Chapter 3: Affected Environment and Environmental Consequences

Introduction

An environmental impact statement (EIS) commonly describes the affected environment in Chapter 3 and the environmental consequences of proposed alternatives in Chapter 4. In this EIS, the affected environment and environmental consequences are combined in this single chapter to allow readers to find information about a particular topic of interest in one place and minimize repetition between chapters. The topics addressed in this chapter are aspects of the environment likely to be directly affected by the management actions proposed in the alternatives.

The "Affected Environment" section under each resource topic describes the existing, or baseline, condition against which environmental effects were evaluated and from which progress toward the desired condition can be measured. Environmental consequences form the scientific and analytical basis for comparison of alternatives, including the proposed action, through compliance with standards set forth in the *Tahoe National Forest Land and Resource Management Plan* (also referred to as the "Forest Plan"), as amended, and a summary of monitoring required by the *National Environmental Policy Act of 1969* (NEPA) and *National Forest Management Act of 1976* (see Appendix G (OHV Monitoring) of this EIS for the findings). The environmental consequences discussion centers on direct, indirect, and cumulative effects, along with applicable mitigation measures. Effects can be neutral, beneficial, or adverse. The "Irreversible and Irretrievable Commitments of Resources" section is located at the end of this chapter. These terms are defined as follows:

Incomplete and Unavailable Information

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) describes how Federal agencies must handle instances where information relevant to evaluating reasonably foreseeable adverse impacts of the alternatives is incomplete or unavailable. Federal agencies must make clear that such information is lacking, and decide whether this incomplete or unavailable information is "essential to a reasoned choice among alternatives" (Title 40 of the Code of Federal Regulations, 40 CFR, Part 1502.22). If the information is deemed essential to a reasoned choice among the alternatives, it must be included or addressed in the environmental impact statement.

Incomplete or unavailable information is made clear in sections titled Assumptions and Limitations so the reader understands how unavailable information was addressed. The EIS summarizes existing credible scientific evidence relative to environmental effects and makes estimates of effects on theoretical approaches or research methods generally accepted in the scientific community.

Knowledge about the biological, physical, and social aspects of ecosystems is, and always will be, incomplete. The ecology, inventory, and management of large landscapes are complex and constantly changing. For example, analysis of the impacts of alternatives on specific plant or animal species prompts questions about population dynamics and habitat relationships. Key relationships and basic data are well established for only a few Tahoe National Forest ecosystems and species. The alternatives were analyzed

using the best available information. As data gaps were encountered during analysis, the interdisciplinary team posed the question of whether the missing information was "essential to a reasoned choice among alternatives." The team concluded that while new information could add precision to estimates or better specify relationships; it would be unlikely to significantly change our understanding of the basic relationships that were used to analyze the effects of the alternatives. New information is always welcome, but no missing information was deemed essential to making a reasoned choice among the alternatives being considered in this EIS. In some instances, information was unavailable to confidently estimate environmental effects; the text indicates that this information is incomplete or unavailable. In such situations, the EIS summarizes existing credible scientific evidence relative to the significant effects and makes estimates of effects on theoretical approaches or research methods generally accepted in the scientific community.

Analysis Process

The environmental consequences presented in Chapter 3 address the impacts of the actions proposed under each alternative for the Tahoe National Forest. This effects analysis was done at the forest scale (the scale of the proposed action as discussed in Ch.1). However, the effects findings in this chapter are based on site-specific analyses of each road, trail and area proposed for addition to the National Forest Transportation System and any changes in vehicle class and/or season of use for existing NFS roads, trails and areas. Each affected road, trail and area proposed in the alternatives has been reviewed by resource specialists and their findings documented in Appendix A (Road Cards). Readers seeking information concerning the environmental effects associated with a specific road, trail or area are directed to Appendix A where details concerning any mitigation measures or any other findings are documented.

For ease of documentation and understanding, the effects of the alternatives are described separately for three discreet actions and then combined to provide the total direct and indirect effects of each alternative (see below). The combination of these discreet actions is then added to the past, present and reasonably foreseeable actions in the cumulative effects analysis. The three discreet actions common to all action alternatives are:

1. **Prohibition of cross-country motorized vehicle travel**. The direct and indirect effects of this action are described generally in each alternative, considering both current conditions and projected trends.
2. **Changes to class of vehicle and season of use on the existing NFTS**. Impacts caused by changes to vehicle class and season of use on the existing NFTS are described generally by alternative. For some impacts (for example public safety), impacts are also addressed by route. Where impacts associated with individual routes are warranted, the reader is directed to appendices or where this data is located.
3. **Addition of motorized trails to the National Forest Transportation System (NFTS) and designation of lands as "Open Areas."** As described above, the impacts of new facilities are addressed in sum total in this chapter while impacts of individual routes or areas are addressed in Appendix A (Road Cards). For most resources, one or more resource indicators are used to

measure the direct and indirect effects of each alternative. Both short and long-term impacts are presented.

Cumulative Effects

Cumulative effects are those impacts on the environment that result from the incremental effects of an action when it is added to other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes them. (See 40 CFR Part 1508.7.)

The cumulative effects analysis area is described under each resource, but in most cases includes the entire Tahoe National Forest including private and other public lands that lie within the Forest boundary. Past activities are considered part of the existing condition and are discussed in the "Affected Environment (Existing Conditions)" and "Environmental Consequences" section under each resource.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach.

- First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible.
- Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one can not reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects.
- Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions.
- Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

For these reasons, the analysis of past actions in this section is based on current environmental conditions.

For this EIS, the following table summarizes the reasonably foreseeable future actions anticipated to occur on National Forest System lands. At a minimum all of these actions were considered in each resource section in chapter three. Additional actions were also considered in some sections if relevant to the cumulative effects associated with that resource.

Table 3.00-1. Reasonably Foreseeable Future Actions Considered in Cumulative Effects Analysis

Project	Description
Shady Flat Cabin	Special Use Permit to Sierra County Arts Council for use of cabin for interpretation of history of the area.
Renew Pacific Bell's expired phone line easements and special use permits	Renew phone line permits, including removing abandoned poles and cables and possible burying and/or co-locating phone lines with power lines in some areas.
Mohawk/Alchemist plan of operation	Operation of underground mine along the Middle Yuba River
Gold Valley resource protection plan	Implement actions proposed to improve Gold Valley and reduce erosion from specific roads/trails.
Forest City management plan	Establish management guidelines that maintain the historic character of the Townsite.
Carvin aspen enhancement	Remove conifers to improve condition of an aspen clone.
Canyon Forest Health	Reduce fuels, thin forest stands, decommission roads.
Tahoe Truckee Sanitary Agency permit renewal	Issue a special use permit to the Tahoe Truckee Sanitary Agency to operate and maintain a sewage interceptor and export conduit pipeline on a strip of NFS lands – 3.73 miles long and 20 feet wide.
Sugarplum	Remove dead, dying, and hazard trees near improvements, thin forest stands.
Legacy Trail	Construct non-motorized multiple use trail from private land in the town of Truckee to Glenshire subdivision.
Glenshire Drive re-alignment	Construct a portion of Glenshire Drive on NFS lands to make room for the repositioning of the railroad track.
Donner Summit PUD permit renewal	Renew/reissue a permit to Donner Summit PUD for operation/maintenance of the existing sewer treatment plant. Permit includes buildings on NFS lands which house PUD administrative offices and a fire station.
DMB Highlands Siller Ranch fire access road	Designate about 400 feet of an unauthorized road as a special use road to be used by Siller Ranch for emergency access to a subdivision.
Truckee Donner PUD Alder Creek road powerline tie	Construct about 500 feet of distribution powerline to connect existing systems both east and west of Highway 89 north to reduce the risk of spot outages.
Yuba Pass hazard tree	Remove hazard trees along NFS roads and state highway 49.
Phoenix	Thin and reduce fuels on about 5,058 acres in areas formerly analyzed in the Euro and Checkmate Project EAs using HFQLG direction.
Montez	Thin and reduce fuels on about 180 acres using HFQLG direction.
Little Truckee River Trail	Construct about 1 miles of multiple use trail between highway 89 north and FS road #450-10-20 – connect to Upper Little Truckee River campground.
Kangaroo	Mechanically thin 44 acres, group select 47 acres, thin 7 acres of conifer in an aspen clone, construct ½ mile of temporary road.
Jackson Meadows hazard tree	Remove hazard trees from campgrounds, along NFS and county roads from Jackson Meadows Reservoir to Little Truckee Summit.
Dinkum	Thin 229 acres, group select 72 acres; remove conifers form 7 acres of aspen, construct ¾ mile of temporary roads.
Coppins	Construct fish/frog passage at stream crossing below NFS road 07.
Carman II watershed restoration	Implement watershed restoration activities

Project	Description
Brumby	Mechanically thin 530 acres, group select 30 acres, remove conifers for 3 acres of aspen, construct 1.3 miles of new permanent road, and about 1 mile of temporary road.
Mears	Thin, salvage and sanitize dead and dying trees
Last Chance	Thin and reduce fuels as a collaborative project – Sierra Nevada Adaptive management project.
Foresthill genetic center plantation	Thin and remove surplus trees in the Foresthill Genetic Resource Center.
East Fork	Thin and remove trees.
Casa Loma	Hand thin trees and brush to reduce fuels
Sierra Pacific power line permit	Re-issue a special use permit for all existing Sierra Pacific power lines.
PG&E distribution line permit	Renew the special use permit for existing lines and facilities
BKS grazing allotment management plans	Update the allotment management plans for the Boca, Kyburz, Sagehen, Sierra Crest and Summit grazing allotments.
Designate energy corridors on federal land in 11 western states.	In accordance with section 368 of the Energy Policy Act of 2005, "The Sec. of Agriculture, Commerce, Defense, Energy and Interior, in consultation with FERC, States, tribal or local units of government will designate energy corridors on federal land."

Assumptions and Limitations

The following assumptions and limitations were applied in the effects analysis in each section:

1. No NEPA decision is necessary to continue use of the NFTS (i.e. OHV and transportation) as currently managed under the No Action alternative. These decisions were made previously.
2. User-created roads, trails and areas are not NFTS facilities. They are unauthorized. Proposals to add these to the NFTS require a NEPA decision.
3. Temporary roads, trails and areas built to support emergency operations or temporarily authorized in association with contracts, permits or leases are not intended for public use. They are not NFTS facilities (e.g. they are unauthorized for public use). Any proposal to add these temporary roads to the NFTS will require a NEPA decision.
4. Maintenance Level 1 roads are currently closed to motorized use by the public. Any proposals to dual designate these roads as a motorized trail and allow public motorized use will require a NEPA decision.
5. Any unauthorized routes not included in the Proposed Action are not precluded from consideration for additions to the NFTS in future travel management actions.
6. The Agency will continue to make changes to the NFTS on an 'as needed basis'. It will also continue to make decisions about temporary roads or trails on an 'as needed' basis associated with contract, permit, lease or other written authorization.
7. Any activity associated with contract, permit, lease or other written authorization is exempt from designation under the Travel Management Rule (36 CFR 212.51 (a) (8) and should not be part of the proposal (i.e. fuelwood permits, motorized SUP permits, mining activity etc.). Such actions are subject to separate NEPA analysis.

8. 'Designation' is an administrative act which does not trigger NEPA. Designation technically occurs with printing of the Motor Vehicle Use Map (MVUM). NEPA is not required for printing a map.
9. For travel management, the federal action triggering NEPA, is any change to current restrictions or prohibitions regarding motorized travel by the public (for example: prohibiting cross-country travel, changing management - changing vehicle class or season of use, and any additions or deletions of facilities (roads, trails or areas) to the National Forest Transportation System (NFTS).
10. Previous decisions on the NFTS do not need to be revisited to implement the Travel Management Rule (TMR) or the Motor Vehicle Use Map (MVUM). That is, the NFTS contains existing facilities (roads & trails) that either underwent NEPA or predate NEPA. Allowing continued motorized use of the facilities in the NFTS in accordance with existing laws and regulations, does not require NEPA.
11. Dispersed recreation activities (i.e. activities which occur after the motor vehicle stops such as: camping, hunting, fishing, hiking etc.) are not part of the scope of the proposed action. The action and the analysis focus on motor vehicle use.
12. Travel analysis is a pre-NEPA planning exercise for transportation planning which informs travel management. Until new directives are published, the agency continues to follow existing policy related to transportation planning and analysis. For example, some Roads Analysis Process requirements in FSM 7700 and 7710 are still applicable.
13. Setting road maintenance levels and changing maintenance levels are administrative and not subject to NEPA. However, changes in allowed vehicle class, season of use, access, and proposals to reconstruct facilities are subject to NEPA.
14. The system will be maintained to standard and all additions or changes to the NFTS will meet standards prior to availability for public use.

Forest Plan Direction

The purpose of the TNF Land and Resource Management Plan (TNF LRMP 1990), as amended, is to direct the management of the TNF. Its goals are to ensure the wise use and protection of TNF resources, fulfill legislative requirements, and address local, regional, and national issues. This section identifies the management standards and guidelines in the TNF LRMP as amended that are applicable to:

- **The prohibition of cross-country motorized vehicle travel.**
- **Changes to class of vehicle and season of use on the existing NFTS.**
- **The addition of motorized trails to the National Forest Transportation System (NFTS) and designation of lands as "Open Areas."**

In addition, this section describes how the forest plan standards and guidelines are incorporated into all of the action alternatives considered in detail in this DEIS.

Forest Plan Management Standards and Guidelines

Wheeled Vehicles
(TNF LRMP as amended by the SNFPA ROD (2004), pg. 59)

Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle (OHV) use areas. Unless otherwise restricted by current forest plans or other specific area standards and guidelines, cross-country travel by over-snow vehicles would continue.

All of the action alternatives would prohibit wheeled motorized vehicle use off of designated roads, trails, and OHV "open areas."

OHV Motorized Use
(TNF LRMP, pg. V-19)

The final determination of designated routes will be made by a trail management plan to be completed within one year after the Forest Plan is approved. Consider the following factors when addressing identified conflicts between non-motorized trail uses and motorized trail users (OHV).

1. *Feasibility and capability of area to accept OHV use (minimal conflict with other resources or users).*
2. *Separation of the users is preferable, offering both types of users a satisfying recreational experience.*
3. *Historic use of the trail facility or area.*
4. *Safety of the users.*
5. *Protection of resources and trail improvements.*
6. *Cooperate with the California Department of Parks and Recreation to implement the Statewide Off Highway Motor Vehicle Recreational Trails Plan.*

Extensive public involvement has been conducted for this project (refer to Chapter 1 "Purpose and Need for Action" and Chapter 4 "Public Involvement") to ensure the above items have been considered in developing the action alternatives. Mitigation measures to address concerns related to potential user conflicts, safety, and natural resource impacts have been developed for the proposed additions to the Tahoe National Forest's transportation system under each action alternative. These measures are summarized in the Mitigation Measures Table in Chapter 2 as well as in the Road Cards (Appendix A). The travel management project has been conducted in cooperation with California Department of Parks and Recreation, which has provided funding for the project.

OHV - Trail Development
(TNF LRMP, pg. V-19)

Consider the following factors when developing trails:

1. *Type of user.*
2. *Protection of resource.*
3. *Safe access to point of interest or experience.*
4. *Enforcement and manageability.*
5. *Protection of private land integrity.*
6. *Monitoring and evaluation capabilities.*

Each action alternative considers the above factors in proposing additions to the Tahoe National Forest's transportation system. Extensive public involvement efforts conducted for the project (refer to Chapter 1 "Purpose and Need for Action," Chapter 4 "Public Involvement," and Appendix F "Trail Use Survey") were aimed at identifying user preferences and access needs as well as public concerns relative to specific existing motorized trails un-authorized for motorized use. Mitigation measures designed to minimize potential impacts to natural resources due to changes in the Forest's transportation system are summarized in Chapter 2 and detailed in Appendix A "Road Cards." Potential impacts on private lands have been considered (refer to Chapter 3.10 "Adjacent Ownerships") in the environmental effects analysis. Law enforcement considerations are documented in Appendix T "Law Enforcement." Resource monitoring requirements under each action alternative are presented in the Monitoring Summary Table in Chapter 2 and described in Appendix G "Off Highway Vehicle Monitoring."

Urban/Rural/Wildland Interface
(TNF LRMP, pg. V-26)

Definition and Management Emphasis

Urban interface situations may occur when National Forest System lands are adjacent to private lands that have been, or may be, developed within this planning period for recreation, rural, residential, urban, or commercial uses. When National Forest management objectives differ from those of our neighbors, both parties may be impacted.

When such mutual impacts or conflicts are identified, the Forest will work with its neighbors to develop a balanced approach to meet public concerns and resource objectives. The project environmental analysis process will be used on a case-by-case basis to identify a range of issue-specific options and resolutions. Development of mutually beneficial solutions may involve the use of innovative resource practices to meet the needs of all parties involved.

Management Direction

When the Urban/Rural/Wildland Interface situation is determined to exist:

1. *Develop alternatives through the interdisciplinary process that address specific resource and public concerns and meet a reasonable balance of multiple use outputs and amenity values.*
2. *Plan for a significant amount of public involvement, higher costs, and greater time to complete the planning process when public concerns and resource management objectives are in conflict.*
3. *Includes all resource management concerns addressing the Urban/Rural/Wildland interface situation, as the issues can be quite varied. Resource concerns that may be involved include, but are not limited to, fuels management, controlling competing vegetation, insect and disease management, timber harvesting, visual resources, water quality, OHV use, special use permits, law enforcement, wildlife and habitat protection, noise, air quality, trespass, and fuel wood cutting.*

Extensive public involvement, described in Chapter 1 (Purpose and Need for Action) and Chapter 4 (Public Involvement) has been conducted for this project to identify and address potential conflicts with adjacent landowners as a result of changes in the Tahoe National Forest's transportation system.

Mitigation measures aimed at reducing potential conflicts with adjacent landowners are included in Appendix A (Road Cards). Chapter 3.10 (Adjacent Ownerships) identifies and discloses potential impacts to adjacent landowners under each of the seven alternatives analyzed in detail in this DEIS.

Endangered, Threatened, and Sensitive Species Management

Standards and Guidelines for California Spotted Owl PACs and Northern Goshawk PACs
(TNF LRMP as amended by the SNFPA ROD (2004), pg. 61)

Evaluate proposals for new roads, trails, off highway vehicle routes, and recreational and other developments for their potential to disturb nest sites.

This project's seven alternatives are evaluated for their potential to disturb California spotted owl nest sites at two scales - (1) within spotted owl Protected Activity Centers (PACs) and (2) within a 0.25 mile radius of known nest sites or activity centers. (Refer to Chapter 3.03 "Terrestrial and Aquatic Species" under "Spotted Owl Nesting Habitat (PACs) and Nest Locations."

Standards and Guidelines for Fisher Den Sites
(TNF LRMP as amended by the SNFPA ROD (2004), pg. 62)

Evaluate proposals for new roads, trails, off highway vehicle routes, and recreational and other developments for their potential to disturb den sites.

Fishers are not known to occur on the TNF; hence, this standard and guideline does not apply. Potential impacts to suitable fisher denning habitat under each alternative are analyzed Chapter 3.03 "Terrestrial and Aquatic Species" under "American Marten and Pacific Fisher Environmental Consequences."

Standards and Guidelines for Marten Den Sites
(TNF LRMP as amended by the SNFPA ROD (2004), pg. 62)

Evaluate proposals for new roads, trails, off highway vehicle routes, and recreational and other developments for their potential to disturb den sites.

Martens occur on the TNF, although known den sites have not been identified. Chapter 3.03 "Terrestrial and Aquatic Species" under "American Marten and Pacific Fisher Environmental Consequences" presents a thorough analysis of the alternatives in terms of their potential to disturb suitable marten denning habitat.

Plant Management Emphasis
(TNF LRMP as amended by the SNFPA ROD (2004), pg. 66)

Conduct field surveys for threatened, endangered, proposed, and sensitive (TEPS) plant species early enough in the project planning process so that the project can be designed to conserve or enhance TEPS plants and their habitat. Conduct surveys according to procedures outlined in the Forest Service Handbook (FSH 2609.25.11). If additional field surveys are to be conducted as part of project implementation, survey results must be documented in the project file.

Surveys for TEPS plant species have been conducted for this travel management project, as described in Chapter 3.06 "Plant Communities." The Mitigation Measures Table in Chapter 2 and the Road Cards

(Appendix A) display the mitigation measures developed to protect TEPS plant species for proposed motorized trail additions to the NFTS under each alternative.

Habitat Connectivity for Old Forest Associated Species
(TNF LRMP as amended by the SNFPA ROD (2004), pp. 53 - 54)

Minimize old forest habitat fragmentation. Assess potential impacts of fragmentation on old forest associated species (particularly fisher and marten) in biological evaluations.

The analysis presented in Chapter 3.03 "Terrestrial and Aquatic Species" under "Old Forest Emphasis Areas" concludes that all of the action alternatives would reduce fragmentation of old forest habitat. The biological evaluation assesses the potential impacts of fragmentation on old forest associated species, including the California spotted owl, Northern goshawk, American marten, and the Pacific fisher.

Assess the potential impact of projects on the connectivity of habitat for old forest associated species.

Chapter 3.03 "Terrestrial and Aquatic Species" under "Late Seral Closed Canopy Forest Associated Species" presents an assessment of the potential impacts of this project's alternatives on the connectivity of habitat for old forest associated species.

Deer Habitat Management
(TNF LRMP, pg. V-30)

Limit vehicle access on key deer winter ranges when deer are present. Also, limit vehicle access in key summer range habitats during periods of migration and fawning.

This project is designed to minimize effects on key deer winter and summer ranges. Project design features include maintaining existing LRMP OHV seasonal restrictions for deer, prohibiting cross country motorized vehicle travel, and establishing wet weather seasonal restrictions for specified motorized trails and roads. The effects of these actions, combined with adding motorized trails to the NFTS and designating "open areas," are analyzed within key deer habitats for the major deer herds on the TNF, including the Downieville, Nevada City, Blue Canyon, and the Loyalton-Truckee herds. (Refer to Chapter 3.03 "Terrestrial and Aquatic Species" under "Ungulates – Mule Deer.")

Meadow Edge Habitat
(TNF LRMP, pg. V-31)

Locate roads away from meadow edges where alterative routes are available.

As described in Chapter 3.03 "Terrestrial and Aquatic Species," all the action alternatives considerably improve meadow function and connectivity for species that use meadow habitats. The project is designed to minimize impacts to meadows and riparian habitat through the implementation of wet weather seasonal restrictions, not proposing motorized trail additions within any occupied willow flycatcher meadows or sandhill crane breeding areas, and prohibiting existing and future cross country motorized travel on the TNF (including meadow habitat).

Standards and Guidelines for Riparian Conservation Areas and Critical Aquatic Refuges
(TNF LRMP as amended by the SNFPA ROD (2004), pp. 62 - 65)

Evaluate new proposed management activities within CARs and RCAs during environmental analysis to determine consistency with the riparian conservation objectives at the project level and the AMS goals for the landscape. Ensure that appropriate mitigation measures are enacted to (1) minimize the risk of

activity-related sediment entering aquatic systems and (2) minimize impacts to habitat for aquatic- or riparian-dependent plant and animal species.

Consistent with the first standard and guideline above, a Riparian Conservation Objective (RCO) analysis has been completed for this project. (Refer to Appendix R "Riparian Conservation Objectives.") Appendix R describes how the project is consistent with the RCOs and the applicable standards and guidelines (listed above).

Water Quality Protection
(TNF LRMP, pg. V-35)

Use Best Management Practices (BMPs) to meet water quality objectives and maintain and improve the quality of surface water on the Forest.

Best Management Practices (BMPs) are implemented as mitigation measures specified in Appendix A (Road Cards) for any motorized trail to be added to the National Forest Transportation or any lands to be designated as "Open Areas." These mitigation measures will meet water quality objectives and maintain and improve the quality of surface water on the Forest.

Soil Restoration
(TNF LRMP, pg. V-35)

During project planning, identify areas of soil damage and abandoned roads in need of rehabilitation. Include these areas in project plans for restoration and improvement.

Areas of soil damage and abandon roads in need of rehabilitation were identified in association with this project and documented in the project record. Project plans for restoration and improvement will be implemented through separate NEPA decisions as funding permits.

Unstable Areas
(TNF LRMP, pg. V-38)

Allow no land-disturbing activities on land classed as extremely unstable, unless a geotechnical investigation determines certain activities are appropriate.

Any motorized trail additions to the National Forest Transportation on extremely unstable lands requiring geotechnical investigation were excluded from consideration in all alternatives.

Unauthorized Activities - Facilities or Uses
(TNF LRMP, pg. V-39)

Take prompt and continued action to identify and resolve all unauthorized occupancy and use of lands administered by the TNF.

All of the action alternatives by prohibiting cross country travel off of designated NFTS roads, NFTS motorized trails and designated "Open Areas" is resolving unauthorized occupancy and use of lands administered by the TNF.

Transportation System Management
(TNF LRMP, pp. V-40 – V-41)

1. *Restrict road, trail, and off-highway use to the extent necessary for protection of:*
    a. *Threatened, endangered and sensitive plants or animals;*
    b. *essential wildlife functions;*

c. *cultural resources, and*
d. *riparian zones and wetlands.*

The effects on **Threatened, endangered and sensitive plants or animals; essential wildlife functions; cultural resources, and riparian zones and wetlands** are described Chapter 3.02 (Soil and Watershed), Chapter 3.03 (Terrestrial and Aquatic Species), Chapter 3.05 (Heritage Resources), Chapter 3.06 (Plant Communities), Appendix J (Plant Biological Evaluation), Appendix K (Management Indicator Species Report), Appendix N (Watch List Report) and Appendix R (Riparian Conservation Objectives). Mitigation measures necessary for the protection of these resources are specified in Appendix A (Road Cards). All of the action alternatives have additional restrictions on road, trail and off-highway use to increase protection of these resources.

2. *Eliminate motorized vehicle use in riparian areas and wetlands except on system roads and designated routes and stream crossings.*

   All of the action alternatives prohibit motor vehicle use off of National Forest Transportation System (NFTS) roads, NFTS motorized trails, and designated "Open Areas."

3. *Maintain the transportation system to a standard that is commensurate with user types and amount of use. Closure of roads and trails will be appropriate if the cost for maintenance and resource protection exceeds the benefits received or the financial ability of the Forest to pay for these services.*

   All of the alternatives included maintenance stands commensurate with the class of vehicles permitted on National Forest Transportation System (NFTS) roads and NFTS motorized trails.

4. *Seasonal road and trail restrictions are preferred over permanent closures.*

   Seasonal restrictions are considered in the different action alternatives.

5. *Before deciding to regulate using physical barriers, consider using signing and public announcements. Consider the risk to resource values and the magnitude of maintenance costs resulting from violations. If physical barriers are used, make sure that private land access needs and/or cooperative agreement requirements are met.*

   Enforcement of any of the action alternatives is described in Appendix T (Law Enforcement). All of the action alternatives using an Engineering, Education, Enforcement strategy. The primary method of enforcing the action alternatives will be accomplished through the Motor Vehicle Use Map. Physical barriers are only specified in Appendix A (Road Cards) as mitigation measures where needed to protect site specific resource concerns.

6. *Regulating for a single purpose use or to meet one group's desire is not an acceptable objective. A need to regulate because of user conflict will be evaluated on a case-by-case basis.*

   Regulating for single purpose uses or meeting one group's desire is outside of the scope of this project.

7. *Close roads and trails or regulate traffic when necessary to protect the safety of Forest users. Candidates for regulation or closure include roads with hazards such as avalanche, landslides, forest fires, flooding, timber operations, etc.*

Not motorized trails are added to the National Forest Transportation System (NFTS) in any of the action alternatives which present unacceptable levels of risk for Forest users. The safety of Forest users on the existing NFTS is described in Appendix S (Mixed Use). The Alternatives vary in the amount of regulation necessary to protect the safety of Forest users through specifying the class of vehicles allowed on the NFTS. The effects on the safety of Forest users are described in Chapter 3.08 (Transportation).

8. *Conduct a separate Forest-wide analysis to correlate land capability, user needs, and user or landowner conflicts with all dispersed recreation travel ways.*

   This Travel Management Project is the Forest-wide analysis correlating land capability, user needs, and user or landowner conflicts with all dispersed recreation travel ways.

9. *Consider the need to protect administrative or special-use facilities when deciding whether to close certain roads. Lookouts, guard stations, and transmission sites are examples of such facilities.*

   Mitigation measures necessary to protect administrative or special-use facilities are contained in Appendix A (Road Cards). If the protection of administrative or special use facilities could not be accomplished through mitigation measures, these routes were excluded from consideration in all of the action alternatives.

10. *Consider the quality of dispersed recreation opportunities when deciding whether to close a road. For example, it may be beneficial to separate four-wheeled motorized recreation use from other forms of motorized recreation, especially when simultaneous use diminishes the quality of the recreation experience for both users.*

    The quality of dispersed recreation opportunities is described in Chapter 3.07 (Recreation) and Chapter 3.09 (Roadless and Special Areas).

Noxious Weeds Management
(TNF LRMP as amended by the SNFPA ROD (2004), pp. 54-55)

As part of project planning, conduct a noxious weed risk assessment to determine risks for weed spread (high, moderate, or low) associated with different types of proposed management activities. Refer to the weed prevention practices in the Region 5 Noxious Weed Management Strategy to develop mitigation measures for high and moderate risk activities.

The Weed Risk Assessment is contained in Appendix M. Mitigation Measures for noxious weeds are contained in Appendix A (Road Cards).

Forest Plan Management Area Direction

Table 3.00-2 presents TNF LRMP direction unique to specific management areas regarding motor vehicle use. This direction is incorporated into all of the alternatives considered in detail.

