sustainable transportation system serving our communities,
- A prioritized review of our entire road system as information for decision-makers and planners into the future,
- Information toward physical and financial resource designations needed to sustain our road system, and
- New and improved ties with our communities in solving resource issues.

We look forward to moving ahead with the TAP and TAR informing our processes!

Figure 6.1: Modoc NF Travel Analysis Opportunities



Appendix 1: Definitions and Acronyms

Administrative NFS Road: Any National Forest System road that is not a public road.

Closure: Restriction of motor vehicle use on a travel way by means of elimination or prohibition. Closures may be permanent or temporary depending on management objectives.

Danger tree: A standing tree that presents a hazard to people due to conditions such as deterioration of or damage to the root system, trunk, stem, or limbs or the direction or lean of the tree. Synonymous with hazard tree for purposes of this Project.

Decommissioning: Activities that result in the stabilization and restoration of unneeded roads or trails to a more natural state.

Designated road, trail, or area: An NFS road, an NFS trail, or an area on NFS lands that is designated for motor vehicle use pursuant to 36 CFR 212.51 on a motor vehicle use map.

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.

Forest transportation atlas: A display of the system of roads, trails, and airfields of an administrative unit.

Forest transportation system: The system of NFS roads, NFS trails, and airfields on NFS lands.

Functional class: The grouping of roads by the character of service they provide.

> **Arterial:** An NFS road that provides service to large land areas and usually connects with other arterial roads or public highways.
>
> **Collector:** An NFS road that serves smaller areas than an arterial road and that usually connects arterial roads to local roads or terminal facilities. Provides service to smaller land areas than an arterial road. It usually connects forest arterial roads to local forest roads or terminal facilities.
>
> **Local:** 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.

Hazard tree: See Danger tree definition above.

Maintenance: The upkeep of the entire forest transportation facility including surface and shoulders, parking and side areas, structures, and such traffic-control devices as are necessary for its safe and efficient utilization.

Maintenance Levels: Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria.

> **LEVEL 1:** These roads have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration

may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps.

Roads receiving level 1 maintenance 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. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for non-motorized uses.

LEVEL 2: Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 "No Traffic Signs," may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to:

a. Discourage or prohibit passenger cars, or

b. Accept or discourage high clearance vehicles.

LEVEL 3: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices (MUTCD) is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.

Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

LEVEL 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

LEVEL 5: Assigned to 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. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage."

Motor vehicle: Any vehicle which is self-propelled, other than: (1) A vehicle operated on rails; and (2) Any wheelchair or mobility device, including one that is battery-powered, that is designed solely for use by a mobility-impaired person for locomotion, and that is suitable for use in an indoor pedestrian area.

Motor vehicle use map: A map reflecting designated roads, trails, and areas on an administrative unit or a Ranger District of the NFS.

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 other local public road authority.

National Forest System trail: A forest trail other than a trail which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

Non-system Road: (also unauthorized, or Alt5 Road) : A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas.

Objective Maintenance Level: The maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The objective maintenance level may be the same as, or higher or lower than, the operational maintenance level. The transition from operational maintenance level to objective maintenance level may depend on reconstruction or disinvestment.

Operational Maintenance Level: The maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns. It defines the level to which the road is currently being maintained.

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.

Public Road: A road under the jurisdiction of and maintained by a public road authority and open to public travel.

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

Reconstruction (road or trail): Improvement and/or realignment of a travel way.

Road: A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Road Analysis Process (RAP): A 2003 precursor to TAP with a Modoc National Forest review of all maintenance level 3 to 5 roads.

Road improvement: Activity that results in an increase of an existing road's traffic service level, expands its capacity, or changes its original design function.

Storage: Used to describe an intermittent use road during the time it is closed to vehicular use. When referring to a NFS road, storage is synonymous with a Maintenance Level 1.

Temporary road: A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or a forest trail and that is not included in a forest transportation atlas.

Trail: A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.

Definitions of Acronyms

AWC: Available Water Capacity

FEIS: Final Environmental Impact Statement

FS: Forest Service

FSH: Forest Service Handbook

GIS: Geographic Information System

MDF: Modoc National Forest

MUTCD: Manual on Uniform Traffic Control Devices

MVUM: Motor Vehicle Use Map

NAIP: National Agriculture Imagery Program

NFS: National Forest System

NFTS: National Forest Transportation System

OHV: Off-Highway Vehicle

R5 or R-5: Region 5

RAP: Road Analysis Process

RAR: Road Analysis Report

RHCA: Riparian Habitat Conservation Area

RO: Regional Office

ROD: Record of Decision

ROW: Right-of-Way

SCA: Student Conservation Association

SNFPA: Sierra Nevada Forest Plan Amendment, also known as the Sierra Nevada Framework

SRR: Surface Rock Replacement

TAP: Travel Analysis Process

TAR: Travel Analysis Report

TES: Threatened, Endangered, and Sensitive

TESW: Threatened, Endangered, Sensitive, and Watch list

TMA Alt 5: Travel Management Analysis Alternative 5

TMR: Travel Management Rule

USGS: United States Geological Survey

WO: Washington Office

Appendix 2*: Modoc National Forest – General Location Map

Appendix 3*: Data Analysis Tables

- System Roads Benefit and Risk Data Set
- Non-System Roads Benefit and Risk Data Set

Appendix 4*: Existing Roads Map

Appendix 5*: Benefit and Risk Map

Appendix 6*: Road Opportunities Map

***Note: Appendices 2 through 6 – Due to their size and need for clarity, these resources are located on the Modoc National Forest Website. Please use the following link for access to view or copy the maps or data: (control + click)**

http://www.fs.usda.gov/detail/modoc/landmangement/?cid=stelprd3853704

(The TAR document is also provided on the web site, as will be any necessary updates required through time.)