As shown in Table 3.00-3, each management area is assigned to one or more Recreation Opportunity Spectrum (ROS) classes. (The ROS provides a means of classifying and managing recreation opportunities based on physical setting, social setting, and managerial setting.) Forest-wide standards and guidelines for managing the six different ROS classes are described below.

ROS – Primitive
(TNF LRMP, pg. V-20)

Manage area to meet the recreation opportunity spectrum (ROS) objective of primitive (P). Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction among users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted. Users should have an extremely high probability of experiencing the area as it is described above.

No motorized use is allowed in any of the alternatives in lands allocated to the Primitive ROS class.

ROS – Semi-Primitive Non-motorized
(TNF LRMP, pg. V-20)

Manage area to meet the ROS objective of semi-primitive non-motorized (SPNM). Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction among users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but is subtle. Public motorized use is not permitted. Users should have a high, but not extremely high probability of experiencing the area as it is described above. Temporary vehicle use may be authorized based on special needs, but only for the duration of the project, roads would then be obliterated. Examples of special needs are insect or fire salvage, vehicle and equipment access (supported by an escaped fire situation analysis), and placement or removal of facilities under special-use permit.

No motorized use is allowed in any of the alternatives in lands allocated to the Semi-Primitive Non-Motorized ROS class.

ROS – Semi-Primitive Motorized
(TNF LRMP, pg. V-21)

Manage area to meet the ROS objective of semi-primitive motorized (SPM). Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but is subtle. Public motorized use is permitted. Roads constructed and projects planned for resource utilization will strive to maintain the character of the ROS class. Following resource utilization, roads will be closed to public use or put-to-bed unless the road meets a specific recreation use in keeping with the ROS class. Users should have a moderate probability of experiencing the area as it is described above, except that there is a high degree of interaction with the natural environment. Opportunity is available to use motorized equipment while in the area.

All of the motorized use in lands allocated to the Semi-Primitive Motorized ROS class is consistent with this direction in all alternatives.

ROS – Roaded Natural
(TNF LRMP, pg. V-21)

Manage area to meet the ROS objective of roaded natural (RN). Area is characterized by a predominantly natural-appearing environment with moderate evidences of the sights and sounds of humans. Such evidences usually harmonize with the natural environment. Interaction among users may be low to moderate, but evidence of other users is prevalent. Resource modification and utilization practices are

evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities. Users should have about equal probability to either experience affiliation with other user groups or be isolated from sights and sounds of people. Opportunity exists to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive type of recreation are not very important. Practice and testing of outdoor skills might be important. Opportunities for both motorized and non-motorized forms of recreation are possible.

All of the motorized use in lands allocated to the Roaded Natural ROS class is consistent with this direction in all alternatives.

ROS – Rural

(TNF LRMP, pp. V-21 – V-22)

Manage area to meet the ROS objective of rural (R). Areas characterized by substantially modified natural environment. Resource modification and utilization practices are primarily to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by large numbers of people. Facilities are often provided for special activities. Moderate densities are provided far away from developed sites. Facilities for intensive motorized use and parking are available. Users should be able to experience affiliation with individuals and groups, sites and opportunities are convenient. Human Interaction and convenience are generally more important than the setting of the physical environment. Opportunities for wildland challenges, risk taking, and testing of outdoor skills are generally unimportant except for specific activities like downhill skiing, for which challenge and risk taking are important elements.

All of the motorized use in lands allocated to the Roaded Natural ROS class is consistent with this direction in all alternatives.

Table 3.00-2. Tahoe National Forest Land Management Plan Management Area direction regarding motor vehicle use

MA #	MA Name	Motor vehicle use	Recreation Opportunity Spectrum
1	Carman	Designated routes only	Roaded natural
2	Ida	Designated routes only	Rural
3	Coobrith	Motor vehicle travel on designated routes only, in summer. Closed in winter.	Roaded natural
4	Sunnyside	Designated routes only summer	Semi-primitive motorized except along the main haul route - Roaded natural.
5	Lavezzola	Designated routes only summer	Roaded natural and semi-primitive motorized in the Sierra Buttes area.
6	Canyon	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle (OHV) use areas.	Roaded natural, except the inner gorge along Canyon Creek, which is semi-primitive motorized.
7	Calpine	Designated routes only	Roaded natural
8	Chapman	Designated routes only, summer	Roaded natural
9	Lakes Basin	Designated routes only summer	Roaded natural except for semi-primitive motorized in the Sierra Buttes area.

MA #	MA Name	Motor vehicle use	Recreation Opportunity Spectrum
10	Cal Ida	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas	Roaded natural
11	Smithneck	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas. Designated routes only in Bear end Jones Valleys for protection of winter deer range and watershed research protection.	Roaded natural
12	Antelope	Closed to all motorized vehicle use from November 1 - May 1 during the critical wildlife life cycle. Designated routes only in summer season. This restriction can be amended if weather conditions are such that deer are not on the winter range.	Roaded natural
13	Forty-Niner	Designated routes only.	Roaded natural except for a small portion of semi-primitive motorized in the Sierra Buttes area.
14	Devils Postpile	Closed	Semi-primitive non-motorized.
15	Harding	Closed	Roaded natural.
16	Babbitt	Closed	Semi-primitive non-motorized.
17	*Not used*		
18	Henness	Designated routes OHV in summer	Roaded natural
19	Eighty-Nine	Designated routes only, summer	Rural around residential areas and developed site at southern end of MA: all other areas Roaded natural.
20	Cornish	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle (OHV) use areas	Roaded natural Semi-primitive motorized within Middle Yuba gorge.
21	Sardine-Worn	Designated routes only, summer\	Roaded natural
22	Goodyears	Designated routes only.	Rural
23	Pendola	Designated routes only, except closed south of the Long Point Road because of key winter deer range (between November I and May 1). This restriction can be amended d weather conditions are such that deer are not on the winter range.	Roaded natural
24	Oregon	Designated routes only, except closed in wildlife areas such as Plum Valley, Lohman Ridge, and Studhorse Canyon (November 1 ~ May 1). This restriction can be amended if weather conditions are such that deer are not on the winter range.	Roaded natural
25	Milton-Jackson	OHV travel on designated routes only	Roaded natural
26	Galloway	Designated routes only	Rural
27	*Not used*		
28	Pinoli	Macklin Creek Drainage and Austin Meadows are closed. Designated routes only from Pinole Peak and Pyramid Peak on the west to the eastern boundary of the Management Area. Seasonal closure in the deer holding area when the deer are using the area The western third of the Management Area will prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas.	Roaded natural except semi-primitive motorized along Middle Yuba River.
29	Pass	Designated routes only	Rural
30	Ruby	Designated routes only	Rural
31	Kyburz	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas.	Roaded natural
32	Stampede-Boca	Designated routes only in summer	Roaded natural
33	Lola	Designated routes only	Roaded natural with rural around ski base facilities if developed.
34	Bullards Bar	Designated routes only	Rural in developed sites, Roaded Natural in all other areas.

MA #	MA Name	Motor vehicle use	Recreation Opportunity Spectrum
35	Independence	Closed	Semi-primitive non-motorized.
36	Sagehen Basin	Designated routes only, summer. Suggested routes winter (Open).	Roaded natural
37	Meadow Lake	Designated routes only	Semi-primitive motorized
38	Billy	Designated routes only	Roaded natural and rural
39	Bowman	Designated routes only	Semi-primitive motorized.
40	Moonshine	Designated routes only	Rural
41	Grouse	Closed	Semi-primitive non-motorized.
42	South Yuba	Designated routes only. Southwest of Bloody Run Creek and the Graniteville Road is closed November 1 to May 1. This restriction can be amended if weather conditions are such that deer are not on the winter range.	Roaded natural except semi-primitive motorized along the Middle Yuba River, part of South Yuba River, and Canyon Creek from Holbrook Flat to Windy Point Cliff.
43	Sagehen Station	Closed	Roaded natural
44	Castle	The Pacific Crest Trail is closed. Designated routes only, summer.	Semi-primitive motorized
45	Meadow	Restricted - motor vehicle travel on designated routes only	Roaded natural
46	Prosser Hill	Designated routes only, summer	Roaded natural
47	Fordyce	Designated routes only summer	Semi-primitive motorized.
48	Red	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle (OHV) use areas. Selected OHV routes will be promoted for the 'Adopt a Trail' program.	Semi-primitive motorized except Roaded natural in western half of section 18, T.17.N, R.13 E.
49	Magonigal	Designated routes only	Roaded natural except semi-primitive motorized in vicinity of upper Lola Montez Lake.
50	Prosser Reservoir	Designated routes only, summer	Rural in developed sites and Roaded natural elsewhere.
51	Hirschdale	Designated routes only, summer	Rural
52	Fuller	Designated routes only	Rural
53	Donner	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas.	Rural or Roaded natural. See element map for detail.
54	Truckee	Closed in developed administrative sites. Designated routes only for remainder.	Rural
55	Boreal Ridge	Closed	Rural
56	Donner Pass	Designated routes only	Rural and Roaded natural per the initial inventory.
57	Spaulding	Designated routes only in vicinity of Cisco Grove and Big Bend Remainder of MA prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas	Rural
58	Steephollow	Designated routes only	Roaded natural
59	Casa Loma	Designated routes only. Seasonal closure on key winter deer range November 1 to May 1, when deer are using the area.	Roaded natural
60	Summit	Closed summer. Open in winter, except for special-use permit areas.	Rural with portions Roaded natural.
61	Twenty	Designated routes only	Roaded natural
62	Queens	Designated routes only winter and summer.	Semi-primitive motorized
63	Emigrant	Designated routes only	Rural
64	East Orchard	Closed	Rural

MA #	MA Name	Motor vehicle use	Recreation Opportunity Spectrum
65	Chalk	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle (OHV) use areas. OHV use restricted in Burlington Ridge area and Greenhorn Road November 1 to May 1. This restriction can be amended if weather conditions are such that deer are not on the winter range.	Roaded natural
66	Yuba Gap	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas	Rural
67	Mears	Designated routes only	Roaded natural
68	Sawtooth	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas.	Roaded natural.
69	Truckee River	Designated routes only	Rural
70	Pole	Designated routes only summer	Roaded natural
71	Tinkers	Designated routes only, summer	Rural for Squaw Valley, rural for Sugar Bowl and Upper Cold stream Canyon, semi-primitive non-motorized for Lower Shirley Canyon, Roaded natural for the balance of the area.
72	Glacier Meadows	Closed	Semi-primitive non-motorized.
73	Monumental	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas	Roaded natural
74	Martis	Closed	Roaded natural
75	Onion	Closed	Semi-Primitive non-motorized within most of the area. Roaded natural appearing along Soda Springs Riverton Road. Both are subject to research objectives.
76	Loch Leven	Designated routes only	Roaded natural
77	Cisco Butte	Closed	Rural
78	Blue	Prohibit wheeled vehicle travel off of designated routes, trails, and limited off highway vehicle use areas.	Adjacent to 1-80, rural; other areas Roaded natural.
79	Cedars	Designated routes only	Roaded natural and semi-primitive motorized in the western portion and semi-primitive non-motorized in the eastern portion.
80	Granite Chief	Closed	Primitive
81	Snow	Closed except for designated routes	Semi-primitive non-motorized, semi-primitive motorized, and Roaded natural.
82	North Fork	Closed	Semi-primitive non-motorized
83	Wabena-Steamboat	Designated routes only summer	Roaded natural
84	Humbug-Sailor	Designated routes only. All routes into the American (MA 067) and the North Fork of the American River (MA 062) are closed to motorized vehicles. Permits may be granted for exceptions. On key winter deer range, closed November 1 to May 1. This restriction can be amended if weather conditions are such that deer are not on the winter range.	Roaded natural.
85	Sugar Pine Point	Closed.	Semi-primitive non-motorized.
86	Scott	Designated routes only, winter and summer, except as otherwise authorized by special-use permit.	Roaded natural; rural for base facilities of ski areas and for the private land within the area.
87	American	Closed	Semi-primitive non-motorized
88	Squaw Peak	Closed	Rural

MA #	MA Name	Motor vehicle use	Recreation Opportunity Spectrum
89	French	Designated routes only summer	Rural for developed sites. Roaded natural for all other areas.
90	Divide	Designated routes only summer	Roaded natural
91	Sunflower	Designated routes only, summer	Semi-primitive non-motorized in Duncan Creek and Little Robinson Valley. Roaded natural in other areas.
92	Peavine	Designated routes only in summer	Roaded natural for those areas with vegetation management, and semi-primitive motorized for the steep canyon lands.
93	Ward	Closed	Rural
94	Elliot	Closed	Roaded natural
95	Macy	Closed	Roaded natural
96	Sugar Pine	Designated routes only summer, and open in winter.	Roaded natural
97	Big	Designated routes only in summer	Roaded natural
98	Eldorado	Designated routes only in summer	Roaded natural for the areas with vegetation management and semi-primitive motorized for the steep canyon lands.
99	Mosquito	Designated routes only summer	Roaded natural
100	Lyon Peak/ Needle Lake	Closed	Semi-primitive, non-motorized.
101	Brimstone	Designated routes only	Roaded natural
102	End of the World	Designated routes only except seasonal closure of deer holding area during the period September 15 to December 31 annually. During winters with low precipitation, this area will be closed. This restriction can be amended if weather conditions are such that deer are not on the holding area.	Roaded natural for most of the area and semi-primitive motorized in the Middle Fork of the American River Canyon.
103	West Seed Orchard	Designated routes only	Roaded natural
104	Grouse Falls	Closed	Semi-primitive non-motorized.
105	Barker	Designated routes only summer	Roaded natural, Semi-primitive motorized for the southwest portion of the MA.
106	Big Oak	Designated routes only in summer. Closed November 1 to May 1. This restriction can be amended if weather conditions are such that deer are not on the winter range.	Roaded natural.
107	Big Tree	Closed	Roaded natural
108	Little Oak	Designated routes only in summer. On key winter deer range, closed November 1 to May 1. This restriction can be amended if weather conditions are such that deer are not on the winter range.	Roaded natural and semi-primitive motorized in the Middle Fork of the American River Canyon.
109	Berry	Designated routes only in summer	Roaded natural

Other Policies

The Forest Service and other agencies have a number of ongoing or recently finalized rulemaking and policy efforts that are relevant to this Motorized Travel Management EIS.

Forest Service Transportation Policy

Travel Management rule (36 CFR 212, 251, 261 and 295): The alternatives in this EIS are designed specifically to implement the requirements of the November 5, 2005, rule for travel management; *Designated Routes and Areas for Motor Vehicle Use*. In particular it addresses the requirements of *36 CFR § 212 Designation of roads, motorized trails, and motorized areas* which states in part *"Motor vehicle use on National Forest System roads, on National Forest System trails, and in areas on National Forest System lands shall be designated by vehicle class and, if appropriate, by time of year by the responsible official on administrative units or Ranger Districts of the National Forest System."*

Roadless Rule

On September 19, 2006, the U.S. District Court, Northern District of California set aside the 2005 State Petitions Rule and re-instated the 2001 Roadless Rule. Key points from the 2001 Roadless Rule include:

Roads: Roads may not be constructed or reconstructed except when needed to protect human health and safety from an imminent fire or flood or other catastrophic event:

- Associated with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, activities
- Needed to protect access provided by treaty or statute
- Needed protect an existing road from creating irreparable damage
- Reconstruction is needed for safety as demonstrated by accidents
- Associated with the renewal or continuation of a mineral lease

Road Maintenance: Road maintenance is permissible

Motorized Trails: Construction/Reconstruction/Maintenance of existing and new NFS motorized trails is not prohibited by the 2001 Roadless Rule

The proposed action is fully consistent with 2001 Roadless Rule.

Other Regional Plans and Initiatives

Fish and Wildlife Listing of Species

Bald Eagle: The bald eagle was listed by the USDI Fish and Wildlife Service as a federally endangered species in 1978. On July 12, 1995, this species was reclassified to Threatened status in the lower 48 states. It was proposed for de-listing on July 6, 1999, but remains protected unless de-listing is finalized. Following de-listing, the species was placed on the Region 5 Regional Forester's Sensitive Species List (USDA Forest Service 1999). The species' status as "Sensitive" in Region 5 would be re-evaluated at the end of the five-year monitoring period that is identified in the U.S. Fish and Wildlife Service's Final Rule for de-listing the species, as published in the Federal Register; or if there is a change in the species' status under the ESA during this period (for example, if the USFWS initiated re-listing due to information gathered from monitoring).

On August 9, 2007, the bald eagle was removed from the federal list of threatened and endangered species. Even though they are delisted, bald eagles are still protected by the Migratory Bird Treaty Act

and the Bald and Golden Eagle Protection Act. These Acts require some measures to continue to prevent bald eagle "take" resulting from human activities.

California Red-legged Frog: On June 24, 1996, the California red-legged frog, *Rana aurora draytonii*, was listed as federally threatened (USDI Fish and Wildlife Service 1996). The Final *California Red-legged Frog Recovery Plan* was released on September 12, 2002 (Federal Register, Vol. 67, No. 177, pgs. 57830-57831) (USDI Fish and Wildlife Service 2002). On April 13, 2004, the USFWS proposed designation of critical habitat, none of which occurs within the Tahoe National Forest (Federal Register, Vol. 69, No. 71, pgs. 19620-19642). The recovery objective is to reduce threats and improve the population status of the California red-legged frog sufficiently to warrant de-listing. The strategy for recovery includes protecting existing populations by reducing threats, restoring and creating habitat that will be protected and managed in perpetuity, surveying and monitoring populations, conducting research on the biology of the species and threats to the species, and re-establishing populations of the species within the historic range.

Lahontan Cutthroat Trout: The Lahontan cutthroat trout (LCT) was listed by the U.S. Fish and Wildlife Service as an endangered species in 1970 (Federal Register Vol. 35, p. 13520). The listing was reclassified to threatened status in 1975 to facilitate recovery and management efforts and authorize regulated angling (Federal Register Vol. 40, p. 29864). Currently, no Critical Habitat has been designated for the LCT (USDI Fish and Wildlife Service 1995).

The USFWS is in the process of revising the 1995 *Recovery Plan for the Lahontan Cutthroat Trout*. As part of the recovery effort, technical teams have been assembled to develop restoration and recovery plans for the Truckee and Walker River basins. A primary purpose of the plan is to identify and prioritize actions for the improvement of ecosystem function to facilitate the restoration/recovery of LCT. The USFWS believes that the establishment of lacustrine populations in both Pyramid and Walker lakes, and in Lake Tahoe is necessary for the recovery of LCT in the Western DPS.

The Truckee River Basin Recovery Implementation Team (TRRIT) has established recovery objectives for various reaches of the Truckee River and its tributaries. Important recovery areas that the TRRIT has initially identified as having immediate potential include: Independence Creek, upstream of Independence Lake; Pole Creek; Hunter Creek; Donner Creek; Perazzo Creek; Prosser Creek; and the Truckee River from its confluence with Donner Creek to the State line; Upper Truckee River; Truckee River from Tahoe Dam to Donner Creek; and, Independence Creek downstream from Independence Lake to the Little Truckee River. The TRRIT has identified Macklin and East Fork Creeks and an unnamed tributary to the East Fork Creek in the Yuba River system as necessary for recovery of LCT because they contain remnants of indigenous Truckee River Basin strains.

In addition the TRRIT has drafted a Short-term Action Plan for Lahontan cutthroat trout in the Truckee river Basin (August 2002). This draft short-term (5 year) action plan includes a description of the elements needed for recovery, goals and objectives, timeline and priorities, actions needed and stakeholder participation plan.

State Plans and Initiatives

Water quality regulations: The California State Water Resources Control Board (SWRCB) has responsibility for enforcing requirements of the Clean Water Act within the state of California. To meet the provisions of the Act, the SWRCB have designated "water quality limited" streams. The States of California will study these watersheds and the listed waterbodies to address point and non-point sources of pollution. The states will use these analyses to set Total Maximum Daily Loads (TMDLs) for pollution sources. The SWRCB will assign sediment "loads" to land owners within the watersheds that encompass these streams. This could affect management on national forest lands by requiring management activities to not exceed the assigned sediment "load." This could impact activities on national forest lands if the sediment loads assigned to the national forest lands restricts needed restoration activities.

Air quality regulations: In July 1997, the EPA revised the existing national air quality standards for ozone and particulate matter. The new standards for particulate matter and ozone are as follows:

The standard for PM_{10} remains essentially unchanged, while a new standard for $PM_{2.5}$ is set at an annual limit of 15 micrograms per cubic meter, with a 24-hour limit of 65 micrograms per cubic meter.

The ozone standard was updated from 0.12 parts per million of ozone measured over one hour to 0.08 parts per million measured over eight hours, with the average fourth highest concentration over a three-year period determining whether an area is out of compliance.

The new standards will not become effective until the state and the EPA have determined the attainment designation, and the state has developed an attainment State Implementation Plan (SIP). Until that time, standards currently in use will remain in effect. The effects of new standards are unknown.

Local Plans and Initiatives

County plans, zoning plans: All county Plans in the state of California affect all private roads within county boundaries. In the counties in the Tahoe National Forest, national forest lands and private lands adjacent to National Forests are generally zoned for very low housing densities (one dwelling per 160 or 640 acres). The regulations for these zones keep roads available for use by the public consistent with the California Vehicle Code.

There will be little effect on county planning from the decision from this EIS. County zoning and regulations are only peripherally affected by Tahoe National Forest management. County plans and zoning are primarily based on locations of existing infrastructure, distance to schools, services, utilities, and land capabilities. There are no direct ties between these plans and route designations on the Tahoe National Forest, so the cumulative effects of this EIS on county plans and the effect of county plans on this decision are minimal.

Corporate Forested lands: Sierra Pacific Industries (SPI) manages more than 250,000 acres in the Sierra Nevada. They are largest corporate landowner in the Tahoe National Forest. SPI has stated that they are opposed to public OHV use on their lands. The assumption has been made in estimating environmental effects in this EIS that corporate forest roads will not be available for use by the public.

Other Private Lands

Other lands within the boundaries of the Tahoe National Forest are owned by parties that are not primarily engaged in timber production. Large landholders, such as utility and water districts, as well as many small landowners, own these lands. Landowners generally manage these forests in a custodial manner with diverse objectives for investment, watershed protection, recreation, home sites and personal retreats, and organizational camps (e.g., church and Scout camps). On some larger landholdings, such as lands owned and managed by utility districts, some form of multiple-use management is practiced, usually focusing on recreation.

As stated in the section above, the cumulative effects to private land from this EIS and to National Forest management from private land timber harvesting are the same as discussed above.

There has been significant conversion of private land from agricultural use to housing and commercial developments but most of this has been in the foothill communities adjacent to the Tahoe National Forest as discussed later in this EIS. This has been within the existing county plans and zoning regulations.

Bureau of Land Management

Most of the land managed by BLM is foothill woodlands, and grassland vegetation types with only a small portion in conifer forests. Forested lands administered by BLM are managed primarily under uneven-aged timber management or by custodial maintenance through salvage harvest of dead and dying trees. In the Folsom Resource Area, most timber harvest is salvage of dead trees with management emphasizing wildlife and vegetation objectives (R. Cooper, BLM, personal communication).

Other Federal Lands

The Bureau of Land Management (BLM) has a multiple use management mission, similar to that of the Forest Service, and the agency's management plans reflect stewardship commitments comparable to those that apply to the national forests. The Forest Service coordinates management activities and planning at various geographic scales with BLM.

Private Lands

State and county agencies regulate private land use. For example, timber harvest is regulated by State Forest Practice Rules. Other uses of private lands are regulated by county ordinances and zoning laws as discussed previously. For purposes of evaluating environmental consequences, it is assumed that private landowners will continue to obey State laws and local ordinances, but that considerable discretion will be afforded landowners in choosing how they manage their properties.

Conversion of wildland to residential or other developed uses is likely to be concentrated in areas of greatest projected population growth. The most significant increased in population are in the foothills of the Tahoe National Forest. This is primarily in Nevada and Placer counties. The population is increasing as well on the eastside of the Tahoe National Forest. These changes could have cumulative effects on species with habitats that occur primarily in foothill zones as discussed later in this chapter.

Major effects on other lands that can be evaluated at this broad geographic scale are changes primarily related to urban development. Expansion of the urban zones with increasing populations will, in many cases, cause conflicts between private lands and national forests. This will necessitate the Forest Service to better identify urban intermix zones and modify management in response to conflicts in recreation. Much of the expansion of these areas depends on how individual county plans address zoning and expansion into rural areas.

Decisions made from this EIS could influence Federal and State regulatory agencies in developing conservation and other agreements with private landowners.

State Lands

State parks: Units of the California State Park system that are in the Sierra Nevada protect all their wildlife and plants and give special care to sensitive species. State Parks have regulations that prohibit any disturbance or destruction of natural resources.

Cumulative Effects and Implications from Actions on Other Lands

In addition to considering the effects of this proposal on other lands, this EIS considers the likely effects on lands administered by the Forest Service from past, ongoing, and reasonably foreseeable management actions occurring on other forest lands. Management of other lands could directly affect terrestrial and aquatic wildlife species that move between ownerships during the year or during their life cycle. The possible contribution of management actions on other lands has been considered in analyzing the effects of the alternatives on species and habitats that are not confined to national forests. This information is presented in this chapter, which describes likely environmental consequences of the alternatives.

Law Enforcement

Law enforcement authority and jurisdiction, cooperation, implementation and tracking, implementation strategy, assumptions and measures of success are discussed in detail in Appendix T (Law Enforcement).

Enforcement Assumptions:

- Enforcement of the laws and regulations related to Travel Management will be enforced equally in authority and weight as with all other Federal laws and regulations.
- As with any change in a regulation on NFS lands, there is usually a transitional period for the public to understand the changes. It is anticipated there will be a higher number of violations to the Travel Management Rule the first few years and the number of violations will decline as the users understand and comply with the rules. It is assumed:
  - Users in communities adjacent to the Forest will comply within 1-2 years.
  - Frequent users but further in distance from the Forest will comply within 2-3 years.
  - Infrequent users regardless of distance may take up to 5 years to comply.
- Law enforcement officer and agency personnel's presence and enforcement actions will positively affect OHV users' behaviors and attitudes.

- The Travel Management Rule and associated motor vehicle use map clearly define the designated routes; therefore, making violations to the rule unequivocal.
- Once the motor use vehicle map is published, the implementation of the established dedicated network of roads, trails, and areas with signs, and user education programs, will reduce the number of violations.
- Forest Protection Officers spend a large percentage of their time on Travel Management issues, estimates range from 30 to 50 percent. Law Enforcement Officers spend approximately 10-20% of their time on enforcement of off-highway vehicle issues.
- The proposal to provide additional facilities to the NFTS through some action alternatives is anticipated to assist enforcing the shift from an 'open to cross country motor vehicle travel' management situation to one where such use is prohibited. These actions provide opportunities and access where such use was occurring in key popular dispersed locations based upon recreation analysis and public input. Providing opportunities in popular, key areas will help relieve pressure to travel off of designated routes.

Road/Trail Cards

During the planning stages of the travel management project for the Tahoe National Forest (TNF), members of the public recommended additions to the existing NFTS. Comments regarding specific roads and trails were also received during the public scoping period for the NOI. The disposition of these roads and trails fell into two categories: 1) Roads and trails brought forward for detailed study in alternative(s), and 2) roads and trails eliminated from detailed study. These decisions were made by the responsible official based upon the purpose and need, the scope of the EIS, and issues raised by the public and the IDT. Road and trail cards were developed for all routes considered in alternative(s). These road/trail cards are located in Appendix A (Road Cards).

A number of the recommended routes are proposed to be added to the NFTS under one or more of the action alternatives. For these routes, the route card identifies the alternative(s) under which the route is proposed, the type of vehicles allowed, and the season when the road or trail would be open as well as any resource concerns and mitigation measures that would be implemented. Regular operation and maintenance activities (e.g. brushing, signing, cleaning and maintaining existing drainage structures patrolling routes, etc.) are a part of regular maintenance and management strategies for the NFTS and covered under separate NEPA.

Short Term Uses and Long Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Alternatives 3, 4, 7, 6, 2 and 5 respectively from most to least, all have the potential to improve the long-term productivity by reducing the number of existing routes on the landscape. Routes that are not designated for public motor vehicle use will have the potential to revert to vegetated conditions, which will reduce many of the adverse effects related to these routes.

Unavoidable Adverse Effects

Implementation of any of the alternatives would result in some unavoidable adverse environmental effects. Although formation of the alternatives included avoidance of some potential adverse effects, some adverse effects could occur that cannot be completely mitigated. The environmental consequences section for each resource area discusses these effects.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

It is not anticipated that designating, or not designating, some existing NFS and unauthorized routes for public motor vehicle use would cause an irreversible or irretrievable commitment of resources.

Other Required Disclosures

National Environmental Policy Act of 1969: NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

This EIS has been prepared in accordance with the following regulations:

National Historic Preservation Act (NHPA) of 1966: Section 106 of the NHPA of 1966 requires federal agencies to consider the potential effects of a Preferred Alternative on historic, architectural, or archaeological resources that are eligible for inclusion on the National Register of Historic Places and to afford the President's Advisory Council on Historic Preservation an opportunity to comment. Section 110 of the Act requires federal agencies to identify, evaluate, inventory, and protect National Register of Historic Places resources on properties they control. Potential impacts to archaeological and historic resources have been evaluated in compliance with Section 106 of the NHPA.

Executive Order 11644 ORV Management: Executive Order 11644 – Use of Off-Road Vehicles on Public Lands (issued February 8, 1972) – provides for the establishment of policies and procedures that will ensure that the use of OHVs on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands. Agency heads are directed to provide for administrative designations of the specific areas and trails on public lands on which the use of OHVs may be permitted, and areas in which the use of OHVs may not be permitted.

Executive Order 11989 ORV Management: Executive Order 11989 – Use of Off-Road Vehicles on Public Lands (issued May 24, 1977) – clarifies agency authority to define zones of use by OHVs on public lands. Agency heads, when they determine that the use of OHVs will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat, or cultural or historic resources to immediately close such areas or trails to the type of OHV causing such effects, until such time that it is determined that such adverse effects have been eliminated and that measures have been implemented to prevent further recurrences.

Executive Order 12898 Environmental Justice: Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (issued February 11, 1994) – requires that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high or adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. None of the alternatives disproportionately affect minority and low-income populations.

Clean Water Act: The Clean Water Act, as amended, regulates the dredging and filling of freshwater and coastal wetlands. Section 404 (33 USC 1344) of the Clean Water Act prohibits the discharge of dredged or fill material into waters (including wetlands) of the United States without first obtaining a permit from the U.S. Army Corps of Engineers. Wetlands are regulated in accordance with federal Non-Tidal Wetlands Regulations (Sections 401 and 404). No dredging or filling is part of this proposed action and no permits are required.

Clean Air Act of 1970: The Clean Air Act of 1970 and its amendments provide for the protection and enhancement of the nation's air resources. No exceeding of the federal and state ambient air quality standards is expected to result from any of the alternatives.

Endangered Species Act (ESA) of 1973: The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult the USFWS and the National Marine Fisheries Service concerning endangered and threatened species under their jurisdiction. Biological evaluations for Proposed, Endangered, Threatened, and Sensitive (PETS) species have been prepared for the proposed action and informal consultation with the USFWS is ongoing.

National Forest Management Act (NFMA) of 1976: The National Forest Management Act of 1976 amends the Forest and Rangeland Renewable Resources Planning Act of 1974 and sets forth the requirements for Land and Resource Management Plans (Forest Plans) for the National Forest System. The alternatives are consistent with the NFMA.

3.01. Air Quality

Regulatory Framework

Direction relevant and specific to the proposed action as it air quality resources includes:

Federal Clean Air Act

The Federal Clean Air Act (CAA) is the federal law passed in 1970, and last amended in 1990, (42 U.S.C. §7401 et seq.) which is the basis for national control of air pollution.

Regional Haze Rule (1990 Clean Air Act Amendments), 40 CFR Part 51

The Regional Haze Rule requires states to demonstrate "reasonable progress" toward improving visibility in each Class I area over a sixty-year period (to 2064), during which visibility should be returned to natural conditions. Class I areas include wilderness or National Parks greater than 5000 acres which existed on August 7, 1977.

General Conformity Rule (1990 Clean Air Act Amendments) (Section 176 (c) of the Clean Air Act (part 51, subpart W, and part 93, subpart B.)

U.S. EPA passed the final General Conformity rule in 1993. Under the rule, federal agencies must work with State and local governments in a nonattainment or maintenance area to ensure that federal actions conform to the initiatives established in the applicable state implementation plan (U.S. EPA, 2008).

California Clean Air Act (H&S §§ 39660 et seq.)

California adopted the California Clean Air Act (CCAA) in 1988. The Act provides the basis for air quality planning and regulation in California independent of federal regulations, and establishes ambient air quality standards for the same criteria pollutants as the federal clean air legislation (CARB, 2007).

CARB Off-Road Recreational Vehicle Emissions Standards Rulemaking

In 1994, the CARB approved new off-highway recreational vehicle regulations (since amended in 1998). The rulemaking established emission standards for off-highway vehicles (OHVs) including off-road motorcycles (dirt bikes) and all-terrain vehicles (ATVs) (CARBc, 2006). OHV registration became contingent on vehicle compliance to California emissions standards. Dirt bikes and ATVs that meet emission standards are eligible for OHV Green Sticker registration and have a year-round operating period, while noncompliant vehicles fall under the OHV Red Sticker program which has a limited operational season.

Affected Environment

Introduction

The two primary potential impacts to air quality resulting from the Travel Management Project are; 1) Air Pollution and 2) Naturally Occurring Asbestos.

Air Pollution

The climate, geography and population growth within and/or adjacent to the TNF are the major reasons that air pollution is an issue on the TNF. Mountain ranges that encircle cities create conditions where air is trapped. Therefore, the pollution created by population growth and its supporting infrastructure in those

cities is often trapped. Sunlight triggers chemical reactions that lead to secondary pollutants and haze commonly known as 'smog.'

Radiative transfer, atmospheric transport and dispersion, and chemical reactions play major roles in creating high concentrations of ozone in the Sierra Nevada. Nitrogen Oxides (NO_2) and Volatile Organic Compounds (VOCs), precursors to ozone, are emitted by mobile sources and carried by wind from the Bay Area, Sacramento and the Central Valley to the western slopes of the TNF. During the transport process the precursors react to form ozone in the presence of sunlight. Other aerosols (e.g., ammonia, nitrates, sulfates, pesticides, herbicides and fine particulates) are also carried by wind. These are deposited on vegetation (dry deposition) or brought down in rain, clouds, fog or mist (wet deposition generally called acid rain) affecting vegetation. This polluted air coming from outside a forest can impact the forest flora, fauna, watersheds, and surrounding communities. Forest management activities also generate pollutants that can affect forest resources, as well as surrounding communities for example smoke from prescribed burning.

Visibility is also impacted by pollutants. Visibility impairment results from both the scattering and absorption of light by particles and gases in the air. Fine particles less than 2.5 microns in diameter ($PM_{2.5}$) are especially efficient at scattering light. Fine elemental carbon particles (soot) and nitrogen dioxide gas are the typical absorbers of light. Scattering by "air" molecules (primarily oxygen and nitrogen with a diameter less than 0.0001 microns) causes the sky to appear blue and, in the absence of natural particulates, sets the upper limit visibility in a specific geographic region.

Affected Air Basins and Air Pollution Control Districts: California is divided into 14 geographic air basins. An air basin is an area surrounded by topographic features that provide for common air quality and transport. The California Air Resources Board (CARB) maintains air quality data by air basin. The TNF is located within the Mountain Counties air basin.

The State is directly responsible for regulating emissions from mobile sources. However, authority to regulate stationary sources has been delegated to Air Pollution Control and Air Quality Management Districts (APCDs and AQMDs) within the provisions of the California Clean Air Act and oversight by the California Environmental Protection Agency. Figure 3.01-1 shows air basins and Air Pollution Control Districts.

Figure 3.01-1. California Air Basins/Counties and Air Pollution Control Districts

Pollutants of Concern: The primary air pollutants that can cause detrimental effects to public health and/or native ecosystems that are produced in part by motorized vehicle use include particulates, sulfur compounds, nitrogen compounds, ozone, and carbon oxides.

- **Particulates**: The term "particulate" is used to describe dispersed solid and liquid airborne particles that are suspended in the atmosphere for a period of time. Particulate matter includes dust, dirt, soot, smoke and liquid droplets directly emitted into the air by sources such as factories, power plants, vehicles, construction activity, fires and natural windblown dust. Particles formed in the atmosphere, such as sulfur dioxide (SO_2) and VOCs are also considered particulate matter. They can contribute to visibility impairment and human health problems. Particulate matter less than 10 microns in diameter (PM_{10}) are those which can enter the human respiratory system. Motorized vehicles produce particulates primarily in the form of fugitive dust.
- **Sulfur Compounds**: Sulfur compounds (oxides, sulfuric acid, and sulfates) are present in the air naturally as a result of seasalt, biogenic gases, and volcanic emissions. Globally, human industrial emissions have almost doubled the amount of sulfur inputs to air compared to pre-industrial levels. Deposition of sulfur compounds can cause acidification of water and soils, decrease visibility, and affect such life forms as cryptogams (such as fungi, algae, mosses, and ferns). Some of the sulfur in diesel fuel is converted to sulfate particles in motorized vehicle exhaust.
- **Nitrogen Compounds**: The primary releases of nitrogen compounds (oxides, ammonium, and nitrates) to the air in the native regime were from microbial activity, lightning and wildfires. The historical levels have almost doubled on a global basis as a result of fossil fuel combustion, animal husbandry practices, and fertilization. Nitrogen compounds can negatively affect aquatic systems, can affect visibility, and are a precursor compound to ozone, which is toxic to plants. Motorized vehicles emit nitrogen oxides in their exhaust. A 1991 EPA report showed that nonroad engines had total emissions almost as high as highway motor vehicles. Non-road emissions from diesel engines were significantly higher than highway emissions in this 1991 study.
- **Ozone**: Ozone is formed when emissions of VOCs combine with nitrogen compounds in the presence of sunlight and warm temperatures. It is present in small quantities in the native regime; however, amounts have increased substantially due to increased levels of nitrogen compounds and VOCs. Ozone is a major component of smog and affects human health. It has been suggested as a factor contributing to the decline of sensitive forest tree species in the Sierra Nevada, and has been shown to cause injurious effects to both Jeffrey and Ponderosa pine.
- **Carbon Oxides**: Carbon monoxide (CO) and carbon dioxide (CO_2) are produced by natural and human sources. CO is a poisonous gas produced by incomplete burning of carbon in fuels. CO_2 is natural constituent of the troposphere. It has a role in global climate change, making it a significant pollutant. Motorized vehicles emit carbon monoxide in their exhaust.

Sources of Pollutants: Air pollutants that can affect the health of TNF resources can be the result of natural or human processes. Natural pollution may occur from forest fires, decomposition of plants and animals, soil erosion, pollen and mold spores, VOCs emitted by vegetation, electrical storms and photochemical reactions. Human pollution sources include: industrial sources, prescribed wildland

burning, animal production, agricultural burning, residential and business development, and vehicle emissions.

Emissions from National Forest Activities: Forest activities that generate air pollutants include prescribed burns, recreation use, vehicle traffic, site preparation, mining, livestock and pack animals, and timber sales. This analysis focuses on those air pollutants generated from motorized vehicle use.

The growing popularity of motorized vehicles has led to concerns about impacts to air quality. Motorized vehicle engines can be either two-stroke or four-stroke. It is estimated that 60-65 percent of the motorcycles used off highways (in the United States) have two-stroke engines (EPA 2001 in Kassar 2005). Between 10-15 percent of ATVs in the United States use two-stroke engines (ibid). Two stroke engines are less fuel efficient and emit more unburned hydrocarbons (HC) and particulate matter (PM) than four-stroke engines. The EPA estimates that 25-30 percent of the fuel in a two-stroke engine remains unburned and is released into the air and water. Emissions from engines include carbon monoxide, hydrocarbons, particulate matter, and a variety of gases classified as “air toxins” such as formaldehyde, other related aldehydes, and volatile organic compounds such as benzene. Motorcycles with two-stroke engines have been found to release ten times the amount of HC emissions as four-stroke motorcycles (CARB 2001 in Kassar 2005). The emissions released by two-stroke engine motorcycles are considered responsible for 90 percent of the emissions from ORVs that contribute to the formation of smog in California (ibid).

As mentioned above, ozone is formed when emissions of VOCs combine with nitrogen compounds in the presence of sunlight and warm temperatures. Many of the off-road vehicles registered in California emit 50 times more pollution than a current model passenger car reflecting their lack of regulation in the past and designs that emphasize performance over fuel economy (CARB 1997 in Kassar 2005). Some estimates state that off-road vehicles produce as much as 4000 times more carbon monoxide emissions and 118 times as many smog-forming pollutants as modern automobiles on a per-mile basis (CARB 1998 in Kassar 2005).

Off-road diesel-powered equipment is considered highly polluting. Diesel is one of the largest contributors to environmental pollution problems worldwide (Lloyd and Cackette 2001). Atmospheric deposition of air pollutants released from diesel exhaust is considered a significant source of ecosystem contamination (ibid). In addition, heavy metals and dioxins common to diesel exhaust can be transported long distances as gases or PM. EMFAC2000, California’s emissions inventory model, estimated that even though diesel-powered vehicles contribute only 5 percent of the daily vehicle miles of travel in California, these diesel-powered vehicles produced at least 56 percent of the vehicle exhaust particulate matter in California in the year 2000.

Fugitive Dust and PM_{10}: Motorized vehicle use of native surface roads/trails/areas also has the potential to create fugitive dust and increase PM_{10} concentrations. The amount of fugitive dust and PM_{10} concentrations generated by Motorized vehicles using native surface roads/trails/areas is dependent on many factors including the type of vehicle, vehicle speed, and number of vehicles. Exposure to high concentrations of engine emissions and fugitive dust can negatively affect human health, damage vegetation; negatively impact animals, reduce soil health and water quality, have atmospheric effects, and affect visibility.

Effects to Human Health: High concentrations of particles can affect human health by: making it difficult to breath, aggravating existing respiratory and cardiovascular disease, reducing the body's defense systems against foreign materials, damaging lung tissue, and contributing to the development of cancer and premature death. The major subgroups of the population most sensitive to the effects of particulate matter are individuals with chronic obstructive pulmonary or cardiovascular disease or influenza, asthmatics, the elderly and children.

Effects on Vegetation: Visible impacts to plants from motorized vehicle emissions include: changes in leaf structure such as chlorophyll destruction (chlorosis), tissue death (necrosis), and pigment formation. Damage may occur even when no visible injury is apparent. Such effects can include reductions in photosynthesis, growth reduction, and predisposition to attack by insects.

Effects on Animals: When animals are exposed to high levels of air pollutants via inhalation of gases or small particles, ingestion of particles suspended in food or water, and absorption of gases through the skin their health is at risk. In general, only soft bodied invertebrates (for example, earth worms), or animals with thin, moist skin (for example, amphibians) are affected by dermal absorption of pollutants.

Effects on Soil and Water: Chemicals from motorized vehicle engines (such as SO_2 and NO_2) can be deposited on vegetation surfaces. These chemicals are then washed to the soil floor by low-pH rainwater. The soil then neutralizes much of the acidity by dissolving and mobilizing minerals. These minerals such as Aluminum, Calcium, Magnesium, Sodium and Potassium may then be leached from the soil into surface waters. The ability of soil to tolerate this acidic deposition is very dependent on the alkalinity of the soil. Many of the steep slopes on the TNF are covered by shallow soils with relatively limited neutralizing capacity. Watersheds with steep slopes with shallow soils and acid rain have lakes and streams that are susceptible to low pH and high levels of aluminum. This combination has been found to be toxic to some fish species. Our ability to predict the effects of air pollution on aquatic systems is limited by the lack of deposition monitoring sites across the range of ecological conditions in the TNF.

Atmospheric Effects: The atmosphere serves as a sink for pollutants and has a considerable capacity for self-renewal. However, the atmosphere is susceptible to short and/or long-term pollution-induced changes. Atmospheric changes can include reduced visibility, changes to urban climate/frequency of rainfall/precipitation chemistry, changes in stratosphere ozone levels, and global climate changes.

Current Conditions

Area Designations (Attainment vs. Non-Attainment Area): State and Federal agencies have established ambient air quality standards for criteria pollutants. If the permissible levels of a particular pollutant are not exceeded in an area, the area is said to be in attainment for that pollutant; if the standards are violated, the area is designated as non-attainment. Table 3.01-1 shows the designation for the affected counties in the TNF. None of the counties are in non-attainment for federal PM_{10} standards and only Placer County is in non-attainment for federal ozone standards. All counties are in non-attainment for state PM_{10} standards.

Table 3.01-1. Area Designation for State and Federal Standards for PM_{10} and Ozone

County	PM_{10}		Ozone	
	Federal	State	Federal	State
Nevada	A	N	A	N
Placer	A	N	N	T
Plumas	A	N	A	U
Sierra	A	N	A	U
Yuba	A	N	A	N

A – Attainment
N - Non-attainment
T – transitional
U – Unclassified

Visibility: Visibility conditions in the Sierra Nevada improve from south to north and also from low elevation to high elevations. In general terms, the visibility conditions on the TNF are considered good. The TNF is located within a class II airshed.

Ozone: The amounts of ozone on the TNF have increased substantially as a result of increased levels of nitrogen compounds and volatile organic compounds. Project Forest monitoring confirms injurious effects to both the Jeffrey and Ponderosa pines. Ozone production varies significantly with changing atmospheric conditions. Models are not available to predict ozone formation resulting from motorized vehicle emissions. Instead, emissions of ozone precursors (NO_2 and VOCs) are usually modeled to help predict the effects. Relative contributions to ozone production can be estimated based on quantity of ozone precursors emitted and climatic conditions at the time of the emissions.

Sulfur and Nitrogen Compounds: The amount of Sulfur compounds that are being released into the air are considered very low (SNFPA 2001). However, the amount of Nitrogen (N) compounds in the air has increased (ibid). Levels of wet and dry N deposition in the Sierra Nevada sites are still well below saturation levels in the northern forests (ibid).

Interaction among Sulfur and Nitrogen compounds and ozone: The three primary pollutants that interact at a broad scale across the TNF and have been demonstrated to impact terrestrial systems include sulfur dioxide, nitrogen oxides, and ozone. Many native species, particularly Ponderosa pine and a host of lichens and mosses are susceptible to increasing levels of ozone. In addition, high-elevation plant communities are at substantial risk to ozone effects while low-elevation native plant communities may be affected by elevated nitrogen levels. Most plant communities adjacent to urban areas are or will be affected by nitrogen compounds, ozone and sulfur compounds. The TNF is at a higher risk than northern forests.

Naturally Occurring Asbestos (NOA)

Introduction: Asbestos is a term used for several types of naturally-occurring fibrous minerals found in many parts of California. The most common type of asbestos is chrysotile, but other types are also found in California. Serpentine rock often contains chrysotile asbestos. Serpentine rock, and its parent material, ultramafic rock, are abundant in the Tahoe National Forest. Serpentine rock is typically grayish-green to bluish-black in color and may have a shiny appearance.

Asbestos is commonly found in ultramafic rock, including serpentine, and near fault zones. The amount of asbestos that is typically present in these rocks range from less than 1% up to about 25%, and sometimes more. Asbestos is released from ultramafic and serpentine rock when it is broken or crushed. This can happen when motor vehicles drive over native surface roads with these rocks. It is also released naturally through weathering and erosion. Once released from the rock, asbestos can become airborne and may stay in the air for long periods of time.

Background on Naturally Occurring Asbestos: "Asbestos" is a commercial term used to identify a group of six silicate minerals (chrysotile, crocidolite, amosite, tremolite, actinolite, anthophyllite) of fibrous or asbestiform habit, which have the properties of high tensile strength, flexibility, chemical resistance, and heat resistance. These properties have made these minerals useful in many manufactured products and industrial processes during the Twentieth Century. A few examples of the many uses of asbestos include brake and clutch linings, insulation, fireproof textiles, and filtration products. The use of asbestos in manufactured goods and processes in the United States has significantly decreased over the last 30 years because of health concerns related to asbestos exposure.

"Naturally Occurring Asbestos" (NOA) is the term applied to the natural geologic occurrence of any of the six types of asbestos. The presence of asbestos in nature is related to the chemistry of rocks in an area and the different geologic processes that have acted on those rocks through time. Formation of asbestos requires certain chemical conditions (available silica, magnesium, calcium, iron, sodium and water) and physical conditions (appropriate temperature, pressure, and possibly stress). These conditions may be present in a variety of geologic settings, but are more common in some settings than in others. In addition to the six asbestos minerals listed above, other asbestiform amphiboles such as richterite and winchite are known or suspected of posing a health risk (Wylie and Verkouteren, 2000). Further discussion of the mineralogy and geology of asbestos can be found in Clinkenbeard and others (2002).

Location of Areas "Most Likely" to contain naturally Occurring Asbestos on Tahoe National Forest: To evaluate the geology of the Tahoe National Forest and the likelihood of the presence of NOA, information on geologic units and soils units was reviewed. Areas most likely to contain NOA are distributed principally in the Foresthill region. Their distribution in the Tahoe National Forest is shown in Figure 3.01-2.

Soils derived from asbestos-bearing rocks may contain free asbestos. Soils derived from ultramafic rocks and serpentinite commonly are distinctive; they often are identified in soils studies as serpentine- or ultramafic- related soils. Typically, they are found as linear belts along major fault zones in the western part of the Forest. The areas represent a composite of both the areas of ultramafic rocks and serpentinite and the areas of soil derived from these rocks.

Serpentinite and partially serpentinized ultramafic rocks often can contain chrysotile asbestos. These rocks may also host amphibole asbestos, typically tremolite, actinolite, or anthophyllite. Also, soils derived from weathering of ultramafic rocks and serpentinite may contain NOA. Soil maps include the following ultramafic- and serpentinite related soils series: Dubakella and Forbes.

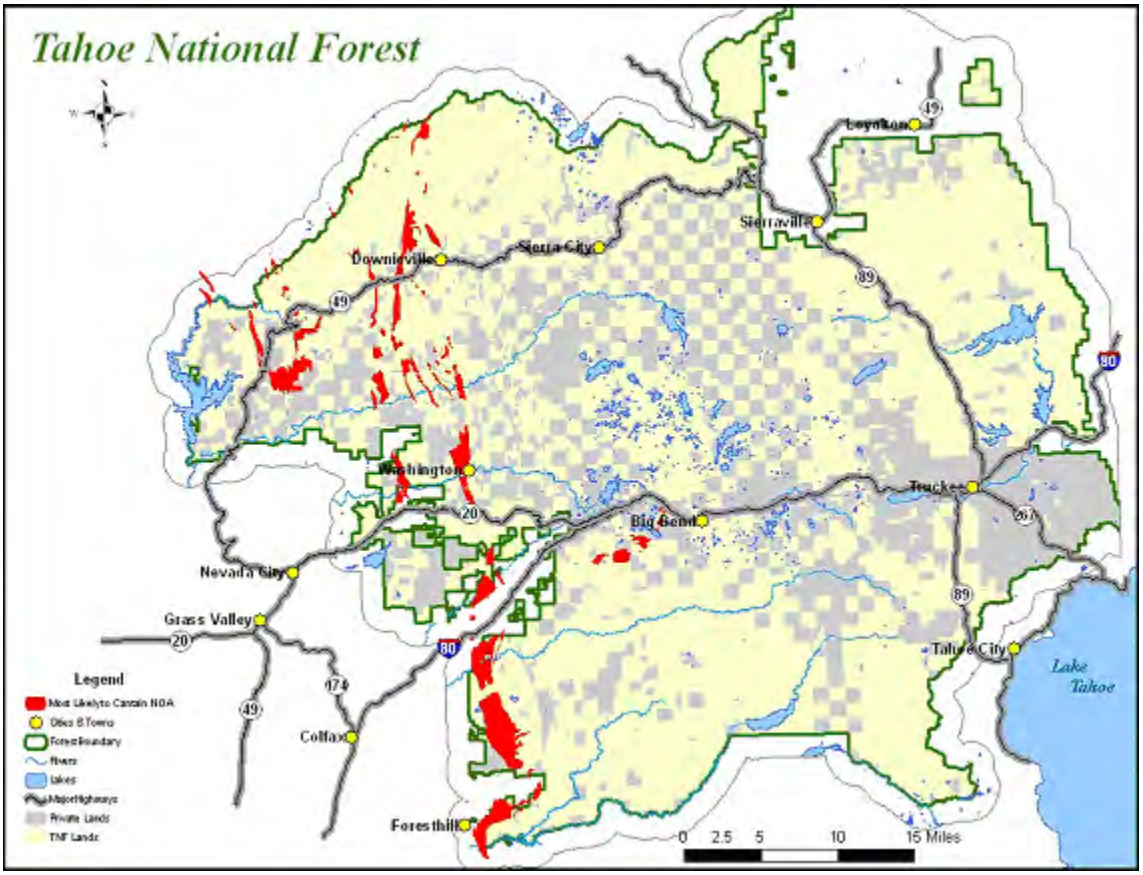

Figure 3.01-2. Areas "Most Likely" to Contain Naturally Occurring Asbestos

Potential Human Effects: Motorized vehicle users on native surface roads and trails with Naturally Occurring Asbestos (NOA) may have increased potential risks for adverse effects to their health. Asbestos is classified as a known human carcinogen by state, federal, and international agencies. State and federal health officials consider all types of asbestos to be hazardous. Information on the health effects of asbestos can be found in the *Toxicological Profile for Asbestos* by the Agency for Toxic Substances and Disease Control (2001). Table 3.01-2 displays the current area available for motor vehicle use on lands "most likely" to contain naturally occurring asbestos.

Table 3.01-2. Motor vehicle use on areas "most likely" to contain naturally occurring asbestos

Category	Amount
Cross Country Travel Area (acres) Routes un-authorized for motor vehicle use (miles)	 1,660 50
Roads open to all vehicles (miles)	33
Trails open to high clearance trail vehicles (miles)	3
Trails open to ATVs and motorcycles (miles)	10
Trails open to motorcycles (miles)	4

Environmental Consequences

Emissions: Predictions about changes in total amount of emissions (sulfur compounds, nitrogen compounds and carbon oxides) generated from recreational use that may occur on the Forest are difficult to make and would be highly speculative. The

Forest Service believes that under all alternatives, levels of emissions (other than fugitive dust) from motorized recreation use would increase by the same amount based on population growth in the market area. Although the use patterns may change, it is expected that total visitation, and hence emissions would increase by the same amount in all alternatives. For example, even though the overall number of available motorized roads and trails is reduced in all of the action alternatives, the same levels of use would occur and simply become more concentrated in those areas. Hence, the amount of pollutants other than fugitive dust is anticipated to increase by the same amount in all alternatives**.**

It is acknowledged that there are many unknowns regarding future regulations on emissions from nonroad engines – recreational vehicles (motorized vehicles). New standards to reduce hydrocarbon (HC) emissions from gasoline powered nonroad recreational vehicles where adopted by EPA in 2002. These new emission standards for new gasoline powered recreational nonroad vehicles where phased in beginning in 2006. EPA expects these standards to reduce HC emissions from these vehicles by 67 percent and CO emissions by 28 percent – nationally – over time. EPA expects that manufacturers will primarily increase their use of 4-stroke engine system designs and improve materials and barrier treatments to reduce the permeation of gasoline through fuel tanks and hoses.

Since EPA has shown that nonroad equipment (recreational vehicles are a part of nonroad equipment) emits large amounts of nitrogen oxides as well as HC, CO, it is likely that regulations will be developed to reduce the amounts of nitrogen oxides produced from recreational gasoline powered vehicles also. New nonroad diesel engines already have emission standards designed to reduce nitrous oxide emissions (EPA 2003). However, current regulations still allow the sale of non-complying OHVs with two-stroke engines found on most non-compliant OHVs (CARB 2007). Table 3.01-3 shows average emissions in tons/day for Placer, Nevada and Sierra Counties within the Mountain Counties Air Basin. It is unknown if these emissions will go up or down over time.

Table 3.01-3. 2006 Estimated Annual Average Emissions for Off-Road Recreational Vehicles

Area	TOG	ROG	CO	NO_2	SO_2	PM	PM_{10}
Statewide	70.54	66.18	184.19	2.04	.57	.83	.75
Sierra County	2.10	1.96	4.75	.05	.02	.03	.02
Nevada County	1.45	1.36	3.24	.03	.01	.02	.02
Placer County	1.98	1.85	4.16	.04	.02	.03	.02

TOG - Total organic gases
ROG – Reactive organic gas
CO – Carbon monoxide
NO_2 – Nitrogen oxides
SO_2 – Sulfur oxides

Ozone: As mentioned previously, the Placer County portion of the TNF is in federal non-attainment for ozone. Motorized vehicle use does not generate significant amounts of ozone precursors and if generated these ozone precursors are generally below *de minimis* and are thus exempt from conformity determination. This statement is based on a 1991 nonroad and vehicle emission study done by EPA and SNFPA 2001 air quality modeling. The emissions of ozone precursors (NO_2 and VOCs) are expected to increase overtime with levels of wet and dry N deposition in the Sierra Nevada also increasing. However, levels are still below saturation levels in the northern forests (SNFPA 2001) and nonroad recreational vehicles are not considered a significant source of ozone precursors at this time. New emission regulations will further reduce contributions from nonroad vehicles in the future.

Fugitive Dust (Particulate Matter): To assess the air quality effects from fugitive dust, the alternatives are compared by the number of miles of native surface (dirt) motorized roads, trails and areas available for use. Those alternatives with the greatest amount of native surface roads, trails and areas are expected to contribute the greatest amount of fugitive dust (particulate matter) into the air. The amount and timing of the motorized vehicle use and the type of motorized vehicle recreating on each road/trail/area is unknown. Other unknown factors that contribute to the amount of fugitive dust produced include: the weather at the time of use and the condition of the road/trail/area, etc.

Fugitive dust from unpaved roads/trails/areas can add suspended particles into the air especially during summer use when the soils are dry. There is currently no way to know exactly how much particulate matter is being generated on the TNF through use of motorized vehicles or to speculate how much will be produced by alternative in the future. Therefore, it is assumed that the alternatives that provide the greatest number of miles available for use by motorized vehicles will produce the greatest amount of fugitive dust. Refer to Table 3.01-4.

Table 3.01-4. Native Surface Roads, Trails and Areas Open to Motorized Vehicles

Category	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Cross Country Travel							
Acres	717,900	0	0	0	0	0	0
Routes un-authorized for motorized use (miles)	1389	0	0	0	0	0	0
Roads open to all vehicles (miles)	1896	2316	1899	1900	2316	2142	1900
Trails open to high clearance trail vehicles (miles)	189	233	189	203	434	227	214
Trails open to ATVs and motorcycles (miles)	18	20	18	20	29	29	20
Trails open to motorcycles (miles)	128	153	128	142	154	149	145
Unclassified roads/trails on private land (miles)	1585	1584	1585	1585	1574	1584	1584
Open Areas (acres)	<100	2700	<100	<100	<100	<100	<100
Total							
Acres	**717,900**	**2700**	**<100**	**<100**	**<100**	**<100**	**<100**
Miles	**5205**	**4307**	**3819**	**3850**	**4508**	**4131**	**3864**

Alternative 1 poses the greatest risk of impacts to air quality due to the continuation of country travel on 717,900 acres including 1,389 miles of roads and trails un-authorized for motorized use. All of the action alternatives reduce the effects to air quality by prohibiting cross country travel and use of those un-authorized routes not being added to the National Forest Transportation System. These benefits to air quality in the action alternatives out way any potential negative impacts created by adding motorized trails to the National Forest Transportation System and any changes being made to the class vehicle or season use being made in the action alternatives.

It is anticipated that implementation of Alternative 1 would generate the greatest amount of motorized vehicle use and would therefore have the highest amounts of fugitive dust. Implementation of Alternative 1 would contribute to air quality degradation more than any of the action alternatives. All of the action alternatives would improve air quality.

Alternative 1

- **Cross Country Travel**: Cross country travel is not prohibited in Alternative 1. Predicting where cross-country motorized vehicle use would occur is not possible. It is likely that this cross-country travel would damage and/or kill some vegetation and increase the amount of bare soil. Cross country travel also results in the continued use of approximately 1,400 miles of unauthorized routes on native surfaces. This use would contribute to increase air quality degradation.
- **Additions to the National Forest Transportation System**: There or no additions of any roads trails or areas to the National Forest Transportation System in Alternative 1. Since there are no additions, there will be no adverse impacts on air quality from this element.
- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the class of vehicles or season of use allowed on the existing road system in this alternative.

Alternative 2

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 2. This will stop the proliferation of new un-authorized routes with native surfaces. The prohibition of cross country travel also results in prohibiting use of all un-authorized roads, trails and areas not added to the National Forest Transportation System. The result is the reduction of native surface roads and trails available for use by motor vehicles 17% from 5,205 to 4,307 miles. These changes will have a positive effect on air quality conditions.
- **Additions to the National Forest Transportation System**: Alternative 2 will add an additional 72.5 miles of native surface trails and 5 OHV Open Areas to the National Forest Transportation System. These additional trails and OHV Open Areas will contribute to air quality degradation.
- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the season of use allowed on the existing road system in this alternative.
  - The class of vehicles allowed on the existing road system is changed from “Open to highway legal vehicles only” to “Open to all vehicles” on 481 miles of road. These changes to class of vehicle could increase the potential for additional fugitive dust being generated.
- **Cumulative Effects**: Alternative 2 improves air quality by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 898 miles. These benefits to air quality in this alternative out way the potential negative impacts created by adding 72.5 miles of trails and 5 OHV open areas to the National Forest Transportation System and changing 481 miles of the existing system from “Open to highway legal vehicles only” to “Open to all vehicles.”

Alternative 3

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 3. This will stop the proliferation of new un-authorized routes on native surfaces. The prohibition of cross country travel also results in the prohibition of motorized use of all un-authorized roads, trails and areas not added to the National Forest Transportation System. The result is the reduction of native surface roads and trails available for use by motor vehicles 27% from 5,205 to 3,819 miles. These changes will have a positive effect on air quality conditions. The prohibition of cross country

travel will result in the prohibition of motorized use of Eureka Diggings, Greenhorn Creek, Prosser Reservoir, Boca Reservoir, and Stampede Reservoir as OHV Open Areas. These prohibitions will also have a positive effect on air quality.

- **Additions to the National Forest Transportation System**: Alternative 3 will not add any additional native surface trails or OHV Open Areas to the National Forest Transportation System (NFTS). The lack of any additions to the NFTS will maintain current air quality conditions.
- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the season of use or class of vehicles allowed on the existing road system in this alternative.
- **Cumulative Effects**: Alternative 3 improves air quality by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 1,386 miles.

Alternative 4

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 4. This will stop the proliferation of new un-authorized routes on native surfaces. The prohibition of cross country travel also results in prohibiting motorized use of all un-authorized roads, trails and areas not added to the National Forest Transportation System. The result is the reduction of native surface roads and trails available for use by motor vehicles 26% from 5,205 to 3,850 miles. These changes will have a positive effect on air quality conditions. The prohibition of cross country travel will result in prohibiting use of Eureka Diggings, Greenhorn Creek, Prosser Reservoir, Boca Reservoir, and Stampede Reservoir as OHV Open Areas. These prohibitions will also have a positive effect on air quality.
- **Additions to the National Forest Transportation System**: Alternative 4 will add an additional 31.2 miles of native surface trails to the National Forest Transportation System. These additional trails will contribute to air quality degradation.
- **Changes to Class of Vehicles and/or Season of Use**: Wet weather seasonal restrictions will be applied to all native surface roads and motorized trails. This change may have a slight improvement on air quality conditions in terms of emissions from vehicles during the winter months. The wet weather seasonal restrictions will have no benefit in terms of the amount of fugitive dust produced on native surface roads and trails during the dry season.
  - The class of vehicles allowed on the existing road system is changed from “Open to highway legal vehicles only” to “Open to all vehicles” on 3.4 miles of road. These limited changes will have no effect on current air quality conditions.
- **Cumulative Effects**: Alternative 4 improves air quality by prohibiting cross country travel, imposing wet weather seasonal restrictions and reducing the total amount of native surface roads and trails available for motorized vehicles by 1,355 miles. These benefits to air quality in this alternative out way the potential negative impacts created by adding 31.2 miles of trails to the National Forest Transportation System and changing 3.4 miles of the existing system from “Open to highway legal vehicles only” to “Open to all vehicles.”

Alternative 5

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 5. This will stop the proliferation of new un-authorized routes on native surfaces. The prohibition of cross country travel also results in prohibiting motorized use on all un-authorized roads, trails and areas not added to the National Forest Transportation System. The result is the reduction of native surface roads and trails available for use by motor vehicles 13% from 5,205 to 4,508 miles. These changes will have a positive effect on air quality conditions. The prohibition of cross country travel will result in prohibiting motorized use of Eureka Diggings, Greenhorn Creek, Prosser Reservoir, Boca Reservoir, and Stampede Reservoir as OHV Open Areas. These prohibitions will also have a positive effect on air quality.
- **Additions to the National Forest Transportation System**: Alternative 5 will add an additional 282.5 miles of native surface trails to the National Forest Transportation System. These additional trails will contribute to air quality degradation.
- **Changes to Class of Vehicles and/or Season of Use**: Wet weather seasonal restrictions will be applied to all native surface roads and motorized trails. This change may have a slight improvement on air quality conditions in terms of emissions from vehicles during the winter months. The wet weather seasonal restrictions will have no benefit in terms of the amount of fugitive dust produced on native surface roads and trails during the dry season.
  - The class of vehicles allowed on the existing road system is changed from “Open to highway legal vehicles only” to “Open to all vehicles” on 481 miles of road. These changes to class of vehicle could increase the potential for additional fugitive dust being generated.
- **Cumulative Effects**: Alternative 5 improves air quality by prohibiting cross country travel, imposing wet weather seasonal restrictions and reducing the total amount of native surface roads and trails available for motorized vehicles by 696 miles. These benefits to air quality in this alternative out way the potential negative impacts created by adding 282.5 miles of trails to the National Forest Transportation System and changing 481 miles of the existing system from “Open to highway legal vehicles only” to “Open to all vehicles.”

Alternative 6

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 6. This will stop the proliferation of new un-authorized routes on native surfaces. The prohibition of cross country travel also results in prohibiting motorized use of all un-authorized roads, trails and areas not added to the National Forest Transportation System. The result is the reduction of native surface roads and trails available for use by motor vehicles 21% from 5,205 to 4,131 miles. These changes will have a positive effect on air quality conditions. The prohibition of cross country travel will result in prohibiting use of Eureka Diggings, Greenhorn Creek, Prosser Reservoir, Boca Reservoir, and Stampede Reservoir as OHV Open Areas. These prohibitions will also have a positive effect on air quality.

- **Additions to the National Forest Transportation System**: Alternative 6 will add an additional 70.3 miles of native surface trails to the National Forest Transportation System. These additional trails will contribute to air quality degradation.
- **Changes to Class of Vehicles and/or Season of Use**: Wet weather seasonal restrictions will be applied to all native surface roads and motorized trails. This change may have a slight improvement on air quality conditions in terms of emissions from vehicles during the winter months. The wet weather seasonal restrictions will have no benefit in terms of the amount of fugitive dust produced on native surface roads and trails during the dry season.
  - The class of vehicles allowed on the existing road system is changed from "Open to highway legal vehicles only" to "Open to all vehicles" on 276 miles of road. These changes to class of vehicle could increase the potential for additional fugitive dust being generated.
- **Cumulative Effects**: Alternative 6 improves air quality by prohibiting cross country travel, imposing wet weather seasonal restrictions and reducing the total amount of native surface roads and trails available for motorized vehicles by 1,074 miles. These benefits to air quality in this alternative out way the potential negative impacts created by adding 70.3 miles of trails to the National Forest Transportation System and changing 276 miles of the existing system from "Open to highway legal vehicles only" to "Open to all vehicles."

Alternative 7

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 7. This will stop the proliferation of new un-authorized routes on native surfaces. The prohibition of cross country travel also results in prohibiting motorized of all un-authorized roads, trails and areas not added to the National Forest Transportation System. The result is the reduction of native surface roads and trails available for use by motor vehicles 26% from 5,205 to 3,864 miles. These changes will have a positive effect on air quality conditions. The prohibition of cross country travel will result in prohibition of motorized use of Eureka Diggings, Greenhorn Creek, Prosser Reservoir, Boca Reservoir, and Stampede Reservoir as OHV Open Areas. These prohibitions will also have a positive effect on air quality.
- **Additions to the National Forest Transportation System**: Alternative 7 will add an additional 45.1 miles of native surface trails to the National Forest Transportation System. These additional trails may have a slight increase in air quality degradation.
- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the season of use allowed on the existing road system in this alternative.
  - The class of vehicles allowed on the existing road system is changed from "Open to highway legal vehicles only" to "Open to all vehicles" on 3.4 miles of road. These limited changes will have no effect on current air quality conditions.
- **Cumulative Effects**: Alternative 7 improves air quality by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 1,341 miles. These benefits to air quality in this alternative out way the potential negative impacts created by adding 45.1 miles of trails to the National Forest Transportation System and changing

3.4 miles of the existing system from "Open to highway legal vehicles only" to "Open to all vehicles."

- **Naturally Occurring Asbestos (NOA)**: Motorized vehicle users on native surface roads and trails with Naturally Occurring Asbestos (NOA) may have increased potential risks for adverse effects to their health. Asbestos is classified as a known human carcinogen by state, federal, and international agencies. Table 3.01-5 displays the area available for motor vehicle use on lands "most likely" to contain naturally occurring asbestos by alternative.

Table 3.01-5. Native Surface Roads, Trails and Areas Open to Motorized Vehicles on Lands "Most Likely" to Contain Naturally Occurring Asbestos

Category	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Cross Country Travel							
Area (acres)	1,660	0	0	0	0	0	0
Routes un-authorized for motor vehicle use (miles)	50	0	0	0	0	0	0
Roads open to all vehicles (miles)	33	36	33	33	36	35	33
Trails open to high clearance trail vehicles (miles)	3	4	3	3	8	4	3
Trails open to ATVs and motorcycles (miles)	10	13	10	13	13	13	13
Trails open to motorcycles (miles)	4	4	4	4	4	4	4
Roads on private lands	18	18	18	18	18	18	18
Total							
Area	**1,660**	**0**	**0**	**0**	**0**	**0**	**0**
Miles	**118**	**76**	**68**	**71**	**79**	**74**	**72**

Alternative 1 poses the greatest potential risk of human exposure to airborne asbestos due to the continuation of country travel on 1,660 acres "Most Likely" to contain naturally occurring asbestos. This includes 50 miles of trails un-authorized for motorized use. All of the action alternatives reduce the potential human exposure to asbestos by prohibiting cross country travel and use of those un-authorized routes not being added to the National Forest Transportation System. This reduction in potential exposure to asbestos in the action alternatives out way any potential negative impacts created by adding motorized trails to the National Forest Transportation System and any changes being made to the class vehicle or season use being made in the action alternatives.

Alternative 1

- **Cross Country Travel**: Cross country travel is not prohibited in Alternative 1. Predicting where cross-country motorized vehicle use would occur is not possible. It is likely that this cross-country travel would include travel on lands "most likely" to contain naturally occurring asbestos. Cross country travel also results in the continued use of approximately 50 miles of unauthorized routes on native surfaces "most likely" to contain naturally occurring asbestos. This use would contribute to an increased risk of human exposure to naturally occurring asbestos.
- **Additions to the National Forest Transportation System**: There or no additions of any roads trails or areas to the National Forest Transportation System in Alternative 1. Since there are no additions, there will be no increased risks to asbestos exposure from this element.

- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the class of vehicles or season of use allowed on the existing road system in this alternative.
- **Cumulative Effects**: Alternative 1 poses the greatest potential risk of human exposure to airborne asbestos due to the continuation of country travel on 1,660 acres "Most Likely" to contain naturally occurring asbestos. This includes 50 miles of trails un-authorized for motorized use.

Alternative 2

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 2. This will stop the proliferation of new un-authorized routes on areas "most likely" to contain naturally occurring asbestos. The cross country travel ban also results in prohibiting use of all un-authorized trails not added to the National Forest Transportation System located on these lands. The result is the reduction of native surface roads and trails available for use by motor vehicles 36% from 118 to 76 miles on lands "most likely" to contain naturally occurring asbestos. These changes will reduce the risk of human exposure to airborne asbestos.
- **Additions to the National Forest Transportation System**: Alternative 2 will add an additional 4 miles of native surface trails to the National Forest Transportation System on land "most likely" to contain naturally occurring asbestos. These additional trails would increase the potential risk of human exposure to asbestos.
- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the season of use allowed on the existing road system in this alternative.
  The class of vehicles allowed on the existing road system is changed from "Open to highway legal vehicles only" to "Open to all vehicles" on 3 miles of road on land "most likely" to contain naturally occurring asbestos. These changes to class of vehicle would increase the potential risk of human exposure to asbestos.
- **Cumulative Effects**: Alternative 2 reduces the risk of human exposure to airborne asbestos by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 42 miles on lands "most likely" to contain naturally occurring asbestos. This overall reduction in risk in this alternative out way the potential negative impacts created by adding 4 miles of trails to the National Forest Transportation System and changing 3 miles of the existing system from "Open to highway legal vehicles only" to "Open to all vehicles" on lands "most likely" to contain naturally occurring asbestos.

Alternative 3

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 3. This will stop the proliferation of new un-authorized routes on areas "most likely" to contain naturally occurring asbestos. The cross country travel ban also results in prohibiting use of all un-authorized trails not added to the National Forest Transportation System located on these lands. The result is the reduction of native surface roads and trails available for use by motor vehicles 42% from 118 to 50 miles on lands "most likely" to contain naturally occurring asbestos. These changes will reduce the risk of human exposure to airborne asbestos.

- **Additions to the National Forest Transportation System**: Alternative 3 will not add any additional miles of native surface trails to the National Forest Transportation System on land "most likely" to contain naturally occurring asbestos. This would not increase the potential risk of human exposure to asbestos.
- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the class of vehicle or season of use allowed on the existing road system in this alternative.
- **Cumulative Effects**: Alternative 3 has the greatest reduction in risk of human exposure to airborne asbestos by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 50 miles on lands "most likely" to contain naturally occurring asbestos.

Alternative 4

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 4. This will stop the proliferation of new un-authorized routes on areas "most likely" to contain naturally occurring asbestos. The cross country travel ban also results in prohibiting use of all un-authorized trails not added to the National Forest Transportation System located on these lands. The result is the reduction of native surface roads and trails available for use by motor vehicles 40% from 118 to 47 miles on lands "most likely" to contain naturally occurring asbestos. These changes will reduce the risk of human exposure to airborne asbestos.
- **Additions to the National Forest Transportation System**: Alternative 4 will add an additional 3 miles of native surface trails to the National Forest Transportation System on land "most likely" to contain naturally occurring asbestos. These additional trails would increase the potential risk of human exposure to asbestos.

  Changes to Class of Vehicles and/or Season of Use: Wet weather seasonal restrictions will be applied to all native surface roads and motorized trails. The wet weather seasonal restrictions will have no benefit in terms of reducing the risk of human exposure to airborne asbestos on native surface roads and trails during the dry season.

  There no changes to the class of vehicles allowed on the existing road system on lands "most likely" to contain naturally occurring asbestos.
- **Cumulative Effects**: Alternative 4 reduces the risk of human exposure to airborne asbestos by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 47 miles on lands "most likely" to contain naturally occurring asbestos. This overall reduction in risk in this alternative out way the potential negative impacts created by adding 3 miles of trails to the National Forest Transportation System.

Alternative 5

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 5. This will stop the proliferation of new un-authorized routes on areas "most likely" to contain naturally occurring asbestos. The cross country travel ban also results in prohibiting use of all un-authorized trails not added to the National Forest Transportation System located on these lands. The result is the reduction of native surface roads and trails available for use by motor vehicles 33% from 118 to 38

miles on lands "most likely" to contain naturally occurring asbestos. These changes will reduce the risk of human exposure to airborne asbestos.

- **Additions to the National Forest Transportation System**: Alternative 5 will add an additional 8 miles of native surface trails to the National Forest Transportation System on land "most likely" to contain naturally occurring asbestos. These additional trails would increase the potential risk of human exposure to asbestos.

  Changes to Class of Vehicles and/or Season of Use: Wet weather seasonal restrictions will be applied to all native surface roads and motorized trails. The wet weather seasonal restrictions will have no benefit in terms of reducing the risk of human exposure to airborne asbestos on native surface roads and trails during the dry season.

  The class of vehicles allowed on the existing road system is changed from "Open to highway legal vehicles only" to "Open to all vehicles" on 3 miles of road on land "most likely" to contain naturally occurring asbestos. These changes to class of vehicle would increase the potential risk of human exposure to asbestos.
- **Cumulative Effects**: Alternative 5 reduces the risk of human exposure to airborne asbestos by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 38 miles on lands "most likely" to contain naturally occurring asbestos. This overall reduction in risk in this alternative out way the potential negative impacts created by adding 8 miles of trails to the National Forest Transportation System and changing 3 miles of the existing system from "Open to highway legal vehicles only" to "Open to all vehicles" on lands "most likely" to contain naturally occurring asbestos.

Alternative 6

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 6. This will stop the proliferation of new un-authorized routes on areas "most likely" to contain naturally occurring asbestos. The cross country travel ban also results in prohibiting use of all un-authorized trails not added to the National Forest Transportation System located on these lands. The result is the reduction of native surface roads and trails available for use by motor vehicles 37% from 118 to 43 miles on lands "most likely" to contain naturally occurring asbestos. These changes will reduce the risk of human exposure to airborne asbestos.
- **Additions to the National Forest Transportation System**: Alternative 2 will add an additional 4 miles of native surface trails to the National Forest Transportation System on land "most likely" to contain naturally occurring asbestos. These additional trails would increase the potential risk of human exposure to asbestos.

  Changes to Class of Vehicles and/or Season of Use: Wet weather seasonal restrictions will be applied to all native surface roads and motorized trails. The wet weather seasonal restrictions will have no benefit in terms of reducing the risk of human exposure to airborne asbestos on native surface roads and trails during the dry season.

  The class of vehicles allowed on the existing road system is changed from "Open to highway legal vehicles only" to "Open to all vehicles" on 2 miles of road on land "most likely" to contain

naturally occurring asbestos. These changes to class of vehicle would increase the potential risk of human exposure to asbestos.

- **Cumulative Effects**: Alternative 6 reduces the risk of human exposure to airborne asbestos by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 43 miles on lands "most likely" to contain naturally occurring asbestos. This overall reduction in risk in this alternative out way the potential negative impacts created by adding 4 miles of trails to the National Forest Transportation System and changing 2 miles of the existing system from "Open to highway legal vehicles only" to "Open to all vehicles" on lands "most likely" to contain naturally occurring asbestos.

Alternative 7

- **Cross Country Travel**: Cross country travel is prohibited in Alternative 7. This will stop the proliferation of new un-authorized routes on areas "most likely" to contain naturally occurring asbestos. The cross country travel ban also results in prohibiting use of all un-authorized trails not added to the National Forest Transportation System located on these lands. The result is the reduction of native surface roads and trails available for use by motor vehicles 39% from 118 to 46 miles on lands "most likely" to contain naturally occurring asbestos. These changes will reduce the risk of human exposure to airborne asbestos.
- **Additions to the National Forest Transportation System**: Alternative 2 will add an additional 3 miles of native surface trails to the National Forest Transportation System on land "most likely" to contain naturally occurring asbestos. These additional trails would increase the potential risk of human exposure to asbestos.
- **Changes to Class of Vehicles and/or Season of Use**: There are no changes to the season of use allowed on the existing road system in this alternative.
  There no changes to the class of vehicles allowed on the existing road system on lands "most likely" to contain naturally occurring asbestos.
- **Cumulative Effects**: Alternative 7 reduces the risk of human exposure to airborne asbestos by prohibiting cross country travel and reducing the total amount of native surface roads and trails available for motorized vehicles by 46 miles on lands "most likely" to contain naturally occurring asbestos. This overall reduction in risk in this alternative out way the potential negative impacts created by adding 3 miles of trails to the National Forest Transportation System.

3.02. Watershed Resources: Geology, Soil, Hydrology

Introduction

This section discusses the physical aspects of watershed resources: geology, soil, and hydrology. The biological and botanical aspects of watershed resources are discussed in Section 3.03 (Terrestrial and Aquatic Species) and 3.06 (Plant Communities). Several attributes of watershed resources can be impacted by management activities: soil hydrologic function and erosion rates and the amount and rate of sedimentation, stream flow (quantity, timing, and quality), and flooding; (Kattelmann and Dozier 1991). However, the relative importance of the alterations and the ability of natural and human communities to adapt to or recover from alterations in hydrologic processes in the Sierra Nevada are highly dependent upon the degree, extent, and location of change and the sensitivity of the watershed.

Forest management activities, including development of geologic resources, can result in ecosystem damage when the activity's location, construction, or implementation is not based on an understanding of geologic conditions and geomorphic processes. The protection of soil and water quantity and quality are important parts of the mission of the Forest Service (Forest Service Strategic Plan for 2007 to 2012, draft, May 2007). Management activities on National Forest System lands must be planned and implemented to protect the health of forest soils and watersheds, including the productivity and hydrologic functions of soils and the volume, timing, and quality of streamflow. The use of roads, trails, and "Open Areas" on National Forests for the operation of motor vehicles has the potential to affect these hydrologic functions through the compaction of soils; interception of runoff; and detachment, transport, and deposition of sediment (e.g., Foltz, 2006). Management decisions to prohibit cross country travel, add new motorized trails to the National Forest Transportation System (NFTS), designate "Open Areas, and/or make changes to the existing vehicle class and season of use on the National Forest Transportation System (NFTS) must consider effects on soil and watershed functions.

There is a close connection between aquatic and riparian ecosystem conditions and the condition of upland watersheds in which they are located. Effects of land management activities move down slope and downstream, merging below each stream confluence in an additive manner. Impacts may result from vegetation removed during timber harvesting, road building, grazing, mining, recreational use, reservoir construction, and wildfire. The level to which watershed conditions are affected relates to the size, intensity, and location of impacts. The "natural sensitivity" of a watershed strongly influences the potential for watershed condition changes as well. Factors influencing natural sensitivity include soil properties, geology, average watershed slope, channel type, climate, precipitation regime, watershed shape, drainage density, vegetation type, and past history of natural disturbances. This analysis focuses on the effects of roads, motorized trails and "Open Areas" on soil and watershed resources.

The information used in this analysis comes from several sources including: the Tahoe National Forest (TNF) Soil Resource Inventory, TNF GIS analysis, existing NEPA project documents, Ecosystem Management Decision Support modeling (EMDS, see Appendix B, Modeling) and field observations and/or inventories. Information in this analysis has been summarized at a variety of scales, including: forest level, river basin and sub-basin, the Hydrologic Unit Code 7 (HUC7) scale (approximately 2,500-

10,000 acres in size), and site-specifically by motorized trail (where available). The HUC7 subwatershed is the scale usually used for cumulative watershed effects for projects on the TNF.

The TNF took a two tiered approach to the analysis in this document. First modeled risk assessments are presented in this chapter. Second, more site specific review of the existing motorized trails un-authorized for motorized use being proposed for addition to the National Forest Transportation System (NFTS) can be found in the Appendix A, Road Cards. The TNF GIS staff compiled and analyzed much of the information presented in this section. The TNF also contracted with University of California, Davis to build a risk assessment model for potential effects of routes on soil and watershed resources. The Ecosystem Decision Support Model (EMDS, Appendix B, Modeling) was used to assess the potential impacts to soil erosion, water quality, and stream channels. The parameters used to assess soil erosion risk were; presence of geo-debris slides, soil erosivity, slope, and precipitation. The risk to water quality and stream channels was based on stream crossing density, route-steam proximity, and position on slope. The modeled risks to soil watershed resources were used in the analysis of the soil and watershed risk assessments. This analysis also uses the results of field observations and inventories taken by TNF specialists (ecologist, soil scientist, hydrologist, and/or fisheries biologist; 2003 - 2007). The field observations used the Green, Yellow, Red (GYR) Trail Condition Rating and Best Management Practices protocols to assess impacts caused by routes currently being used by public, motorized vehicles.

Land Ownership Patterns

There are some HUC7 watersheds within the boundaries of the Tahoe National Forest that are owned primarily by the Forest Service, some are mixed Forest Service and private ownership, and others are primarily under private ownership. It is difficult to show the direct and indirect effects of this proposal in watersheds with a high percentage of private ownership. For example, the Donner Lake HUC7 watershed is 74 percent privately owned. There are 369 native surface, motorized stream crossings in this watershed. Of these 369 crossings, only 36 are under Forest Service jurisdiction. Given that the Forest Service only owns ten percent of the crossings, any changes in this watershed associated with proposals in this document would be masked by the impacts associated with those on private land. However, this document analyzes the cumulative effects of activities on all lands regardless of ownership.

Most National Forest System (NFS) lands have roads and motorized trails that are not under Forest Service control (federal, state and county routes). For example, Figure 3.02-1 shows road and trail density by HUC7 watershed for the No Action alternative and two of the action alternatives. In each alternative the first set of bars is total motorized road and trail density all ownerships and the second set is National Forest Transportation System (NFTS) motorized road and trail density. In every case the percent of HUC7 watersheds with road and trail density less than 2.5 miles per square mile is highest when looking only at NFTS motorized road and trail density. NFTS motorized road and trail density in excess of 5.5 miles per square mile occurs only in Alternative 1. All action alternatives would decrease the density of NFTS motorized roads and trails below 5.5 miles per square mile at the HUC7 watershed scale.

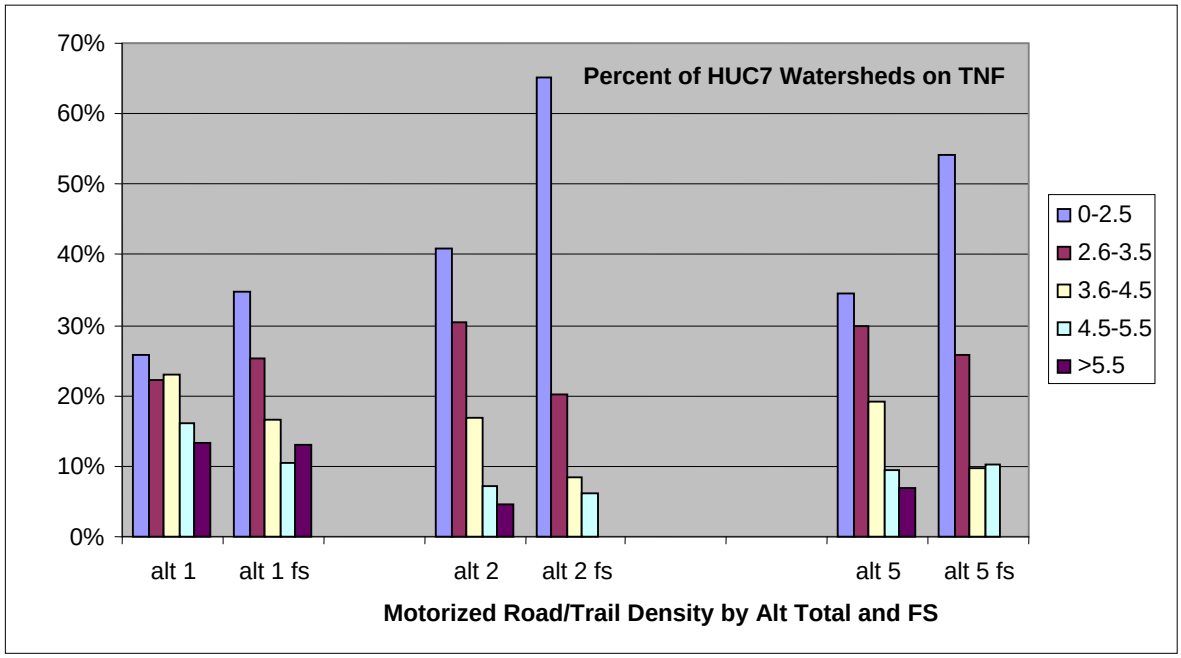

Figure 3.02-1. Total Route Density and Forest Service Route Density for Alternatives 1, 2 and 5

Geology

Introduction. Geological resources affect all aspects of national forest lands. Geological resources include cave resources, paleontological resources, geological special interest areas, and ground water resources. Geological hazards can impact public safety on national forest lands. Hazards can include mine shafts, rock falls, debris flows, slope stability issues, caves and public health concerns.
Geology determines watershed morphology, soils types, and other essential ecosystem functions. Ground water is a valuable resource that may be affected by this project. Mining related hazards are a concern for public safety as the National Forests could have potentially dangerous abandoned mine shafts and hazardous products in the areas of the proposed action.

Regulatory Framework

Regulatory Direction relevant to the proposed action as it affects geologic resources includes:

FSM-2880.11 - Statutory Authority

1. **Organic Administrative Act of June 4, 1897, as Amended (30 Stat. 34, as Supplemented and Amended; 16 U.S.C. 473-478, 482-482(a), 551. (FSM 2501.1.)** This act authorizes the Secretary of Agriculture to issue rules and regulations for the occupancy and use of the National Forests. This is the basic authority for issuing special use permits for the collection of vertebrate paleontological resources for scientific and educational purposes on National Forest System lands.
2. **Preservation of American Antiquities Act of June 8, 1906 (34 Stat. 225; 16 U.S.C. 431 et seq.). (FSM 2361.01.)** This act authorizes permits for archeological and paleontological

exploration involving excavation, removal, and storage of objects of antiquity or permits necessary for investigative work requiring site disturbance or sampling which results in the collection of such objects.

3. **Federal Aid Highway Act (72 Stat. 913; 23 U.S.C. 305)**. This section of the United States Code allows federal funding for mitigation of archeological and paleontological resources recovered pursuant to Federal aid highway projects.
4. **Multiple Use - Sustained Yield Act of June 12, 1960 (MUSY) (74 Stat. 215; 16 U.S.C. 528-531). (FSM 2501.1.)** This act requires due consideration for the relative values of all resources and implies that the administration of nonrenewable resources must be considered.
5. **Watershed Protection and Flood Prevention Act of August 4, 1954, as Amended (68 Stat. 666; 16 U.S.C. 1001). (FSM 2501.1.)** This act authorizes the Secretary of Agriculture to share costs with other agencies in recreational development, ground-water recharge, and water-quality management, as well as the conservation and proper use of land.
6. **Federal Water Pollution Control Act of July 9, 1956, as Amended (33 U.S.C. 1151) (FSM 2501.1); Federal Water Pollution Control Act Amendments of 1972 (86 Stat. 816) (FSM 2501.1), and Clean Water Act of 1977 (91 Stat. 1566; 33 U.S.C. 1251). (FSM 2501.1, 7440.1.)** These acts are intended to enhance the quality and value of the water resource and to establish a national policy for the prevention, control, and abatement of water pollution. Ground water information, including that concerning recharge and discharge areas, and information on geologic conditions that affect ground water quality are needed to carry out purposes of these acts.
7. **Wilderness Act of September 3, 1964 (78 Stat. 890; 16 U.S.C. 1131-1136). (FSM 2501.1.)** This act describes a wilderness as an area which may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value. These geological features are generally identified for wilderness classification purposes.
8. **National Forest Roads and Trails Systems Act of October 13, 1964 (78 Stat. 1089; 16 U.S.C. 532-538). (FSM 7701.1.)** This act provides for the construction and maintenance of an adequate system of roads and trails to meet the demands for timber, recreation, and other uses. It further provides that protection, development, and management of lands will be under the principles of multiple use and sustained yield of product and services (16 U.S.C. 532). Geologic conditions influence the final selection of route locations.
9. **Wild and Scenic Rivers Act of October 2, 1968 (82 Stat. 906 as Amended; 16 U.S.C. 1271-1287)**. This act states that it is the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstanding scenic, recreation, geologic, fish and wildlife, cultural, or other similar values shall be preserved in free-flowing condition.
10. **National Environmental Policy Act of January 1, 1970 (NEPA) (83 Stat. 852 as Amended; 42 U.S.C. 4321, 4331-4335, 4341-4347). (FSM 1950.2.)** This act directs all agencies of the Federal Government to utilize a systematic interdisciplinary approach which will ensure the

integrated use of the natural and social sciences in planning and in decision making which may have an impact on man's environment. Geology is one of the applicable sciences.

11. **Mining and Minerals Policy Act of December 31, 1970 (84 Stat. 1876; 30 U.S.C. 21a)**. This act provides for the study and development of methods for the disposal, control, and reclamation of mineral waste products and the reclamation of mined lands. This requires an evaluation of geology as it relates to ground water protection and geologic stability.
12. **Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531-1536, 1538-1540)**. This act provides for the conservation of endangered and threatened species and their habitats.
13. **Archeological and Historical Conservation Act of 1974 (AHCA) (88 Stat. 174; 16 U.S.C. 469). (FSM 2361.01.)** This act requires all Federal agencies to notify the Secretary of the Interior when a construction project threatens to irreparably harm or destroy significant scientific, prehistoric, historic, or archeological data. The paleontological resource may have significant scientific and historic value.
14. **Disaster Relief Act of 1974 (88 Stat. 143; 42 U.S.C. 5121, 5132). Section 202(b) states that the President shall direct appropriate Federal agencies to ensure timely and effective disaster warnings for such hazards as earthquakes, volcanic eruptions, landslides, and mudslides**. The Federal Register, Vol. 42, No. 70 of April 12, 1977, "Warnings and Preparedness for Geologic Related Hazards," implies coordination with the U.S. Geological Survey in such warnings.
15. **Forest and Rangeland Renewable Resources Planning Act of August 17, 1974 (RPA) (88 Stat. 476; 16 U.S.C. 1600-1614) as Amended by National Forest Management Act of October 22, 1976 (90 Stat. 2949; 16 U.S.C. 1609). (FSM 1920 and FSM 2550.)** This act requires consideration of the geologic environment through the identification of hazardous conditions and the prevention of irreversible damages. The Secretary of Agriculture is required, in the development and maintenance of land management plans, to use a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences.
16. **Resource Conservation and Recovery Act of 1976 (RCRA) (90 Stat. 2795; 42 U.S.C. 6901) as Amended by 92 Stat. 3081**. This act, commonly referred to as the Solid Waste Disposal Act, requires protection of ground water quality and is integrated with the Safe Drinking Water Act of December 16, 1974, and Amendments of 1977 (42 U.S.C. 300(f)). (FSM 7420.1.)
17. **Surface Mining Control and Reclamation Act of August 3, 1977 (SMCRA) (30 U.S.C. 1201, 1202, 1211, 1221-43, 1251-79, 1281, 1291, 1309, 1311-16, 1321-28)**. This act enables agencies to take action to prevent water pollution from current mining activities, and also promote reclamation of mined areas left without adequate reclamation prior to this act.
18. **Archaeological Resource Protection Act (ARPA) October 31, 1979 (93 Stat. 721; 16 U.S.C. 470 aa)**. This act protects archeological resources, and prohibits the removal, sale, receipt, and interstate transport of archeological resources obtained illegally from public lands. Archeological resources include paleontological resources in context with archeological resources. Also, this

act authorizes the Secretary of Agriculture to issue permits for archeological research, investigations, studies, and excavations.

19. **Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA) (94 Stat. 2767; 42 U.S.C. 9601, et seq)**. This act provides authority to the Environmental Protection Agency and to other federal agencies, including the United States Department of Agriculture, to respond to release of hazardous substances, pollutants, and constituents. It also provides for joint and several liability to potentially responsible parties (PRPs) for cleanup costs of existing water contamination. See also FSM 2160.
20. **Federal Cave Resources Protection Act of 1988 (102 Stat. 4546; 16 U.S.C. 4301 et seq)**. This act provides that Federal lands be managed to protect and maintain, to the extent practical, significant caves.

The following Executive Orders provide direction for geologic resources and services activities on National Forest System lands:

FSM-2880.12 - Executive Orders

1. **Executive Order 11593, Protection and Enhancement of Cultural Environment, May 13, 1971 (3 CFR 559, 1971-75 Compilation)**. This Executive Order directs agencies to preserve, restore, and maintain the historic and cultural environment of the Nation.
2. **Executive Order 12113, Independent Water Project Review, January 5, 1979.** This Executive Order requires an independent water project review by the Water Resources Council on preauthorization reports and preconstruction plans for Federal and federally assisted water and related land resource plans. The technical review will evaluate each plan for compliance with the Council's principles and standards, agency procedures, other Federal laws, and goals for public involvement.

Affected Environment

Introduction

Physiography, Relief and Drainage

The Tahoe National Forest is located in the central Sierra Nevada. It is roughly divided into three physiographic areas by a glacially sculpted crest zone that trends north-south. The western third of the survey area is dominated by deeply incised canyons separated by long, narrow, gently sloping ridges. The eastern third is characterized by low foothills and broad valleys.

The ascent from the Central Valley through the western third of the Forest toward the crest is gentle; with the average slope through a west-to-east transect about 3 to 5 percent. The underlying rock formations generally trend northwest by southeast. Drainages are generally toward the southwest, with main stream channels cut through and across geologic formations. The headwaters of major drainages start in the glaciated crest zone, and descend through gently sloping volcanic and granitic bedrock to deeply entrenched V-shaped canyons along the western edge of the area, where metamorphic rocks are exposed. Typically, the land surfaces of the folded and faulted metamorphic rocks are steep and angular,

the land surfaces of granitic rocks rounded, smooth, and often have a basin-like appearance, and the land surfaces of volcanic rocks are flat and relatively smooth, reflecting their origin.

The primary potential impacts to geologic resources resulting from the Travel Management Project are associated with cave management, paleontological resources, geological special interest areas, ground water management, and areas with a risk of mass movement (primarily debris slides).

Cave Resources, Geologic Special Interest Areas, and Paleontological Resources

The term "cave" means any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge (including any cave resource therein, but not including any vug, mine, tunnel, aqueduct, or other manmade excavation) and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or manmade. Such term shall include any natural pit, sinkhole, or other feature which is an extension of the entrance. There are two known caves on the Tahoe National Forest. Neither of these caves is within ¼ mile of road or motorized trail.

There are two Geologic Special Interest Areas on the Tahoe National Forest: Devil's Postpile Geologic Area (69acres, postpile geologic feature) and Glacier Meadow Geologic Area (84 acres, glacial geologic features).

Paleontological resources on the Tahoe National Forest include plant and animal fossils and petrified wood. There are six known Paleontolocal sites currently identified on the Tahoe National Forest. These sites are listed below in Table 3.02-1.

Table 3.02-1. Paleontolocal sites currently identified on the Tahoe National Forest

Site	Description	Potential Impacts
1	Fossilized mastodon remains	One motorized trail un-authorized for motorized use
2	Petrified Wood	One existing NFTS road
3	Petrified Wood	One existing NFTS Motorized Trail
4	Petrified Wood	One motorized trail un-authorized for motorized use
5	Paleo Botanical Fossils	One motorized trail un-authorized for motorized use and one existing NFTS road
6	Paleo Botanical Fossils	One motorized trail un-authorized for motorized use

Groundwater Resources

Groundwater is water located beneath the ground surface in soil pore spaces and in the fractures of rock formations. Groundwater is recharged from, and eventually flows to, the surface naturally. Discharge of groundwater often occurs at springs and seeps and can form wetlands. Roads and motorized trails near springs and seeps can intercept flow and channel water movement and/or can pollute groundwater resources. There are seven motorized trails un-authorized for motorized use and one un-authorized "Open Area" that have the potential to impact groundwater resources. These are shown below in Table 3.02-2.

Table 3.02-2. Ground Water Resources Potentially Impacted By Motorized Trails Un-Authorized for Motorized Use

Trail ID	Ground Water Resource
ARM-13	Spring near trail
TKN-J5	Seep at beginning of trail
SV-005	Stringer meadows near trail
TKS-11	Adjacent to wet meadow complex and several wetlands
YRS-SF5	Adjacent wetland
TKN-003	Begins at wetland
TKN-J2	Seasonal wetland/vernal pool at the end of the trail
Eureka Diggings	Seasonal wetlands/vernal pool

Debris Slides

Road and motorized trail networks in mountainous forest landscapes have the potential to increase the susceptibility to shallow landsliding by altering subsurface flow paths. The most common type of landslide feature found on the TNF is debris slides. Debris slides are a type of soil movement that usually occurs on steep slopes with shallow soils over bedrock. Roads and motorized trails that cross debris slides can increase debris slide activity, increasing sediment delivery to channels. The risk of debris slides is covered in the Soils part of this section.

Abandoned Mine Lands

Some abandoned mine land (AML) sites can be a concern for public safety (e.g., mine shafts, hazardous substances, etc). There are 96 AML sites currently identified on the TNF that are within 100 feet of roads or motorized trails. Fifty-eight sites are along existing National Forest Transportation System (NFTS) roads or NFTS motorized trails. The other thirty-eight of these AML sites are along motorized trails un-authorized for motorized use.

Geology Environmental Consequences

Cave Resources, Geologic Special Interest Areas, and Paleontological Resources

There are two known caves on the Tahoe National Forest. Neither of these caves is within ¼ mile of a road or motorized trail and therefore will not be affected by any of the alternatives.

No changes in management of the Geologic Special Interest Areas (GSIA) will occur under implementation of any of the alternatives. Motorized vehicle use within these GSIAs is either excluded or discouraged. Therefore, native geologic features within these GSIAs will not be impacted by motorized vehicle activity. There are no environmental consequences associated with GSIAs in any of the alternatives.

Paleontological resources on the Tahoe National Forest include plant and animal fossils and petrified wood. There are six known Paleontolocal sites currently identified on the Tahoe National Forest. All six of the sites could be impacted by motorized use in Alternative 1 (No Action). All of the action alternatives reduce the number of sites potentially impacted by motorized use. The number of sites potentially impacted by motorized use in each alternative is shown in Table 3.02-3.

Table 3.02-3. Paleontological resources on the Tahoe National Forest potentially impacted by motorized vehicles by alternative

Site	Description	Potential Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
1	Fossilized mastodon remains	Motorized trail added to NFTS	X				X		
2	Petrified Wood	One existing NFTS road	X	X	X	X	X	X	X
3	Petrified Wood	One existing NFTS Motorized Trail	X	X	X	X	X	X	X
4	Petrified Wood	Motorized trail added to NFTS	X	X			X	X	X
5	Paleo Botanical Fossils	Motorized trail added to NFTS One existing NFTS road	X	X	X	X	X	X	X
6	Paleo Botanical Fossils	One motorized trail un-authorized for motorized use	X						
		Total Number	**6**	**4**	**3**	**3**	**5**	**4**	**4**

Groundwater Resources

The potential effects of routes on aquatic species are covered in Section 3.03 (Terrestrial and Aquatic Species). The potential effects of groundwater on erosion rates are covered in the soils section and in the Road Cards (Appendix A). Given the scale of this project, there would be little measurable effect of this project to water quality of groundwater resources. All motorized trail additions to the National Forest Transportation System (NFTS) which could impact groundwater resources have mitigation measures specified in Appendix A to reduce or eliminate any potential adverse effects. These mitigation measures for ground water resources are summarized by alternative in Table 3.02-4.

Table 3.02-4. Mitigation measures to protect groundwater resources by alternative

Trail ID	Ground Water Resource	Mitigation Measure Required	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
ARM-13	Spring near trail	None, no impact to spring	X	X			X	X	X
TKN-J5	Seep at beginning of trail	Redirect water flow	X	X			X	X	X
SV-005	Stringer meadows near trail	Barriers placed to protect meadows	X	X			X		
TKS-11	Adjacent to wet meadow complex and several wetlands	Drainage structures and barriers placed to protect meadows	X	X			X	X	X
YRS-SF5	Adjacent wetland	Barriers placed to protect meadows	X	X		X	X	X	X
TKN-003	Begins at wetland	None, no impact to wetland	X	X			X	X	
TKN-J2	Seasonal wetland/vernal pool at the end of the trail	Barriers placed to protect wetland/vernal pool	X	X		X	X	X	X
Eureka Diggings	Seasonal wetlands/vernal pool	None, No impact to wetland/vernal pool	X						
		Total Number of Mitigations	8	7	0	2	7	6	5

Abandoned Mine Lands (AML)

To assess the potential health and safety risks from abandoned mine lands effects, the alternatives are compared by the number of known, mapped AML sites within 100 feet of roads and motorized trails. There are currently 96 AML sites within 100 feet of roads and motorized trails. Those alternatives with the greatest number of AML sites with 100 feet of roads and motorized trails are expected to have the highest risk to public safety. There is no way of knowing how many people using the roads and motorized trails may be accessing the mine sites. Table 3.02-5 shows the number of AML sites which could have potential public safety concerns related to motorized public access. The No Action Alternative (Alternative 1) would have the highest risk to public safety. Alternative 3 would have the lowest risk to public safety because it has the lowest number of AML sites near motorized roads and trails. All other action alternatives would add three motorized trails to the National Forest Transportation System (NFTS) near AML sites. Mitigation measures to assure public safety are included in Appendix A (Road Cards) for these sites. Mitigation measures typically are to seal off any hazardous openings such as mine adits.

Table 3.02-5. Number of Abandoned Mine Land (AML) Sites within 100 Feet of Roads and Motorized Trails by Alternative

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Number of AML Sites within 100’	96	61	58	61	61	61	61

Abandoned Mine Land Sites (AML)

Prohibition on Cross Country Travel: All of the action alternatives prohibit cross country travel. This prohibition will reduce the public risk caused by the presence of abandoned mine land features across the forest. It would also prevent the proliferation of any new motorized trails un-authorized for motorized use which could increase the public safety risk. Prohibition of cross country travel would decrease the number AML sites within 100 feet of roads and motorized trails by 38 sites. The changes in the number of AML sites within 100’ of roads and motorized trails resulting from the prohibition on cross country travel are displayed in Table 3.02-6.

Table 3.02-6. Changes in the number Abandoned Mine Land Sites within 100’ of motorized vehicle access due to the prohibition of Cross Country Travel

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Changes in number of AML Sites within 100’	0	-38	-38	-38	-38	-38	-38

Additions to the National Forest Transportation System (NFTS): There are no motorized trail additions to the NFTS under Alternative 1. The action alternatives would add between 31.2 and 282.8 miles of motorized trails to the NFTS. Addition of motorized trails to the NFTS within 100 feet of abandon mine land (AML) sites would have minimal new effects to public safety. Appendix A, Road Cards, has mitigations needed to add the routes to the NFTS with minimal impacts to user safety. The changes in abandoned mine land sites within 100 feet resulting from the additions to the NFTS are displayed in Table 3.02-7.

Table 3.02-7. Changes in Abandoned Mine Land Sites within 100 feet of roads and motorized trails due to Additions to the National Forest Transportation System

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Number of AML Sites within 100'	0	-3	0	-3	-3	-3	-3

Changes to Class of Vehicles and/or Season of Use: Changing the class of vehicle allowed to use a particular National Forest Transportation System (NFTS) road or motorized trail or the season of use does not change the impacts to and from abandoned mine land sites.

Cumulative Effects: All action alternatives would result in a decrease in public health and safety risks associated with motorized access to abandon mine land sites. Alternatives 3 would decrease the number of AML sites within 100 feet of roads and motorized trails by 38 sites. The rest of the action alternatives would decrease the number of AML sites adjacent to roads and motorized trails by 35 sites. The cumulative effects to public health and safety from abandoned mine lands are displayed in Table 3.02-8.

Table 3.02-8. Abandoned Mine Land Sites within 100 feet of motorized roads and trails

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Number of AML Sites within 100'	96	61	58	61	61	61	61

Soil Resources

Introduction

Soil Erosion Related to Roads and Trails

Kattelmann (1996) characterized Sierra Nevada landscapes as having relatively low, natural surface erosion rates. Sierra Nevada soils generally have high infiltration rates. In undisturbed forests, surface erosion is usually minimal because infiltration rates are generally greater than rainfall or snowmelt rates, and water is absorbed into the soil.

Roads are considered the principal cause of accelerated erosion in forests throughout the western United States (California Division of Soil Conservation 1971, California Division of Forestry 1972, Reid and Dunne 1984, McCashion and Rice 1983, Furniss and others 1991, Harr and Nichols 1993). The locations of roads determine the degree of potential impacts, making some roads more environmentally sensitive than others. The presence of roads can increase the frequency of slope failures compared with the rate for undisturbed forest by hundreds of times (Sidle and others 1985). A single, poorly designed trail on a highly erosive soil could cause unacceptable soil loss, but result in no impact to water quality if not delivered to a stream. A very high density of trails on a moderately erosive soil in an area with a high stream density could be unacceptable for water quality (the likelihood of delivery is high), but not necessarily a major impact to the soil resource.

There are two types of soil loss on roads and trails. First is the loss of soil from the tread itself. Because the road or trail surface is a dedicated use of the land, this is really not so much a soil productivity issue as it is a loss of facility function. Loss of soil productivity occurred when the road or

trail was constructed as part of the transportation system. In the case of user created trails, the loss of soil productivity occurred as the trail became more compacted and established over time. The second type of erosion is the loss of soil that occurs when concentrated water from the road or trail surface creates a gully or some other erosion features downslope. This reduces soil productivity, vegetative growth and water quality when sediment is delivered to a watercourse.

Concentrated runoff is the primary agent of erosion on native surfaced roads and motorized trails. Mechanical displacement of soil by traffic is also important, although most mechanically displaced soil is ultimately transported by concentrated runoff. Mechanical displacement becomes more significant as road or trail gradients become steeper. Mechanical erosion and soil loss by dusting are problems on user created trails because treads in surface soils are high in organic matter and generally not well compacted.

Road and Motorized Trail Characteristics

The characteristics of roads and motorized trails are important in defining the affected environment for soil and watershed resources and for analyzing the effects of the proposed actions. Some roads and motorized trails are a lower risk to soil and watershed resources than others. Lower-risk roads and motorized trails tend to be more stable and generally have less surface soil loss and a lower potential for sediment delivery to streams. Native surface motorized roads and trails generally have a higher risk of surface erosion and sediment delivery. The following definitions of Lower Risk Routes and Higher Risk Routes are used throughout the remainder of this chapter.

- **Lower Risk Routes**
  "Lower Risk Routes", such as, surfaced National Forest Transportation System (NFTS) roads, non-motorized trails, over-snow routes, and county and state roads have been grouped as lower risk in this assessment because these routes have generally been engineered, are not subject to mechanical erosion by motorized vehicles, and/or have regular maintenance schedules. These types of routes are generally less prone to surface erosion and sediment production/transport to streams or lakes.
- **Higher Risk Routes**
  "Higher Risk Routes" include three categories based on their potential for soil loss and potential sediment delivery to streams, lakes, or other water bodies. These categories are: native surface National Forest Transportation System (NFTS) roads, NFTS motorized trails, and motorized trails un-authorized for motorized use.

  Native Surfaced National Forest Transportation System Roads. The majority of native surfaced National Forest Transportation System (NFTS) roads were originally constructed for hauling timber. These roads have a cut slope, a road prism, and a fill slope. NFTS native surface roads generally have well-compacted prisms, and constructed watercourse crossings with culverts and fills. Drainage is provided by inside ditches with culvert cross drains and by rolling dips. Long sustained gradients are common, although gradients are usually not steep. Maintaining drainage structures is the key to minimizing erosion on these roads. Drainage structures on NFTS native surface roads are particularly susceptible to damage by wet season use.

National Forest Transportation System (NFTS) motorized trails. There are two types of NFTS motorized trails: (1) those constructed specifically for OHV use, and (2) those converted from roads. Trails specifically designed and constructed for OHV use are narrow, have minimal cuts and fills, and have meandering alignments without long sustained gradients. Rolling the grade and constructing OHV rolling dips provide drainage. Unless constructed by hand, treads are usually cut into the subsoil and have compaction adequate for a good running surface. Most of the NFTS motorized trails, however, are road-to-trail conversions and were not originally designed and constructed for OHV use. The well-compacted road prisms do provide a firm running surface, but the compacted surface also makes maintaining rolling dips difficult during wet season use. NFTS motorized trails converted from roads require more attention to drainage because of` their long sustained gradients.

Motorized trails un-authorized for motorized use. Motorized trails un-authorized for motorized use fall into two general categories, user created motorized trails and National Forest Transportation System (NFTS) Maintenance Level 1 and temporary roads that the Forest Service attempted to close to motorized use and which have continued to be used by the public.
Many user-created motorized trails originated as wheel tracks made by users seeking access to a destination with no engineering input. User-created motorized trails have usually no drainage, roll the grade only by chance, and often include unsustainably steep gradients. User-created motorized trails were not constructed, so their treads are in loose surface soils rather than well-compacted subsoil which better supports traffic and resists mechanical erosion. As topsoil is eroded, user-created motorized trails become entrenched. This concentrates runoff, causing additional entrenchment and erosion. Most user-created motorized trails either are eroded, or will be eroded if not drained.

Most National Forest Transportation System (NFTS) Maintenance Level 1and temporary roads were originally constructed for hauling timber. Some of these roads have a cut slope, a road prism, and a fill slope. NFTS roads have been engineered and generally have well-compacted prisms, and constructed watercourse crossings with culverts and fills. Drainage is provided by inside ditches with culvert cross drains and by rolling dips. Long sustained gradients are common, although gradients are usually not steep. Maintaining drainage structures is the key to minimizing erosion on these roads. Drainage structures on NFTS Maintenance Level 1 and temporary roads with native surfaces are particularly susceptible to damage by wet season use. These roads are generally less of a risk for causing soil erosion than true user created motorized trails because initially they were engineered and they have had drainage control installed.

Regulatory Framework: Compliance with the Forest Plan and Other Regulatory Direction

For forest plan direction for soil, watershed and geology resources, refer to Chapter 3.00. Other Regulatory Direction specifically relevant to the proposed action as it affects soil resource includes:

- **National Forest Management Act of 1976.** Renewable Resource Program. "(C) recognize the fundamental need to protect and where appropriate, improve the quality of soil, water, and air resources."
- **National Soil Management Handbook**. The Soil Management Handbook (USDA 1991) is a national soils handbook that defines soil productivity and components of soil productivity, establishes guidance for measuring soil productivity, and establishes thresholds to assist in forest planning.

  Management activities cause varying degrees of soil disturbances, which may or may not cause a significant change in productivity. Soil quality standards (threshold values where soil disturbances become detrimental, that is, result in significant change) are intended for areas where management prescriptions are being applied, such as timber harvest areas and range allotments. They are not intended to apply to administrative sites or other areas with dedicated uses.
- **Region 5 Soil Management Handbook Supplement**. The Forest Service Region 5 Soil Management Handbook Supplement establishes regional soil quality analysis standards (SQS, USDA 1995). The Region 5 soil quality analysis standards address three basic elements for the Soil Resource: 1) soil productivity (including soil loss, porosity; and organic matter), 2) soil hydrologic function, and 3) soil buffering capacity. The analysis standards apply only to those areas dedicated to growing vegetation. They are not applied to lands with other dedicated uses, such as developed campgrounds, administrative facilities or in this case, the actual land surface authorized for travel by the public using various kinds of vehicles, both licensed or non-licensed.

Affected Environment

Soil Resources

Soils on Tahoe National Forest

Soils on the Tahoe National Forest can be separated into 3 physiographic groups, oriented from west to east:

Dominantly Nearly Level to Very Steep Soils of the Westside

Soils in this group are well drained and somewhat excessively drained. They formed in material weathered from volcanic, metasedimentary, granitic, or ultra basic rock, as well as in glacial or alluvial deposits. Rock outcrops are numerous in many areas. Slopes are 2 to 75 percent.

These soils are on the lower slopes of the western Sierra Nevada, at elevations of 1,800 to 6,000 feet. The annual precipitation is 40 to 80 inches, and the frost-free growing season is 130 to 200 days.

Some of the major soil series in this zone are Hurlbut, Deadwood, Putt, Cohasset, Jocal, Holland, McCarthy, Crozier, and Ledmount. The soils in this zone make up about 33 percent of the survey area. Soils in this zone usually have more clay and are more susceptible to rutting and erosion, than those at higher elevations. Likewise, these soils are the accessible to OHV use throughout the year because precipitation in this zone is mostly rain.

Dominantly Nearly Level to Very Steep Soils of High Elevation Mountainsides

The soils in this group are excessively drained to moderately well drained. They formed in material weathered from volcanic, metasedimentary, and granitic rock, as well as glacial or alluvial deposits. Rock outcrops are numerous in many areas. Glacial rock land also occurs throughout the area. Slopes range from 2 to 75 percent. These soils are along the crest of the Sierra Nevada, at elevations of 5,400 to 10,000 feet. The annual precipitation is 35 to 80 inches, and the frost-free season is 25 to 125 days. Some of the major soil series in this zone are Tallac, Smokey, Meiss, Bucking, Ledford, Fugawee, Waca, and Ahart. Areas of nearly level to very steep Rock outcrop are also mapped in this zone. The soils in this zone make up about 48 percent of the survey area. Soils are generally loamy to sandy, and have more rock fragments. Gully erosion is a hazard in this zone. Snow cover makes the season of use shorter, and wet season closures are less of an issue than in the soils of the lower Westside.

Dominantly Nearly Level to Very Steep Soils of the Eastside

The soils in this group are somewhat excessively drained to well drained. They form in material weathered from volcanic, rhyolitic, and granitic rock, and alluvial deposits. Rock outcrops are numerous in many areas. Slopes range from 2 to 75 percent. These soils are on the lower slopes of the eastern Sierra Nevada, and the Verdi ranges, at elevations of 4,800 to 6,500 feet. The annual precipitation is 15 to 40 inches, and the frost-free growing season is 20 to 75 days. Some of the major soil series in this zone are Euer, Martis, Aldi, Franktown, Kyburz, Trojan, and Portola. The soils in this zone make up about 19 percent of the survey area. Soils are generally loamy to sandy, and have more rock. These soils have some of the lowest erosion rates on the Tahoe National Forest.

Existing Soil Erosion Risk Assessment

Many factors can influence the risk of erosion and potential impacts to watershed resources including: soil erosivity; stream density; and the type and density of roads on the landscape. The presence of highly erosive soils/landscapes or high native-surfaced, motorized route density does not mean that there will be negative effects to soil and watershed resources. But the presence of both high erosion risks and high motorized route density indicates that there could be a higher risk of accelerated erosion and sediment production due to motorized roads and trails.

The inherent risk of erosion of the soils within the Tahoe National Forest (TNF) was assessed using the Ecosystem Management Decision Support Model (EMDS. See Appendix B, Modeling). The parameters used in the EMDS model to assess soil erosion risk were 1) presence of geo-debris slides, 2) soil erodibility, 3) slope, and 4) precipitation. The EMDS model compared the K factor, percent slope, precipitation, and presence of geodebris slides of each route segment (~300 meters) to all other road and motorized trail segments on the TNF. The length of roads and motorized trails in each HUC7 watershed was grouped by modeled erosion hazard to define the potential erosion risks on the watersheds on the TNF. The EMDS risk assessment is internally referenced to the soils on the TNF. This means that the highest erosion risk score modeled using TNF data was defined as the highest potential erosion risk possible on the TNF and the lowest score was defined as the lowest potential erosion risk possible on the TNF. The result is a relative risk value assigned between 0 (highest risk) and 1 (lowest risk) for each 300

meter segment of every road and motorized trail. So the highest risk modeled is the highest erosion risk on the TNF and the lowest risk modeled is the lowest risk on the TNF.

In general, modeled risk of erosion was higher than actual amount of resource damage found during field inventories. However, the GIS analysis predicted more crossings than were found during field inventories. This is partially due to the fact the ephemeral stream GIS coverage used in this analysis has not been fully field verified across the entire TNF. Geo-debris slides also tend to be over-estimated in the model. Routes were usually higher on the landscape than the feature that was modeled – route was above scoured channel or debris slide was not active. To adjust the model would require field verification and remapping of the ephemeral stream layer and more accurate mapping of location and level of activity of debris slide features across the Forest. The model was not adjusted in this project. Until adjusted the modeled risk is still useful as general a risk assessment because it still assesses the relative potential risk of soil erosion in a road and motorized trail-related disturbed environment.

Figure 3.02-2 shows a map of the TNF with the EMDS landscape erosion risk averaged by HUC7. The modeled erosion is “Higher” to “Highest” on much of the west slope of the TNF. This is due to the steeply sloping topography of many of the watersheds, the presence of geo-debris slides, higher precipitation values, and finer-textured, more erosive soils. The modeled risk is “Lower” or “Lowest” on the east-side of the TNF due to coarser textured soils and less steep slopes.

HUC 7 Watersheds were used to compile information about the potential impacts to soil and watershed resources because this the scale generally used for cumulative watershed effects analysis on the Tahoe National Forest. This scale is large enough to encompass the effects of management activities, but not so large as to mask the effects of the proposed actions. Because HUC7 watersheds range from 2,500 to 10,000 acres in size, density (e.g., miles of road & trails/acre of HUC7 or number of crossings/acre of HUC7) is a more meaningful measurement of route risks than simply number of miles. Therefore, road/trail density is used in this analysis as well as the miles of roads and trails as well as number of crossings. For the purposes of this assessment HUC7 watersheds with Higher to Highest EMDS erosion risk and high to moderately high route density (focused routes as explained below) were used to select HUC7 watersheds at highest risk of adverse effects due to motorized travel on native surface roads and motorized trails. For a more site specific scale, see Appendix A, Road Cards, for trail-specific erosion mitigation measures.

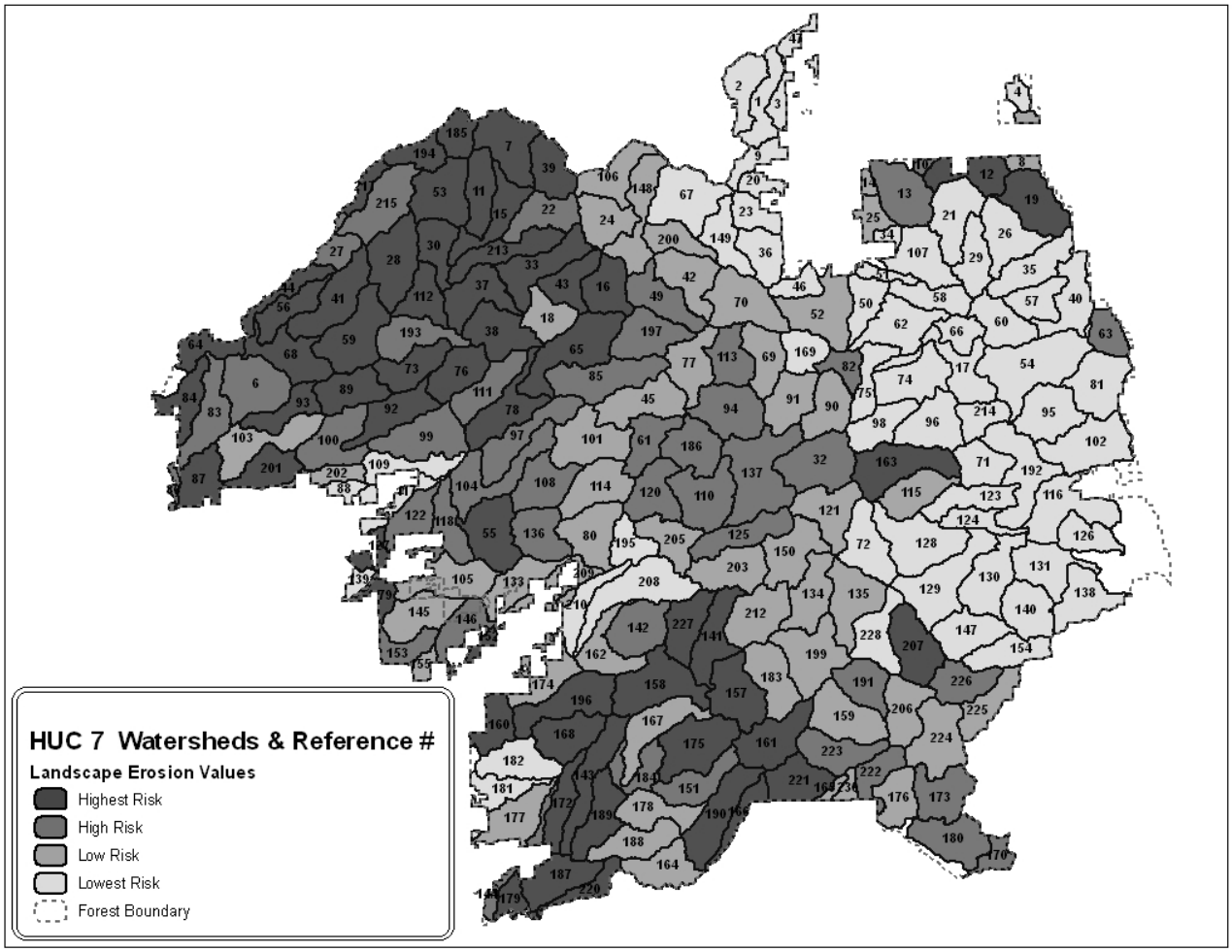

Figure 3.02-2. EMDS Erosion Risk by HUC7 Watersheds.

Soil Risk Assessment Based on Density of Existing "Higher Risk Routes" in TNF Watersheds

This analysis focuses on "Higher Risk Routes" defined as native surface (dirt) roads and motorized trails. Not incorporated in the focused analysis were "Lower Risk Routes" defined as surfaced roads, non-motorized trails, over-snow routes, and county and state roads because these routes tend to be more stable. To do this analysis watershed were separated into quartiles based on the density of miles open for motorized use of "Higher Risk Routes" as described earlier. These categories are shown in Table 3.02-9 below.

Table 3.02-9. "Higher Risk Route" density categories (mi. /sq. mi.)

Level of Risk Category	"Higher Risk Route" density (mi. /sq. mi.)
Highest	3.6 Plus
High Risk	2.8 to 3.5
Low Risk	2.0 to 2.7
Lowest Risk	0 to 1.9

These groupings are 0-1.9, 2.0-2.7, 2.8-3.5, and more than 3.6 mi/sq mi of "Higher Risk Routes" per HUC7 watershed.

The highest density category represents

the highest potential risk to the soil and watershed resources and was used in conjunction with the EMDS Erosion Risk rating to identify the HUC7 watersheds on the TNF with the highest risk of negative effects due to motorized travel.

Existing Soil Risk Assessment based on EMDS Erosion Risk and "Higher Risk Route" density in Watersheds

The following table shows percentage of watersheds on the forest according to the combination of EMDS Erosion Risk and "Higher Risk Route" density.

Table 3.02-10. Percent of HUC7 Watersheds on Tahoe National Forest by "Higher Risk Route" density categories and EMDS Erosion Risk category

"Higher Risk Route" density Mi/ Sq Mi by HUC7				
EMDS Erosion Risk category	**0-1.9**	**2.0-2.7**	**2.8-3.7**	**3.8-8.6**
Lowest	3%	5%	6%	10%
Lower	6%	5%	7%	7%
Higher	7%	6%	8%	3%
Highest	9%	9%	3%	5%

The shaded cells in Table 3.02-10 represent the percent of HUC7 watersheds on the TNF with the highest potential erosion risk to soil and watershed resources from motorized travel on "Higher Risk Routes."

Table 3.02-11 shows the HUC7 watersheds that were identified as having both Higher or Highest EMDS Erosion Risk class and "Higher Risk Route" density in the existing environment analysis above. Currently the TNF has 37 HUC7 watersheds or 18% of the TNF HUC7s with either "Higher" or "Highest" EMDS Erosion Risk potential, and highest or higher densities of "Higher Risk Routes."

Figure 3.02-3 shows the location of the watersheds listed in Table 3.02-7. Two of the HUC7 watersheds identified as high risk are on the east-side of the TNF, Squaw Creek and East Martis Creek. The major portions of both Squaw Creek (76 percent) and East Martis Creek (99 percent) are privately owned. The rest of the high risk watersheds are on the west-side of the TNF in the Yuba (8 – North Yuba; 7 – Middle Yuba; 6 – South Yuba), Bear (2), or American River (9 – Middle Fork American; 3 North Fork American) basins. All of these watersheds have at least fifty percent Forest Service ownership.

Table 3.02-11. HUC7 Watersheds with both higher to highest EMDS Erosion Risk and higher to highest density of "Higher Risk Routes"

HUC7	Watershed Name	River Basin	"Higher Risk Route" density (mi/sq. mi)	EMDS Erosion Risk
16050102010102	Squaw Creek	Truckee	5.1	0.37
16050102010404	East Martis Creek	Truckee	4.6	0.06
18020125010404	Upper Pauley Creek	North Yuba	2.8	0.41
18020125010505	Fiddle Creek	North Yuba	4.7	0.34
18020125010506	Cherokee Creek	North Yuba	4.8	0.39
18020125010507	North Yuba River-Indian Creek	North Yuba	3.3	0.33
18020125020103	Canyon Creek-Morristown Ravine	North Yuba	4.3	0.40
18020125020104	Little Canyon Creek	North Yuba	3.8	0.45
18020125020302	North Yuba River-Lost Creek	North Yuba	3.2	0.38

HUC7	Watershed Name	River Basin	"Higher Risk Route" density (mi/sq. mi)	EMDS Erosion Risk
18020125020305	Willow Creek	North Yuba	3.2	0.45
18020125030202	East Fork Creek	Middle Yuba	3.5	0.44
18020125030301	Middle Yuba River-National Gulch	Middle Yuba	4.5	0.41
18020125030302	Wolf Creek	Middle Yuba	3.2	0.46
18020125030402	Oregon Creek-Miller Creek	Middle Yuba	4.3	0.40
18020125030403	Oregon Creek-Marion Creek	Middle Yuba	3.1	0.46
18020125030501	Upper Kanaka Creek	Middle Yuba	3.0	0.27
18020125030506	Lower Middle Yuba River	Middle Yuba	3.1	0.43
18020125040106	South Yuba River-Pierce Meadow	South Yuba	3.0	0.45
18020125040404	Canyon Creek-Texas Creek	South Yuba	2.9	0.46
18020125040405	Lower Canyon Creek-South Yuba River	South Yuba	3.7	0.45
18020125040501	Upper Poorman Creek	South Yuba	4.9	0.44
18020125040502	Lower Poorman Creek	South Yuba	3.4	0.44
18020125040601	South Yuba River-Jefferson Creek	South Yuba	3.2	0.42
18020126010101	Headwaters Bear River	Bear	3.4	0.43
18020126010102	Bear River-Stump Canyon	Bear	3.6	0.40
18020128010104	Middle Fork American River-Dolly Creek	American	4.2	0.40
18020128010106	Middle Fork American River-Chipmunk Creek	American	3.2	0.41
18020128010202	Lower Duncan Canyon	American	3.9	0.34
18020128030101	Screwauger Canyon	American	3.7	0.45
18020128030102	Deep Canyon	American	5.0	0.42
18020128030103	Secret Canyon	American	3.1	0.43
18020128030201	North Fork of Middle Fork American River-Bear Wallow	American	2.9	0.45
18020128030202	Grouse Creek	American	4.2	0.37
18020128040102	Volcano Canyon	American	3.1	0.36
18020128050302	Humbug Canyon	American	3.9	0.34
18020128050402	Upper East Fork North Fork of North Fork American River	American	3.1	0.47
18020128050405	North Fork of North Fork American River-Blue Canyon	American	2.8	0.44

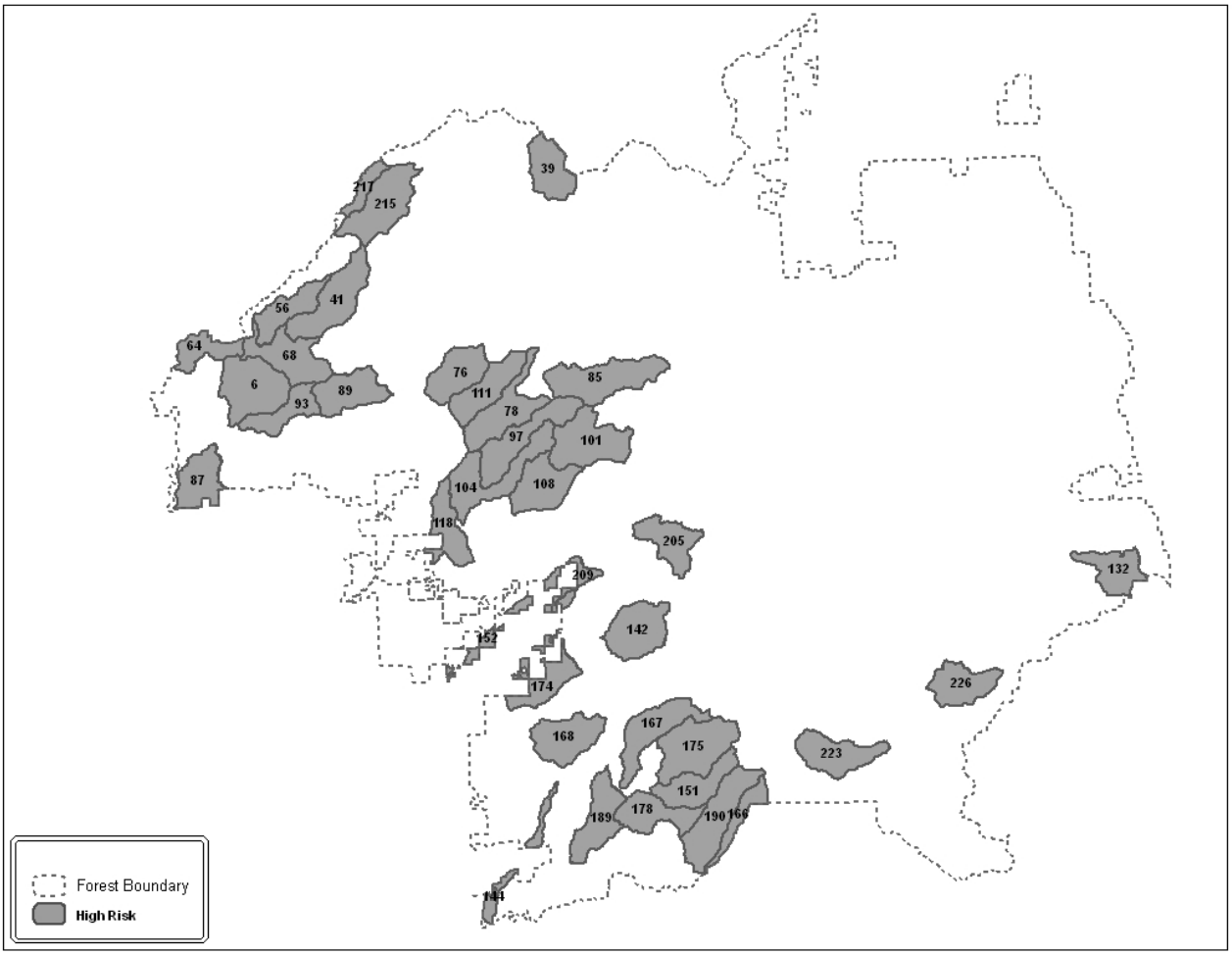

Figure 3.02-3. High Risk Watersheds based on EMDS Erosion Risk and density of "Higher Risk Routes"

Table 3.02-12 shows the average EMDS Erosion Risk rating and the existing "Higher Risk Route" density by major river basin. The potential erosion risks in the Truckee and Feather River basins are the lowest on the TNF. The Truckee River Basin has the second highest existing density of "Higher Risk Routes." The Bear River has the highest existing density of "Higher Risk Routes" and is in the higher potential EMDS Erosion Risk quartile. The Yuba River basin is in the highest EMDS Erosion Risk class, with the South Yuba having a slightly lower EMDS Erosion Risk than the rest of the basin. The existing density of "Higher Risk Routes" in the Yuba River Basin averages 2.6 miles/ square mile. The Middle Yuba has the highest density (2.8 mi/sq mi) and the North Yuba ha the lowest (2.5 mi/sq mi). The American River basin is in the highest EMDS Erosion Risk quartile. "Higher Risk Route" density averages 2.6 mi/sq mi. The Middle Fork American River has a density of 3.2 mi/sq mi and the North Fork American River has a density of 2.2 mi/sq mi.

Table 3.02-12. EMDS Erosion Risk rating and density of "Higher Risk Routes" by major river basin

River Basin	HUC 7 Acres	EMDS Erosion Risk (Risk Quartile)	Density of "Higher Risk Routes" (miles/sq. mi.)
Truckee	200,500	0.65 (Lowest)	3.7
Feather	112534.28	0.63 (Lower)	2.7
North Yuba	*229,995*	*0.39 (Highest)*	2.5
Middle Yuba	*126,370*	*0.44 (Highest)*	2.8
South Yuba	*170,886*	*0.46 (Higher)*	2.7
Subtotal Yuba	**527,252**	**0.42 (Highest)**	**2.6**
Bear	20,108	0.50 (Higher)	3.9
Middle Fork American	*146,533*	*0.42 (Highest)*	3.2
North Fork American	*133,107*	*0.44 (Highest)*	2.2
Subtotal American	**279,639**	**0.43 (Highest)**	**2.6**

Field Survey Green, Yellow Red (GYR) Motorized Trail Condition Ratings

Field surveys were completed for motorized trails using the GYR OHV Trail Condition Rating protocol. Stream crossings were evaluated using the GYR protocol and R-5 Best Management Practices Evaluation Protocol (BMPEP). The GYR protocol uses factors, such as, water control, erosion off-trail, tread wear, tread width, and crossing data to rate route conditions. Motorized trails were broken into segments in the field based on site conditions. The GYR Trail condition rating form was used to rate each motorized trail segment. A motorized trail segment was defined as a portion of trail that has similar resource impacts. The green condition class means that motorized trails are generally in functional order with minimal resource issues, but may need maintenance of drainage structures. The yellow condition class means motorized trails are still useable but maintenance needs to prioritized for these sections. The red condition class means the trail condition is serious enough to be brought to the immediate attention of management. Trails rated red are to be repaired or closed within six months. The R-5 BMPEP protocol looks at erosion on route, sediment movement on route and off, route/stream crossings, etc. The surveys show that many trail systems have some sort soil erosion or watershed impacts (some green condition class trails have erosion, but the erosion is not leaving the trail). Many of these trails show impacts caused by wet season use (e.g., rutting, widening of routes around wet spots, channelized water movement, etc.). Table 3.02-13 shows that approximately five percent of the inventoried routes have some resource impacts; 11 percent are overgrown; and 85 percent are in an acceptable condition (some of these routes need drainage structure reconstruction/maintenance).

Table 3.02-13. Percent of Inventoried Routes by Route Condition Class.

Inventoried Routes	Green Condition Class	Yellow Condition Class	Red Condition Class	Overgrown Route
Percent In Condition Class	85%	4%	1%	11%

Other Results from Green, Yellow and Red Route Condition Ratings

Approximately half of the motorized trails un-authorized for motorized use that were inventoried had erosion identified as an issue somewhere along the trail. Ten percent of the trails inventoried had wetland issues (e.g., are within wetland buffers or could impact wetland hydrology). Twenty percent of the trails were incised up to 6 inches (two routes up to 12 inches).

Sixty seven percent of the trails inventoried had no stream crossings. The thirty three percent of inventoried trails that did have crossings had a total of 40 stream crossings. Twenty-three of the inventoried crossings are in a "green" condition (indicating an acceptable level of resource impacts). Fourteen of the inventoried crossings are in a "yellow" condition (indicating that the crossing is contributing some level of sediment to the adjacent stream) and need some type of drainage control work. Three crossings were rated as red, indicating that the crossing needs repair. Two crossings with failed culverts on TKS-6 and one crossing on SV-P15 are in a red condition. Appropriate mitigation measures required to allow these motorized trails to be added to the National Forest Transportation System (NFTS) are specified in Appendix A (Road Cards).

Most of the impacts seen in surveys for this project can be mitigated, although some of the mitigations could be quite expensive. Unless survey information indicated otherwise, user created trails are assumed to be eroded and in poor condition, or have a high risk of accelerated erosion because they were not designed/located properly and lack drainage.

Existing Seasonal Closures

The condition of native surface roads and motorized trails ("Higher Risk Routes") can quickly decline during winter or wet weather use due to rutting. Rutting is the process where soils are displaced and deform to the shape of the tire tracks that make their way through saturated soils. Rutting makes the route more susceptible to damage in the spring as the area begins to dry out. Rutting can occur if traffic enters the area before the soils have sufficient drying time. To some extent wet season damage can be influenced by soil type, but all soil types are susceptible to wet season use. "Higher Risk Routes" are most susceptible to damage by motor vehicles when wet. As noted above, 20 percent of these routes inventoried had trail incision. One of the primary causes of route incision was use when soils were saturated. "Higher Risk Route" use when soils were saturated and soil strength was low is also a contributing factor in the inventoried routes with erosion. Currently there are 3,388.7 miles of National Forest Transportation System (NFTS) native surface roads and motorized trails that are open year round. Two hundred and thirty one miles of roads and motorized trails are closed seasonally (primarily wildlife closures). The areas that are seasonally closed for wildlife also function to reduce wet season damage to routes, soils, and watershed resources.

Existing Cross Country Travel

As discussed above, many user-created motorized trails were not constructed to National Forest Transportation System (NFTS) standards. These trails are generally not maintained and are higher risk routes in terms of erosion and water quality risks. Generally, the more un-maintained, motorized trails un-authorized for motorized use there are in a watershed, the higher the risk to soil and watershed resources. Cross-country travel has resulted in 1,389 miles of motorized trails un-authorized for motorized use on

the TNF. As discussed above in the inventory results section, some routes are stable and others need maintenance/mitigation.

Soil Environmental Consequences

This analysis is focused on the effects of three actions: (1) the prohibition of cross-country travel, (2) additions to the National Forest Transportation System (NFTS), and (3) changes to the class of vehicle and/or season of use on the NFTS.

Cross-country motorized vehicle travel increases the amount of native surface motorized trails un-authorized for motorized use on the Tahoe National Forest. The motorized trails un-authorized for motorized use being considered for addition to the NFTS are native surface trails that currently exist on the ground, so the hydrologic footprint of the trails already exists. The primary change considered in this analysis are the prohibition of cross country travel, changes in miles of motorized use on existing roads and trails and changes in class of vehicle or season of use. Therefore, the effects of route designation on soil and watershed resources focuses on native surface NFTS roads and motorized trails, motorized trails un-authorized for motorized use and non-private roads (with native surface) within the National Forest boundary. These are the routes where effects on soil and watershed resources are most likely to occur. Surfaced roads are not included because generally soil loss by erosion is very low on them.

Direct and Indirect Effects to Soil Resources

Direct impacts to soils and adjacent watersheds and stream courses that result from this project are limited. There are no new ground disturbing activities proposed with this project. The roads and trails being evaluated in this analysis already exist on the ground, but may require upgrading to NFTS standards as well as periodic maintenance. They are compacted and generally lack vegetation. Runoff from the surface is collected and discharged as potentially erosive flows at points below the road. Some are eroded or causing erosion, others are stable and are not causing any negative resource impacts. From the standpoint of soil productivity and growing vegetation, these routes are already non-productive. Therefore, on these roads and trails the potential effects on soil and watershed resources are related to sustaining road or trail function, protecting adjacent soils from runoff and gully erosion, protecting water quality, or restoring the routes to a productive state. It should be noted that most roads and motorized trails on the Tahoe National Forest have some site specific risk to soil and water resources. Many of these risks can be mitigated.

Prohibiting motorized use on native surface roads and trails may result in less erosion to the extent that recurrent disturbance of the soil surface by motor vehicle traffic is the primary cause of erosion. In many situations, however, erosion and subsequent sediment delivery to water bodies is the result of a combination of factors that include motorized use, as well as, season of use, a lack of drainage, inadequate maintenance, and poor trail design or location. If non-motorized trail users continue to use the roads and trails some erosion and sediment transport could continue to occur.

The primary concern or effect of this project on the soil resource is the potential for soil erosion and subsequent effects on soil productivity or the ability of the soil to produce vegetation. Secondary effects from erosion are the loss of soil depth, infiltration capacity and permeability or in other words, a

reduction in the soil hydrologic function**.** Subsequent sediment deposition can damage terrestrial plants and aquatic organisms. High levels of sediment deposition can also reduce the utility of facilities for water storage and diversion and hydroelectric production. Activities in and near stream channels have the greatest potential for altering sediment deliver and storage as well as channel form. Because this document covers existing wheel tracks, the direct impacts to soil productivity, hydrologic function, and buffering capacity have already taken place.

The erosion that may occur from the trail or road surface is a concern regarding loss or degradation of the facility, but not a particular concern for the soil resource, because the travel way surface is a dedicated use and no longer dedicated to growing vegetation. The effects analysis for the soil resource will focus on the risk of soil erosion from trail/road runoff water to the soil adjacent to or down slope from the route. Erosion and sediment generated by the trail or road surface may be a concern to water quality if there is the potential for its delivery to a drainage feature.

The most serious impacts of roads occur where roads are in close proximity to streams or wetlands (See Riparian Conservation Objective Analysis, Appendix R). Stream crossings have direct effects on the channel and local sediment regime. The basic problem comes down to disturbing the stream bed, banks, floodplain, and terraces of the stream. Streamflow diversions at road-stream crossings can result in significant erosion of road surfaces and hillslopes (for example, Best, 1995). Because the crossing is coincident with the channel, there is little opportunity to buffer any impacts of the crossing. Also, roadside ditches near the crossing drain directly into the stream, often contributing sediment to the stream. Although any stream crossing can have some impact on the channel, careful engineering, construction, and maintenance can limit the severity of the impacts.

All alternatives would have indirect effects on soil and watershed resources, but they vary by alternative. Route designation would indirectly affect soil erosion and subsequent sediment delivery to streams to the extent that activities resulting from designation or closure (1) affect the amount of *traffic and season of use* on routes; (2) designate routes in areas with highly erosive soils; (3) affect levels of *maintenance*; and (4) affect the potential for *recovery* and restoration.

None of the proposed alternatives includes decommissioning or restoration for motorized trails not designated for motorized use. A recent field study (Poff, 2005) suggests that providing adequate drainage - along with effective closure - is a critical element in effectively restoring OHV-damaged areas. Without adequate drainage, many trails would continue to erode even if they could be effectively closed. Some motorized trails not designated for motorized would most likely start to recover from the edges and slowly close in to some extent. Others would be used by other users (mountain bikes, equestrian, and hikers) and would probably remain on the ground in some form. If use of the route ceases, in the short term (five years or less), some native vegetation may establish on routes that have little soil compaction. It is likely that routes with moderate to heavy soil compaction (within the wheel tracks) will take more than five years to recover vegetation (develop native forb or shrub cover). Some stable, moderately used trails will recover within twenty years. In some cases, native shrubs growing along the sides of the trail will lean into the trail. However, the bare, compacted soils established by motorized vehicle use will remain un-vegetated and subject to erosion. The most severely disturbed sites are not likely to recover

without some type of active restoration. The disposition of motorized trails un-authorized for motorized use that are not added to the system will be dealt with in future NEPA documents.

The type of trail to be rehabilitated affects the potential for recovery without treatment. Without treatment, National Forest Transportation System (NFTS) Maintenance Level 1 and temporary roads would recover very slowly. Most fill slopes and cut slopes would re-vegetate in time, but road prisms are compacted in lifts and do not recover without a physical treatment to break up the compaction. Generally all roads and trails can be assumed to be compacted to the point where natural recovery would take decades. NFTS Maintenance Level 1 and temporary roads also alter natural slope drainage and concentrate runoff. Roads and trails in poor condition are unlikely to improve on their own. On most roads, restoration to a fully productive state would require decommissioning.

By contrast, user created motorized trails are not constructed and have the potential to recover faster. Compaction is not as deep, less topsoil has been displaced, and natural soil profiles have not been disturbed. All this is quite variable, mostly depending upon side slope gradients. It doesn't take many trips to physically displace the top soil. Generally all roads and motorized trails can be assumed to be compacted to the point where natural recovery would take decades. However, actively eroding user created motorized trails will continue to erode without adequate drainage.

User created motorized trails that occur on shallow soils and lack forest or brush cover would be more difficult to close effectively and would recover very slowly.

Projected Effects on Soils on the Tahoe National Forest

The inherent risk of erosion of the soils within the Tahoe National Forest (TNF) was assessed using the Ecosystem Management Decision Support Model (EMDS Model. See Appendix B, Modeling). The parameters used in the EMDS model to assess soil erosion risk were 1) presence of geo-debris slides, 2) soil erodibility, 3) slope, and 4) precipitation. "Higher Risk Route" (native surface roads and motorized trails) density and EMDS Erosion Risk are used to asses the cumulative effects of this project on soils on the TNF.

Projected Soil Risk Assessment Based on Density of "Higher Risk Routes" in the Watershed

"Higher Risk Routes" were previously defined as native surface roads and motorized trails. The density of "Higher Risk Routes" by major river basin by alternative is shown in Table 3.02-14. The No Action alternative (Alternative 1) has the highest density of "Higher Risk Routes" used by motorized vehicles. All action alternatives would result in lower densities of "Higher Risk Routes" than in the existing condition (Alt. 1). Alternatives 3, 4 and 7 would have the lowest route density of "Higher Risk Routes." Alternative 6 densities would be slightly higher than alternatives 3, 4 and 7. Alternatives 2 and 5 would result in the highest density of "Higher Risk Routes."

Table 3.02-14. Density of "Higher Risk Routes" by major river basin and alterative (mi, /sq. mi.)

River Basin	HUC 7 Watershed Acres	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Truckee River	200,500	3.7	3.2	3.0	3.0	3.3	3.1	3.0
Feather River	112,534.28	2.7	2.3	2.0	2.0	2.3	2.2	2.0
North Yuba River	*229,995*	2.5	1.9	1.5	1.5	2.1	1.6	1.5
Middle Yuba River	*126,370*	2.8	2.2	2.1	2.1	2.3	2.2	2.1
South Yuba River	*170,886*	2.7	2.3	2.0	2.0	2.4	2.2	2.0
Subtotal Yuba	**527,252**	**2.6**	**2.1**	**1.8**	**1.8**	**2.2**	**2.0**	**1.8**
Bear River	20,108	3.9	3.3	2.8	2.9	3.3	3.3	2.9
North Fork American River	*146,533*	3.2	2.6	2.3	2.3	2.9	2.5	2.3
Middle Fork American River	*133,107*	2.2	1.7	1.6	1.6	1.8	1.7	1.6
Subtotal American	**279,639**	**2.6**	**2.1**	**1.9**	**1.9**	**2.3**	**2.1**	**1.9**
TNF Total		**2.8**	**2.3**	**2.1**	**2.1**	**2.5**	**2.2**	**2.1**

The existing "Higher Risk Routes" density by HUC7 watershed was separated into quartiles. These groupings are 0-1.9, 2.0-2.7, 2.8-3.7, and more than 3.8 mi/sq mi of "Higher Risk Routes" per HUC7 watershed. The highest density category represents the highest risk to the soil and watershed resources and was used in conjunction with the EMDS Erosion Risk rating to identify those HUC7 watersheds on the TNF with the highest risk of negative effects due to motorized travel. The following table shows the percent of HUC7 watersheds on Tahoe National Forest by "Higher Risk Route" density and EMDS Erosion Risk class.

Table 3.02-15. Percent of HUC7 Watersheds on Tahoe National Forest by density of "Higher Risk Routes" and EMDS Erosion Risk class

Route Density Mi/Sq Mi by HUC7				
EMDS Risk Class	**0-1.9**	**2.0-2.7**	**2.8-3.5**	**3.6-8.6**
Lowest	2%	4%	7%	9%
Lower	6%	5%	9%	5%
Higher	7%	7%	7%	3%
Highest	10%	9%	3%	4%

The shaded cells in Table 3.02-15 represent the HUC7 watersheds on the TNF with the highest potential erosion risk to soil and watershed resources from motorized travel on "Higher Risk Routes." These higher risk watersheds were used in the focused assessment discussed in the next section.

"Higher Risk Route" density

"Higher Risk Route" densities will be used to track changes in effects of this project proposal. Table 3.02-15 shows the density of "Higher Risk Routes" by Alternative. The Truckee River Basin has the second highest existing "Higher Risk Route" density (3.7 mi/sq mi). The Bear River watershed has the highest existing "Higher Risk Route" density (3.9 mi/sq/mi). The existing "Higher Risk Route" density in the Yuba River Basin averages 2.6 miles/ square mile. The Middle Yuba has the highest density (2.8 mi/sq mi) and the North Yuba has the lowest (2.5 mi/sq mi). The American River basin has an existing "Higher Risk Route" density of 2.6 mi/sq mi. The Middle Fork American River has a density of 3.2 mi/sq mi and the North Fork American River has a density of 2.2 mi/sq mi.

Table 3.02-16 shows the density of "Higher Risk Routes" by major river basin by alternative. The No Action alternative (Alternative 1) has the highest densities of "Higher Risk Routes" used by motorized vehicles. All action alternatives would result in lower densities of "Higher Risk Routes" than in the existing condition (Alt. 1). Alternatives 3, 4 and 7 would have the lowest route density of motorized use on "Higher Risk Routes." Alternative 6 densities would be slightly higher than alternatives 3, 4 and 7. Of the action alternatives, Alternatives 2 and 5 would result in the highest route densities.

Additions of motorized trails to the National Forest Transportation System (NFTS) would have minimal effects to soil resources, because these trails are already part of the disturbance footprint. Appendix A, Road Cards, have mitigations that are needed to add the motorized trails to the NFTS with minimal impacts to soil resources. NFTS motorized trails have standards that need to be met and can be maintained.

Table 3.02-16. Density of ""Higher Risk Routes"" by major river basin by alterative (mi./sq. mi.)

River Basin	Basin Acres	EMDS Erosion Risk (risk quartile)	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	200,500	0.65 (Lowest)	3.7	3.2	3.0	3.0	3.3	3.1	3.0
Feather River	112,534	0.63 (Lower)	2.7	2.3	2.0	2.0	2.3	2.2	2.0
North Yuba River	*229,995*	*0.39 (Highest)*	2.5	1.9	1.5	1.5	2.1	1.6	1.5
Middle Yuba River	*126,370*	*0.44 (Highest)*	2.8	2.2	2.1	2.1	2.3	2.2	2.1
South Yuba River	*170,886*	*0.46 (Higher)*	2.7	2.3	2.0	2.0	2.4	2.2	2.0
Subtotal Yuba	**527,252**	**0.42 (Highest)**	**2.6**	**2.1**	**1.8**	**1.8**	**2.2**	**2.0**	**1.8**
Bear River	20,108	0.50 (Higher)	3.9	3.3	2.8	2.9	3.3	3.3	2.9
North Fork American River	*146,533*	*0.42 (Highest)*	3.2	2.6	2.3	2.3	2.9	2.5	2.3
Middle Fork American River	*133,107*	*0.44 (Highest)*	2.2	1.7	1.6	1.6	1.8	1.7	1.6
Subtotal American	**279,639**	**0.43 (Highest)**	**2.6**	**2.1**	**1.9**	**1.9**	**2.3**	**2.1**	**1.9**
TNF Total	**1,946,924**	**0.49 (Higher)**	**2.8**	**2.3**	**2.1**	**2.1**	**2.5**	**2.2**	**2.1**

"Higher Risk Route" density

Prohibition on Cross Country Travel: All of the action alternatives prohibit cross country travel. This prohibition will reduce the density of "Higher Risk Routes" in all watersheds across the forest. It would also prevent the proliferation of any new motorized trails un-authorized for motorized use which would increase the density of "Higher Risk Routes." The impacts on the density of "Higher Risk Routes" resulting from the prohibition on cross country travel are displayed in Table 3.02-17. All action alternatives would decrease the density of "Higher Risk Routes" by 1.1 miles per square mile or less. The largest decreases in all action alternatives are found in the North Yuba River and Bear River. Decreases in "Higher Risk Route" density average 0.8 miles/square mile in the Feather and Yuba River Basins and 0.6 miles/square mile in the American River Basin. Prohibition of cross country travel would also decrease the average "Higher Risk Route" density cross the Tahoe National Forest by 0.5 mi/ square mile.

Table 3.02-17. Changes in density of "Higher Risk Routes" by River Basin due to the prohibition of cross country travel

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	200,500	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Feather River	112,534	0.0	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
North Yuba River	*229,995*	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Middle Yuba River	*126,370*	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
South Yuba River	*170,886*	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Subtotal Yuba	**527,252**	**0.0**	**-0.8**	**-0.8**	**-0.8**	**-0.8**	**-0.8**	**-0.8**
Bear River	20,108	0.0	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
North Fork American River	*146,533*	0.0	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Middle Fork American River	*133,107*	0.0	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Subtotal American	**279,639**	**0.0**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**
TNF Total	**1,946,924**	0.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5

Motorized Trail Additions to the National Forest Transportation System (NFTS): All of the motorized trail additions to the NFTS being considered in the alternatives are native surface trails which fall under the "Higher Risk Route" category. There are no motorized trail additions to the NFTS under Alternative 1 and 3. The other action alternatives would add between 31.2 and 282.8 miles of native surface, motorized trails to the NFTS. These additions to the system would have minimal effects to soil resources, because these motorized trails are already part of the disturbance footprint and would be managed according to TNF trail and resource standards. Appendix A, Road Cards, have mitigations that are needed to add these motorized trails to the NFTS with minimal impacts to soil resources. The impacts on the density of "Higher Risk Routes" resulting from the additions to NFTS are displayed in Table 3.02-18. Alternatives 1 and 3 would result in no change in the density of ""Higher Risk Routes"." Alternatives 4 and 7 would add 0.1 mi/square mile of "Higher Risk Routes" in the Bear River basin. Alternative 6 would add 0.1-0.2 miles/square mile of "Higher Risk Routes" in all river basins. Alternative 2 would add 0.1-0.3 miles/square mile of "Higher Risk Routes" in all river basins. Alternative 5 would add 0.1-0.6 miles/square mile of "Higher Risk Routes" in all river basins.

Table 3.02-18. Changes in the density of "Higher Risk Routes" due to motorized trail additions to the National Forest Transportation System (NFTS) (mi./sq. mi.)

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	200,500	0.0	0.1	0.0	0.0	0.2	0.1	0.0
Feather River	112,534	0.0	0.1	0.0	0.0	0.2	0.2	0.0
North Yuba River	*229,995*	0.0	0.3	0.0	0.0	0.6	0.1	0.0
Middle Yuba River	*126,370*	0.0	0.1	0.0	0.0	0.1	0.1	0.0
South Yuba River	*170,886*	0.0	0.2	0.0	0.0	0.3	0.0	0.0
Subtotal Yuba	**527,252**	**0.0**	**0.2**	**0.0**	**0.0**	**0.4**	**0.1**	**0.0**
Bear River	20,108	0.0	0.2	0.0	0.1	0.3	0.2	0.1
North Fork American River	*146,533*	0.0	0.1	0.0	0.0	0.3	0.1	0.0
Middle Fork American River	*133,107*	0.0	0.1	0.0	0.0	0.2	0.0	0.0
Subtotal American	**279,639**	**0.0**	**0.1**	**0.0**	**0.0**	**0.2**	**0.1**	**0.0**
TNF Total	**1,946,924**	**0.0**	**0.1**	**0.0**	**0.0**	**0.2**	**0.1**	**0.0**

Changes to Class of Vehicles and/or Season of Use: Changing the class of vehicle allowed to use a particular National Forest Transportation System (NFTS) road could change the impacts to soil and watershed resources due to the change in road surface. Therefore, these roads are considered "Higher Risk Routes" even though they already have "hardened" surfaces that lack vegetation. It is likely that direct impacts to soil and watershed resources occurred when the road was constructed. Impacts may still be occurring if the road is collecting and concentrating overland flow of water and increasing erosion rates. These indirect and cumulative impacts would continue regardless of the type of vehicle using the route. When the maintenance level of a particular route changes (the maintenance level does not always change when class of vehicle changes), the risk of erosion can increase. However, all roads would be maintained for resource needs no matter what maintenance level.

Native surface roads and motorized trails ("Higher Risk Routes") are most susceptible to damage by motor vehicles when wet. The condition of "Higher Risk Routes" can quickly decline during winter or wet weather use due to rutting. Wet season use of ""Higher Risk Routes"" often leaves ruts which channel water and increase the erosive power of that water, this can lead to increased erosion both on the trail and adjacent to the trail. Many of the impacts found during field surveys were caused by wet season use of routes.

Implementing seasonal closures would reduce rutting and subsequent channeling of surface water runoff. Seasonal closures would decrease the potential effects of motorized vehicle use on "Higher Risk Routes" by decreasing erosion and sedimentation. The benefits of seasonal closures would be equal to the prohibition on cross country travel and would by far exceed adding between 31.2 and 282.8 miles of "Higher Risk Routes" (with an existing disturbance footprint) into the NFTS.

Alternatives 1, 2, 3 and 7 all have the vast majority of "Higher Risk Routes" open year round and, therefore, have a higher risk to soil resources. The wet weather seasonal closures imposed in Alternatives 4, 5 and 6 would result in all of the "Higher Risk Routes" being closed to motorized use during the wettest time of the year, thus greatly reducing potential negative impacts to soil resources and to water

quality. Table 3.02-19 displays changes in the density of native surface roads and trails ("Higher Risk Routes") due to change in class of vehicles by alternative. Alternatives 1, 3, 4, and 7 would result in no change in the density of "Higher Risk Routes." Alternatives 2, 5 and 6 would result in adding 0.1-0.2 miles/square mile of "Higher Risk Routes" in all river basins.

Table 3.02-19. Changes in the density of "Higher Risk Routes" due to changes in class of vehicles

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	200,500	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Feather River	112534	0.0	0.2	0.0	0.0	0.2	0.2	0.0
North Yuba River	*229,995*	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Middle Yuba River	*126,370*	0.0	0.1	0.0	0.0	0.1	0.1	0.0
South Yuba River	*170,886*	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Subtotal Yuba	**527,252**	**0.0**	**0.1**	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**
Bear River	20,108	0.0	0.2	0.0	0.0	-0.2	0.2	0.0
North Fork American River	*146,533*	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Middle Fork American River	*133,107*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal American	**279,639**	**0.0**	**0.1**	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**
TNF Total	**1,946,924**	**0.0**	**0.1**	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**

Cumulative Effect: This project would not change the footprint of current wheel-tracks on the Tahoe National Forest. It would decide which "Higher Risk Routes" are authorized for motorized use. All action alternatives would result in a net reduction in the density of "Higher Risk Routes" in all river basins. All action alternatives would result in a slight decrease in the risk of negative cumulative effects to watersheds. The cumulative impacts on the density of "Higher Risk Routes" resulting from this project are displayed in Table 3.02-20. Alternative 1 represents the existing condition. Alternatives 2 through 7 represent the density of "Higher Risk Routes after twenty years (when routes not designated for motorized use would have recovered hydrologically). Alternatives 3, 4, and 7 have the same cumulative reductions in the density of "Higher Risk Routes" after 20 years. Alternative 6 has a larger density of "Higher Risk Routes" after the same period. The seasonal closures proposed in Alternatives 4, 5 and 6 would decrease the risk of erosion on and adjacent to "Higher Risk Routes" by reducing the rutting and channeling of surface water flow.

Table 3.02-20. "Higher Risk Route" density after cumulative effects of all proposed actions (year 20)

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	200,500	3.7	3.2	3.0	3.0	3.3	3.1	3.0
Feather River	112534	2.7	2.3	2.0	2.0	2.3	2.2	2.0
North Yuba River	*229,995*	2.5	1.9	1.5	1.5	2.1	1.6	1.5
Middle Yuba River	*126,370*	2.8	2.2	2.1	2.1	2.3	2.2	2.1
South Yuba River	*170,886*	2.7	2.3	2.0	2.0	2.4	2.2	2.0
Subtotal Yuba	**527,252**	**2.6**	**2.1**	**1.8**	**1.8**	**2.2**	**2.0**	**1.8**
Bear River	20,108	3.9	3.3	2.8	2.9	3.3	3.3	2.9
North Fork American River	*146,533*	2.4	2.0	1.8	1.8	2.2	1.9	1.8
Middle Fork American River	*133,107*	2.1	1.7	1.6	1.6	1.8	1.7	1.6
Subtotal American	**279,639**	**2.3**	**1.9**	**1.7**	**1.7**	**2.0**	**1.8**	**1.7**
TNF Total	**1,946,924**	**2.8**	**2.3**	**2.0**	**2.1**	**2.4**	**2.2**	**2.1**

Projected Cumulative Effects on Soils

The cumulative effects on soils have been analyzed at several scales: HUC7 watershed, River Basin, and Forest level. The cumulative effects analysis presented here is for the whole geographic area of the Tahoe National Forest. Short-term effects take place within 1-5 years. Long-term effects take 20-30 years. They represent the additive, incremental effects of past, present, and reasonably foreseeable future activities, actions, and decisions on the soil resource. The current condition of the roads and trails, the number of private roads, and the soil damage at primitive campsites are all a reflection of past and current management activities.

Management actions affect traffic, user-created motorized trails, maintenance, the effectiveness of closures, and recovery of closed routes. Cumulatively, these actions influence tread wear and soil erosion. The maintenance backlog has allowed drainage structures to deteriorate, putting some native surface roads at a higher risk of failure under a major storm event. National Forest funding for OHV trail maintenance has been inadequate, and grants for trail maintenance from the State OHV Commission have been inconsistent resulting in a backlog of deferred maintenance needs. National Forest appropriated funding cannot be spent to maintain roads and motorized trails that are not part of the National Forest Transportation System (NFTS). The cumulative effect of these actions has been some erosion and deterioration of roads and motorized trails and an increased risk of failures.

Fuels treatments open up stands, create fire lines and temporary roads, and generally create opportunities for unauthorized motorized use. This has been and would continue to be a problem in urban-interface areas and in other areas with easy access to the Forest. The foothills-Forest-urban interface is one of the most rapidly growing areas in the State, and OHV registrations in this area are increasing at an even faster rate (Widell, 2002). There is an increasing demand for motorized recreation, especially on ATVs. All of this increasing demand will increase use levels on NFTS roads and motorized trails and also increase the pressure to create non-FS routes.

This analysis includes NFTS roads and motorized trails as well as motorized trails un-authorized for motorized use. Projects listed in Appendix Q (Wildlife Cumulative Effects) have been incorporated into

this analysis. Most fuels and vegetation management projects include road maintenance as a part of the proposal. Some projects include decommissioning of unnecessary routes. Projects listed in Chapter 3.00 as reasonably foreseeable actions have also been considered in this analysis.

This project does not propose or change the current road or trail-related disturbance footprint. Although route designation would have very limited direct effects on watersheds, route designation would indirectly (1) affect the amount, type and season of use (motorized vs. non-motorized) of *traffic* on routes; (2) allow or prohibit use of routes by motorized vehicles in areas of highly erosive soils; (3) affect maintenance levels; and (4) affect the potential for recovery and restoration.

Route designation identified in the project record those roads and trails that need reroutes or restoration. Reroutes would require some new construction that would cause soil disturbance and a temporary loss of vegetation. Restoration of damaged areas and road decommissioning would also cause soil disturbance. To the extent these actions are implemented in the future, the long term effects of these actions would be reduced soil erosion.

As discussed above, over a 5-30 year period vegetative recovery would decrease the erosion impacts of some trails not added to the NFTS. Even if these trails are used for non-motorized purposed, there most likely would be some decrease in erosion and sediment as the route closes in from the sides and compaction of the tread decreases.

The cumulative effect of the proposed actions would be to decrease the density of “Higher Risk Routes” on soils on the TNF. Table 3.02-21 shows the proposed decrease in the density of “Higher Risk Routes” by major river basin. The density of “Higher Risk Routes” would decrease by 0.3-0.6 miles/square mile in the Truckee and Feather River basins; 0.3-.08 in the Yuba and American River basins; and 0.6-1.0 in the Bear River basin. The smallest decreases are associated with Alternative 5 and the largest with Alternative 3. Table 3.02-20 shows the percent of the acres on the Tahoe National Forest by the density of “Higher Risk Routes” by alternative.

Table 3.02-21. Density of “Higher Risk Routes” by Alternative (Percent of Acres on Tahoe National Forest)

“Higher Risk Route” density	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
0-1.9 (mi./sq.mi.)	24.5%	41.7%	52.5%	50.5%	36.8%	44.1%	50.5%
2.0-2.7(mi./sq.mi.)	26.0%	29.4%	25.0%	23.0%	30.4%	28.4%	26.5%
2.8-3.5(mi./sq.mi.)	23.5%	14.7%	13.2%	15.7%	14.7%	14.2%	12.3%
3.6-8.6(mi./sq.mi.)	26.0%	14.2%	9.8%	10.8%	17.6%	13.2%	10.8%

Soil Risk Assessment Based on EMDS Erosion Risk and density of “Higher Risk Routes” in HUC 7 watersheds

This analysis focuses on “Higher Risk Routes” defined as native surface roads and motorized trails. Not incorporated in the focused analysis were surfaced roads, non-motorized trails, over-snow routes, private roads and county and state roads because these tend to be more stable. To do this analysis, watersheds were separated into quartiles based on the density of miles open for motorized use of “Higher Risk Routes” as described earlier. These categories are shown in Table 3.02-22 below:

Table 3.02-22. "Higher Risk Route" density categories (mi./sq. mi.)

Level of Risk Category	"Higher Risk Route" density (mi./sq. mi.)
Highest	3.6 Plus
High Risk	2.8 to 3.5
Low Risk	2.0 to 2.7
Lowest Risk	0 to 1.9

Table 3.02-23 lists the HUC7 watersheds within the highest level of risk category based on the density of "Higher Risk Routes." Two of the HUC7 watersheds identified in the highest level of risk category are on the east-side of the TNF, Squaw Creek and East Martis Creek. The rest are on the west-side of the TNF in the North Yuba (8); Middle Yuba (7) ; South Yuba (7)), Bear (2), Middle Fork American (6); or North Fork American (5) basins. Two watersheds (Squaw Creek and East Martis Creek) show very little to no change through all alternatives. These two watersheds are primarily private and have no proposed motorized trail additions to the National Forest Transportation System (NFTS) or change in class vehicles in this project. All other action alternatives would decrease the density of "Higher Risk Routes" in the watersheds with the highest potential erosion risk except for four Westside watersheds in Alternative 5. Alternative 5 would have "Higher Risk Route" densities equal to or more than the existing condition in the Cherokee Creek, East Fork Creek, Deep Canyon and Grouse Creek HUC7 watersheds.

Table 3.02-23. Density of "Higher Risk Routes" by alternative for high risk HUC7 watersheds

HUC7	HUC7 Name	Landscape Erosion Risk TV	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
16050102010102	Squaw Creek	0.37	5.1	5.1	5.1	5.1	5.1	5.1	5.1
16050102010404	**East Martis Creek**	**0.06**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**
18020125010404	Upper Pauley Creek	0.41	2.8	2.5	2.2	2.2	2.6	2.4	2.3
18020125010505	Fiddle Creek	0.34	4.7	2.3	2.3	2.3	4.6	2.4	2.3
18020125010506	Cherokee Creek	0.39	4.8	0.9	0.7	0.7	5.1	2.0	0.7
18020125010507	North Yuba River-Indian Creek	0.33	3.3	2.1	2.0	2.0	2.3	2.1	2.0
18020125020103	Canyon Creek-Morristown Ravine	0.40	4.3	1.9	1.9	1.9	4.3	1.9	1.9
18020125020104	Little Canyon Creek	0.45	3.8	1.9	1.9	1.9	3.6	1.9	1.9
18020125020302	North Yuba River-Lost Creek	0.38	3.2	2.3	2.3	2.3	2.6	2.3	2.3
18020125020305	Willow Creek	0.45	3.2	2.2	2.1	2.2	2.4	2.2	2.1
18020125030202	East Fork Creek	0.44	3.6	3.3	3.1	3.1	3.3	3.3	3.1
18020125030301	Middle Yuba River-National Gulch	0.41	4.5	3.5	3.5	3.5	3.6	3.5	3.5
18020125030302	Wolf Creek	0.46	3.2	2.5	2.5	2.5	2.6	2.5	2.5
18020125030402	Oregon Creek-Miller Creek	0.40	4.3	3.3	3.3	3.3	3.5	3.3	3.3
18020125030403	Oregon Creek-Marion Creek	0.46	3.1	2.1	2.1	2.1	2.5	2.1	2.1
18020125030501	Upper Kanaka Creek	0.27	3.0	1.6	1.6	1.6	1.8	1.6	1.6
18020125030506	Lower Middle Yuba River	0.43	3.1	1.6	1.6	1.6	1.9	1.6	1.6
18020125040105	Rattlesnake Creek	0.40	3.2	2.9	2.8	2.8	2.9	2.9	2.8
18020125040106	South Yuba River-Pierce Meadow	0.45	3.0	2.4	2.3	2.3	2.4	2.4	2.3
18020125040404	Canyon Creek-Texas Creek	0.46	3.0	2.4	2.3	2.3	2.4	2.4	2.3

HUC7	HUC7 Name	Landscape Erosion Risk TV	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
18020125040405	Lower Canyon Creek-South Yuba River	0.45	3.7	2.7	2.7	2.7	2.9	2.7	2.7
18020125040501	Upper Poorman Creek	0.44	4.9	3.9	3.9	3.9	4.2	3.9	3.9
18020125040502	Lower Poorman Creek	0.44	3.4	2.7	2.7	2.7	2.8	2.7	2.7
18020125040601	South Yuba River-Jefferson Creek	0.42	3.2	2.5	2.5	2.5	2.5	2.5	2.5
18020126010101	Headwaters Bear River	0.43	3.3	1.6	1.6	1.6	2.1	1.6	1.6
18020128010104	Middle Fork American River-Dolly Creek	0.40	4.2	3.3	3.3	3.3	4.1	3.3	3.3
18020128010106	Middle Fork American River-Chipmunk Creek	0.41	3.2	2.6	1.4	1.4	2.6	2.5	1.4
18020128010202	Lower Duncan Canyon	0.34	3.9	3.0	2.9	2.9	3.3	2.9	2.9
18020128020501	Screwauger Canyon	0.45	7.5	3.9	3.9	3.9	7.5	3.9	3.9
18020128030101	Deep Canyon	0.42	3.7	2.8	2.8	2.8	3.2	2.8	2.8
18020128030102	Secret Canyon	0.43	5.0	4.1	4.1	4.1	5.0	4.1	4.1
18020128030104	North Fork of Middle Fork American River-Bear Wallow	0.45	3.8	3.2	3.2	3.2	3.4	3.2	3.2
18020128030201	Grouse Creek	0.37	2.9	1.7	1.7	1.7	1.7	1.7	1.7
18020128030204	West Branch El Dorado Canyon	0.35	3.4	2.8	2.8	2.8	2.9	2.6	2.8
18020128050302	Humbug Canyon	0.34	3.8	3.3	3.1	3.3	3.5	3.3	3.3
18020128050402	Upper East Fork North Fork of North Fork American River	0.47	3.4	2.3	1.8	1.8	2.6	2.3	1.8

Figure 3.02-4 displays the change in “Higher Risk Route” density in the watersheds identified above Figure 3.02.4 shows that all action alternatives increase the percent of watersheds with “Higher Risk Route” densities of 1.9 miles/sq mile or less and decrease the percent of watersheds with “Higher Risk Route” densities greater than 3.6 mi/sq mile.

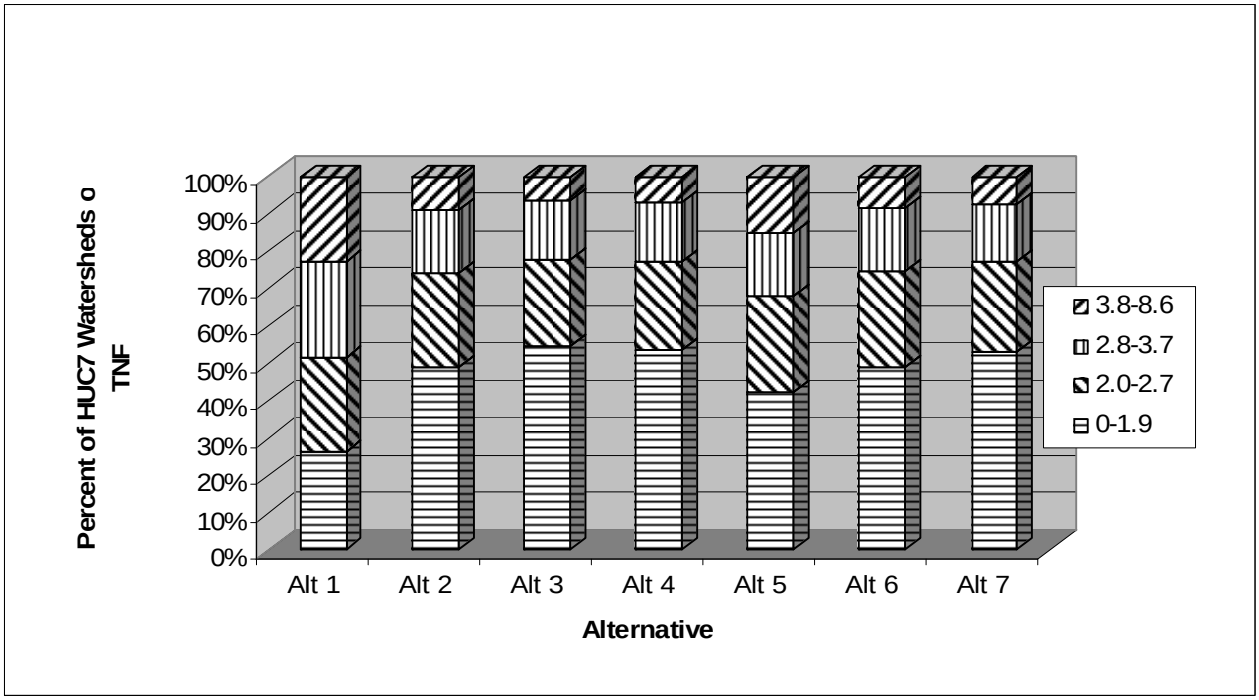

Figure 3.02-4. Change in percent of watersheds in "Higher Risk Route" density categories

Cumulative Effects to soils based on EMDS Erosion Risk and "Higher Risk Route" density

Prohibition on Cross Country Travel: All of the action alternatives prohibit cross country travel. It would also prevent the proliferation of any new motorized trails un-authorized for motorized use which would increase number of high risk watersheds. The impacts on "Higher Risk Route" density in high risk watersheds resulting from the prohibition on cross country travel are displayed in Table 3.02-24. This prohibition will reduce the "Higher Risk Route" density in HUC7 watersheds with a moderately high to high erosion potential. The largest reduction is in the Cherokee Creek HUC7 (North Yuba River). The smallest reductions are found in the Truckee River in East Martis Creek (0.0 mi/sq mi) and Squaw Creek (0.1 mi/sq mi). These two watersheds are the only HUC7s with high EMDS Erosion Risk and high "Higher Risk Route" density on the eastside of the TNF. These two HUC7s are also primarily under private ownership. The other Westside watersheds show reductions of 0.4 to 4.2 miles per square mile in the Action Alternatives.

Table 3.02-24. Changes in "Higher Risk Route" density in high risk watersheds (mi,/sq. mi.)

HUC7 Watershed	HUC7 Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Squaw Creek	5113	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
East Martis Creek	4632	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Pauley Creek	5078	0.0	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Fiddle Creek	7814	0.0	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Cherokee Creek	4572	0.0	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
North Yuba River-Indian Creek	6651	0.0	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3
Canyon Creek-Morristown Ravine	1888	0.0	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3

HUC7 Watershed	HUC7 Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Little Canyon Creek	7671	0.0	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8
North Yuba River-Lost Creek	3471	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Willow Creek	8192	0.0	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
East Fork Creek	8450	0.0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Middle Yuba River-National Gulch	6687	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Wolf Creek	5551	0.0	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Oregon Creek-Miller Creek	5657	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Oregon Creek-Marion Creek	4244	0.0	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
Upper Kanaka Creek	5458	0.0	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4
Lower Middle Yuba River	4997	0.0	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4
South Yuba River-Pierce Meadow	4928	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Canyon Creek-Texas Creek	7929	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Lower Canyon Creek-South Yuba River	6156	0.0	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
Upper Poorman Creek	6917	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Lower Poorman Creek	7932	0.0	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
South Yuba River-Jefferson Creek	4673	0.0	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
Headwaters Bear River	2494	0.0	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7
Bear River-Stump Canyon	594	0.0	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2
Middle Fork American River-Dolly Creek	5787	0.0	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
Middle Fork American River-Chipmunk Creek	2742	0.0	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8
Lower Duncan Canyon	7817	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Screwauger Canyon	8537	0.0	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
Deep Canyon	5343	0.0	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
Secret Canyon	6526	0.0	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
North Fork of Middle Fork American River-Bear Wallow	5937	0.0	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Grouse Creek	5264	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Volcano Canyon	2371	0.0	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Humbug Canyon	6100	0.0	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Upper East Fork North Fork of North Fork American River	6651	0.0	-1.6	-1.6	-1.6	-1.6	-1.6	-1.6
North Fork of North Fork American River-Blue Canyon	4359	0.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5

Additions to the National Forest Transportation System (NFTS): There are no additions to the NFTS under Alternative 1. The action alternatives would add between 31.2 and 282.8 miles of “Higher Risk Routes” to the (NFTS). Additions to the (NFTS) would have minimal effects to soil resources, because these motorized trails un-authorized for motorized use are already part of the disturbance footprint and would be managed according to TNF trail and resource standards. Appendix A, Road Cards, has mitigations that are needed to add the motorized trails to the NFTS with minimal impacts to soil resources.

Table 3.02-25 displays changes in “Higher Risk Route” density in high risk watersheds due to adding motorized trails to the NFTS. Alternatives 1 and 3 would result in no change in “Higher Risk Route” density in high risk watersheds. Motorized trail additions to the NFTS in Alternative 2 would increase “Higher Risk Route” density in 22 watersheds by 0.1 to 1.5 miles per square mile. Alternatives 4 and 7

would increase "Higher Risk Route" density by 0.1 mile per square mile in one watershed. Alternative 5 would increase "Higher Risk Route" density by 0.1 to 3.4 miles per square mile in 29 watersheds. Alternative 6 would increase "Higher Risk Route" density by 0.1to 1.2 miles per square mile in 13 watersheds.

Table 3.02-25. Changes in the "Higher Risk Route" density in High Risk Watersheds due to additions to the National Forest Transportation System (mi./sq. mi.)

HUC7 Watershed	HUC7 Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Squaw Creek	5113	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East Martis Creek	4632	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Pauley Creek	5078	0.0	0.2	0.0	0.0	0.2	0.2	0.0
Fiddle Creek	7814	0.0	0.4	0.0	0.0	2.4	0.1	0.0
Cherokee Creek	4572	0.0	0.1	0.0	0.0	3.4	1.2	0.0
North Yuba River-Indian Creek	6651	0.0	0.6	0.0	0.0	-0.8	0.0	0.0
Canyon Creek-Morristown Ravine	1888	0.0	0.6	0.0	0.0	2.0	0.0	0.0
Little Canyon Creek	7671	0.0	1.5	0.0	0.0	2.7	0.0	0.0
North Yuba River-Lost Creek	3471	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Willow Creek	8192	0.0	0.2	0.0	0.0	0.3	0.0	0.0
East Fork Creek	8450	0.0	0.6	0.0	0.0	0.6	0.6	0.0
Middle Yuba River-National Gulch	6687	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wolf Creek	5551	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon Creek-Miller Creek	5657	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon Creek-Marion Creek	4244	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Upper Kanaka Creek	5458	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Lower Middle Yuba River	4997	0.0	0.0	0.0	0.0	0.1	0.0	0.0
South Yuba River-Pierce Meadow	4928	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Canyon Creek-Texas Creek	7929	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Lower Canyon Creek-South Yuba River	6156	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Upper Poorman Creek	6917	0.0	0.2	0.0	0.0	0.3	0.2	0.0
Lower Poorman Creek	7932	0.0	0.4	0.0	0.0	0.4	0.0	0.0
South Yuba River-Jefferson Creek	4673	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Headwaters Bear River	2494	0.0	0.2	0.0	0.0	0.2	0.2	0.0
Bear River-Stump Canyon	594	0.0	0.0	0.0	0.0	1.0	0.0	0.0
Middle Fork American River-Dolly Creek	5787	0.0	0.5	0.0	0.0	0.3	0.5	0.0
Middle Fork American River-Chipmunk Creek	2742	0.0	1.1	0.0	0.0	1.1	1.1	0.0
Lower Duncan Canyon	7817	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Screwauger Canyon	8537	0.0	0.2	0.0	0.0	0.3	0.0	0.0
Deep Canyon	5343	0.0	1.3	0.0	0.0	2.0	0.4	0.0
Secret Canyon	6526	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Fork of Middle Fork American River-Bear Wallow	5937	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Grouse Creek	5264	0.0	0.5	0.0	0.0	1.1	0.0	0.0
Volcano Canyon	2371	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Humbug Canyon	6100	0.0	0.1	0.0	0.1	0.1	0.1	0.1
Upper East Fork North Fork of North Fork American River	6651	0.0	0.5	0.0	0.0	0.8	0.5	0.0
North Fork of North Fork American River-Blue Canyon	4359	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Changes to Class of Vehicles and/or Season of Use: Changing the class of vehicle allowed to use a particular National Forest Transportation System (NFTS) road could change the impacts to soil and watershed resources due to the change in road surface. Therefore, these NFTS roads are considered "Higher Risk Routes" even though they already have "hardened" surfaces that lack vegetation. It is likely that direct impacts to soil and watershed resources occurred when the road was constructed. Impacts may still be occurring if the road is collecting and concentrating overland flow of water and increasing erosion rates. These indirect and cumulative impacts would continue regardless of the type of vehicle using the road. When the maintenance level of a particular route changes (the maintenance level does not always change when class of vehicle changes), the risk of erosion can increase. However, all roads would be maintained for resource needs no matter what maintenance level.

Native surface roads and trails ("Higher Risk Routes") are most susceptible to damage by motor vehicles when wet. The condition of "Higher Risk Routes" can quickly decline during winter or wet weather use due to rutting.

Wet season use of "Higher Risk Routes" often leaves ruts which channel water and increase the erosive power of that water, this can lead to increased erosion both on the and adjacent to the "Higher Risk Route". Many of the impacts found during field surveys were caused by wet season use of "Higher Risk Routes".

Implementing seasonal closures would reduce rutting and subsequent channeling of surface water runoff. Seasonal closures would decrease the potential effects of motorized vehicle use on "Higher Risk Routes" by decreasing erosion and sedimentation. The benefits of seasonal closures would be equal to prohibition on cross country travel and would by far exceed adding between 31.2 and 282.8 miles of native surface, motorized trails ("Higher Risk Routes") with an existing disturbance footprint into the NFTS.

Table 3.02-26 displays changes "Higher Risk Route" density in High Risk Watersheds by alternative. Alternatives 1, 2, 3 and 7 all have the vast majority of "Higher Risk Routes" open year round and therefore, have a higher risk to soil resources. The wet weather seasonal closure imposed in Alternatives 4, 5 and 6 results in all of the "Higher Risk Routes" being closed during the wet time of the year, thus greatly reducing potential negative impacts to soil resources and to water quality.

Alternatives 2, 5, and 6 have changes to the class of vehicles which increases the "Higher Risk Route" density in High Risk Watersheds.

Table 3.02-26. Changes in "Higher Risk Route" density in High Risk Watersheds due to changes in class of vehicles on existing National Forest Transportation System roads (mi./sq. mi.)

HUC7 Watershed	HUC7 Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Squaw Creek	5113	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East Martis Creek	4632	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Pauley Creek	5078	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fiddle Creek	7814	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cherokee Creek	4572	0.0	0.2	0.0	0.0	-0.2	-0.2	0.0
North Yuba River-Indian Creek	6651	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canyon Creek-Morristown Ravine	1888	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Little Canyon Creek	7671	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HUC7 Watershed	HUC7 Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
North Yuba River-Lost Creek	3471	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Willow Creek	8192	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East Fork Creek	8450	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Middle Yuba River-National Gulch	6687	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wolf Creek	5551	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon Creek-Miller Creek	5657	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon Creek-Marion Creek	4244	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Kanaka Creek	5458	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lower Middle Yuba River	4997	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Yuba River-Pierce Meadow	4928	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canyon Creek-Texas Creek	7929	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Lower Canyon Creek-South Yuba River	6156	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper Poorman Creek	6917	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lower Poorman Creek	7932	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Yuba River-Jefferson Creek	4673	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Headwaters Bear River	2494	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bear River-Stump Canyon	594	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Fork American River-Dolly Creek	5787	0.0	0.5	0.0	0.0	0.5	0.5	0.0
Middle Fork American River-Chipmunk Creek	2742	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lower Duncan Canyon	7817	0.0	-0.2	0.0	0.0	0.2	0.2	0.0
Screwauger Canyon	8537	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deep Canyon	5343	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Secret Canyon	6526	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Fork of Middle Fork American River-Bear Wallow	5937	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grouse Creek	5264	0.0	0.7	0.0	0.0	0.7	0.7	0.0
Volcano Canyon	2371	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Humbug Canyon	6100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upper East Fork North Fork of North Fork American River	6651	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Fork of North Fork American River-Blue Canyon	4359	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Cumulative Effects: This project would not change the footprint of current wheel-tracks on the Tahoe National Forest. It would decide which roads, trails and “Open Areas” are authorized for motorized use. All action alternatives would result in a net reduction in “Higher Risk Route” density in all High Risk Watersheds. All action alternatives would result in a slight decrease in the risk of negative cumulative effects to High Risk Watersheds. The cumulative impacts on “Higher Risk Route” density in High Risk Watersheds resulting from this project are displayed in Table 3.02-27. Alternative 1 represents the existing condition. Alternatives 2 through 7 would represent the risk at twenty years (when motorized trails not designated for motorized use would have recovered hydrologically). All other Action Alternatives would decrease the “Higher Risk Route” density in the High Risk Watersheds except for four Westside watersheds in Alternative 5. Alternative 5 would have route densities equal to the existing condition in the Cherokee Creek, East Fork Creek, Deep Canyon and Grouse Creek HUC7 watersheds.

Table 3.02-27. "Higher Risk Route" density in High Risk Watersheds due to the cumulative effects of all proposed actions after 20 years (mi./sq. mi.)

HUC7 Watershed	HUC7 Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Squaw Creek	5113	5.1	5.1	5.1	5.1	5.1	5.1	5.1
East Martis Creek	4632	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Upper Pauley Creek	5078	2.8	2.5	2.2	2.2	2.5	2.4	2.3
Fiddle Creek	7814	4.7	2.7	2.3	2.3	4.7	2.4	2.3
Cherokee Creek	4572	-4.8	0.9	0.7	0.7	4.3	2.1	0.7
North Yuba River-Indian Creek	6651	3.3	2.6	2.0	2.0	2.8	2.1	2.0
Canyon Creek-Morristown Ravine	1888	4.3	2.6	1.9	1.9	4.0	1.9	1.9
Little Canyon Creek	7671	3.8	3.4	1.9	2.0	4.7	2.0	1.9
North Yuba River-Lost Creek	3471	3.2	2.6	2.6	2.6	2.6	2.6	2.6
Willow Creek	8192	3.2	2.4	2.1	2.2	2.4	2.2	2.1
East Fork Creek	8450	3.5	3.8	3.1	3.1	3.8	3.8	3.1
Middle Yuba River-National Gulch	6687	4.5	3.5	3.5	3.5	3.5	3.5	3.5
Wolf Creek	5551	3.2	2.5	2.5	2.5	2.5	2.5	2.5
Oregon Creek-Miller Creek	5657	4.3	3.3	3.3	3.3	3.3	3.3	3.3
Oregon Creek-Marion Creek	4244	3.1	2.1	2.1	2.1	2.3	2.1	2.1
Upper Kanaka Creek	5458	3.0	1.6	1.6	1.6	1.6	1.6	1.6
Lower Middle Yuba River	4997	3.1	1.6	1.6	1.6	1.7	1.6	1.6
South Yuba River-Pierce Meadow	4928	3.0	2.4	2.3	2.3	2.4	2.4	2.3
Canyon Creek-Texas Creek	7929	2.9	2.4	2.2	2.2	2.4	2.4	2.2
Lower Canyon Creek-South Yuba River	6156	3.7	2.9	2.8	2.8	2.9	2.8	2.8
Upper Poorman Creek	6917	4.9	4.1	3.9	3.9	4.2	4.1	3.9
Lower Poorman Creek	7932	3.4	3.1	2.7	2.7	3.1	2.7	2.7
South Yuba River-Jefferson Creek	4673	3.2	2.5	2.5	2.5	2.5	2.5	2.5
Headwaters Bear River	2494	3.4	1.8	1.6	1.7	1.8	1.8	1.7
Bear River-Stump Canyon	594	3.6	1.4	1.4	1.4	2.4	1.4	1.4
Middle Fork American River-Dolly Creek	5787	4.2	3.3	3.3	3.3	4.1	3.3	3.3
Middle Fork American River-Chipmunk Creek	2742	3.2	2.5	1.4	1.4	2.5	2.5	1.4
Lower Duncan Canyon	7817	3.9	3.1	2.9	2.9	3.3	3.1	2.9
Screwauger Canyon	8537	3.7	3.1	2.8	2.8	3.2	2.8	2.8
Deep Canyon	5343	5.0	5.4	4.1	4.1	6.1	4.5	4.1
Secret Canyon	6526	3.1	2.4	2.3	2.3	2.4	2.4	2.3
North Fork of Middle Fork American River-Bear Wallow	5937	2.9	1.8	1.7	1.7	1.8	1.7	1.7
Grouse Creek	5264	4.2	4.3	3.2	3.2	4.9	3.9	3.2
Volcano Canyon	2371	3.1	1.9	1.9	1.9	2.1	1.9	1.9
Humbug Canyon	6100	3.9	3.4	3.2	3.4	3.4	3.4	3.3
Upper East Fork North Fork of North Fork American River	6651	3.1	2.1	1.5	1.5	2.4	2.1	1.5
North Fork of North Fork American River-Blue Canyon	4359	2.8	2.3	2.3	2.3	2.3	2.3	2.3

Hydrology

Introduction

The Sierra Nevada annually yields a large but variable amount of water. Continuous stream-flow records began to be maintained in the mountains less than one hundred years ago and are of short duration with respect to longer-term natural variability. Based on this recent historical record, the Sierra Nevada generates about 25 km3 (20 million acre feet) of runoff each year, on average, out of a total for California of about 88 km3 (71 million acre feet). Stream flow in the Sierra Nevada is generated by seasonal rainfall and snowmelt.

Over 60 percent of California's water supply comes from the Sierra Nevada Mountains and it accounts for 60 percent of the total dollar value of all natural products or services produced by the entire region; more than forest products, agricultural products, recreational services or even residential development (Timmer et al. 2006). The rivers, lakes and streams within these watersheds supply municipal and agricultural users, provide hydro-power, prime recreation including fishing, swimming, boating or sightseeing as well as highly valuable riparian and aquatic habitats. Refer to the aquatic and other biological sections of this EIS for a description of the wide range of species supported within this area as well as a general description of the condition of these species and their habitat.

Precipitation in this portion of the Sierra Nevada Mountain range is a Mediterranean type climate with the majority of the precipitation falling in the winter. Above 6000 feet winter precipitation is dominated by snow fall that equates to roughly 50 to 60 inches of water per year. Intense summer thunderstorms commonly occur in this high elevation zone as well. Precipitation at elevations below about 4000 feet is dominated by rain that provides 40 to 50 inches per year. The zone in between about 4,000 to 6,000 feet is referred to as the rain-on-snow zone which is highly susceptible to rapid runoff and higher erosion rates when a warm rain falls on a snow pack. About half of average annual precipitation occurs during winter, about a third in autumn, about 15% in spring, and generally less than 2% in summer (Smith 1982). About 50% of annual precipitation falls as snow at 1,700 m (5,600 ft) at a latitude of 39° N (Kahrl 1978). Stream flow generated below 1,500 m (4,900 ft) is usually directly associated with storms, while stream flow above 2,500 m (8,200 ft) is primarily a product of spring snowmelt. Between these approximate bounds, stream flow is generated both by warmer storms and by melt of snow cover in spring. Of course, the major rivers collect inputs throughout their elevation range with a mix of precipitation events. Cayan and Riddle (1993) calculated the seasonal distribution of runoff of six Sierra Nevadan rivers which illustrates that snowmelt runoff becomes more important and midwinter rainfall runoff becomes less important with increasing elevation. In the American River Basin, less than half of annual runoff occurs from April through July in the lower two-thirds of the basin. In small catchments of the American adjoining the Sierra Nevada crest, more than two-thirds of annual runoff occurs during this period (Elliott et al. 1978).

People expect water of high quality from rivers on the TNF, and most of the time this expectation is met. High quality water is necessary to provide for beneficial uses such as municipal water supplies, agriculture, recreation, hydroelectric power, and to provide in stream flows for aquatic and riparian ecosystems. Water of sufficient quality to provide suitable conditions for coldwater fish generally meets

the conditions required for other uses. The proper functioning of riparian and upland ecosystems is directly linked to satisfactory water quality.

High water quality is a critical habitat element for many species in riparian and aquatic ecosystems. The quality of water depends on many variables. The water quality variables most strongly tied to forested landscapes include water temperature, turbidity, and chemical and nutrient concentrations. These elements interact in complex ways to influence distribution, patterns of abundance, growth, reproduction, and migration of aquatic organisms. For example, sediment alone is not lethal to fish (Cordone and Kelley 1961), but fine sediments deposited on a streambed may disrupt substrate habitats for their food supply, aquatic insects, and result in fish population declines. Fine sediments can disrupt spawning, smother egg masses, or disrupt the development of larvae. Extremes of water temperature affect the type, quantity, and health of plants and animals within aquatic systems. Increases in summertime stream temperature are often cumulative as water moves downstream through watersheds.

Motor Vehicle Use and Water Quality

Motor vehicles presently access at least part of every HUC7 watershed located on the TNF. In a few watersheds (e.g., the Headwaters of the Middle Fork American River) the only motorized routes are surfaced “major” roads. A number of watersheds have low levels of motorized roads and trails since they are primarily within designated wilderness or Research Natural Areas or in inaccessible areas of the Forest (e.g., Headwaters of Canyon Creek (South Yuba River) and Upper Five Lakes and Middle Five Lakes (Middle Fork American River). Watersheds that contain high levels of private ownership such as those around urban areas, rural communities and some private timberlands have route densities that are much higher than average for the TNF (e.g., Squaw Creek and Donner Lake). Historical logging practices on public lands also left a legacy of high levels of routes in some areas. The native surface, motorized route system is the part of the transportation system that has the highest risk of causing soil erosion (on the route tread and/or on areas adjacent to the route) and subsequent sediment delivery to water bodies.

Roads are considered the principal cause of accelerated erosion in forests throughout the western United States (California Division of Soil Conservation 1971, California Division of Forestry 1972, Reid and Dunne 1984, McCashion and Rice 1983, Furniss and others 1991, Harr and Nichols 1993). Roads are also known to modify natural mountainside drainage networks. These drainage changes can alter physical processes in streams, leading to changes in stream flow regime; sediment transport and storage; channel, stream bank, and streambed configurations; substrate composition; and slope stability next to streams (Furniss and others 1991). The locations of roads determine the degree of potential impacts, making some roads more environmentally sensitive than others. The presence of roads can increase the frequency of slope failures compared with the rate of slope failures in undisturbed forest by hundreds of times (Sidle and others 1985). The closer the road or trail is to a water body, the higher the risk of negative effects to that water body. Road stream crossings constructed with culverts have been identified as a significant source of road derived sediment (Hagans and Weaver 1987, Best and others 1995, Weaver and others 1995, Park and others 1998). In addition, vegetation removal activities conducted within 300 feet of streams have been found to significantly negatively influence stream channel conditions (McGurk and Fong 1995). During rainfall events, sediment and other pollutants are transported to water bodies.

Downstream uses would potentially experience negative effects including reservoir infilling, silting of spawning gravel and aquatic habitats, plugging drainage systems, and the increase in risk of petroleum product and other pollutant exposure from vehicle operation.

Not all roads in any given area contribute equal amounts of sediment; the greatest volumes of sediment seem to come from a limited number of sites. In many forested catchments, unpaved roads are the primary sources of sediment but the effect of this sediment on downstream water resources depends on both the magnitude of the road erosion and the connectivity of the roads to the stream network (Coe 2001). Routes on steep slopes as well as near stream routes are commonly "hydrologically connected" to the stream system. Hydrologically connected routes can dramatically increase stream sedimentation, increase stream peak flows and serve as conduits for transport of chemicals from road spills or those applied to roadside areas (Furniss, et al. 1999).

The greatest risk of sediment moving into streams occurs where routes cross streams. Routes near streams are also commonly connected to the stream network. Coe's studies on the Eldorado NF reveled that 25 percent of the routes surveyed were hydrologically connected and that 59 percent of the connectivity was apparent at stream crossings (2006). Routes that cross streams have the potential for direct impacts to streams in 3 different ways.

- **Travel through a stream** can cause disturbance to the stream bed or banks.
- **Contaminants** such as petroleum products, sediment and or anything that is spilled on the roadway can enter the stream at crossings.
- **Stream crossings fail**. Roads often divert streamflow at road-stream crossings, and these diversions can result in erosion of native hillslopes, as well as road surfaces. When a stream crossing fails there is typically a large pulse of sediment released into the stream system. All crossings are designed for failure associated with storms of particular recurrence intervals.

In recent decades, road engineering and construction practices have been improved to alleviate these problems. Most stream crossings are on ephemeral streams, most are improved with culverts; many are bridges; and some crossings go through live streams or ephemeral stream beds. Every engineered stream crossing is designed for failure at a storm of roughly a 50 to 100 year recurrence interval. Culverts are typically corrugated metal pipes that sometimes plug with sediment and or debris; some eventually rust out or are damaged by obstructions or flows around the pipes. The conditions of the roads that drain into these culverts also influence how well the crossing may function. Existing routes constitute current and potential sources of sediment. In general, higher route densities translate to higher potential for adverse effects to aquatic and riparian habitats.

Regulatory Direction relevant to the proposed action as it affects water resources includes:

- **Clean Water Act of 1948** (as amended in 1972 and 1987) establishes as federal policy the control of point and non-point pollution and assigns the States the primary responsibility for control of water pollution. Compliance with the Clean Water Act by national forests in California is achieved under state law (see below).
- Non-point source pollution on national forests is managed through the **Regional Water Quality Management Plan** (USDA Forest Service, Pacific Southwest Region, 2000), which relies on

implementation of prescribed best management practices. The Water Quality Management Plan includes one BMP for OHV use (4-7) and 28 BMPs related to road construction and maintenance (2-1 to 2-28). All NFS roads and trails open to OHV use are required to comply with the appropriate BMPs.

Of particular relevance for travel management, **BMP 4-7** requires each forest to 1) identify areas or routes where OHV use could cause degradation of water quality; 2) identify appropriate mitigation and controls, and 3) restrict OHV use to designated routes. This BMP further requires Forests to take immediate corrective actions if considerable adverse effects are occurring or are likely to occur.

- The **California Water Code** consists of a comprehensive body of law that incorporates all state laws related to water, including water rights, water developments, and water quality. The laws related to water quality (sections 13000 to 13485) apply to waters on the national forests and are directed at protecting the beneficial uses of water. Of particular relevance for the proposed action is section 13369, which deals with nonpoint-source pollution and best management practices.
- The **Porter-Cologne Water-Quality Act**, as amended in 2006, is included in the California Water Code. This act provides for the protection of water quality by the State Water Resources Control Board and the Regional Water Quality Control Boards, which are authorized by the U.S. Environmental Protection Agency to enforce the Clean Water Act in California.

Affected Environment

Existing Water Supply

The Tahoe National Forest contains portions of headwaters of the American, Bear, Feather, Truckee and Yuba Rivers. The American, Bear and Yuba Rivers flow westward from the crest of the Sierra Nevada to the Sacramento River in the City of Sacramento. The headwaters of the Middle Fork Feather River are in the Sierra Valley area. The river is formed by the confluence of several streams draining the surrounding mountains and then flows west to join the Sacramento River near Marysville. The American, Bear, Feather, and Yuba rivers and their tributaries provide water for domestic, agricultural, environmental and industrial uses as well as power production. The Truckee River Basin covers an area from Lake Tahoe in California to Pyramid Lake, located approximately 50 air miles away in Nevada. Approximately 760 square miles (almost 25 percent of the basin), lie within California. Most of the precipitation and water storage occur within the California part of the Truckee River Basin. The Truckee River, from south of Bear Creek confluence to the near the California near Floriston, is within the TNF boundary. The Truckee River provides the majority of the municipal water supply for the Reno-Sparks area.

The Wild and Scenic status of rivers on the TNF can be found in Section 3.09, Inventoried Roadless Areas and Special Areas.

Most of the watersheds on the Tahoe are highly regulated systems. The American, Yuba, and Bear River systems are due to complete FERC re-licensing by 2013. Truckee River is operates under the Truckee River Operating Agreement. The Sierra Valley is an adjudicated basin. This project is not likely to impact existing water supply to any measurable extent.

Existing Water Quality

Table 3.02-28. Sediment yields from reservoir surveys, suspended sediment records, and other estimates (Kattelmann, 1996).

Watershed	Annual Sediment Yield (m^3/km^2)
American – Ralston	80
American – Auburn Dam Site	130
American – Folsom	250
Bear – Combie	360
Feather – Oroville	90 100 120
Truckee – Upper Truckee Squaw Creek Trout Creek	21 12, 93 12
Yuba – Nonmining Mining North Yuba – Bullards Bar	160 3,300 130

Compared to other parts of California and the United States, the Sierra Nevada overall has relatively low sediment yields (Kattelmann, 1996). General estimates show that the Sierra Nevada has the lowest sediment yield in California (generally less than 100 m^3/km^2/year). Sediment transport measurements in a variety of streams in the eastern Sierra Nevada were generally less than 10 m^3/km^2/year. A Soil Conservation Service report classified sediment yield below 150 m^3/km^2/year as "low" with respect to nationwide rates (Kattelmann, 1996). Table 3.02-28 shows some annual sediment yield data for watersheds on the Tahoe National Forest. These figures show that the Truckee River system has lower sediment yields than the rivers on the west side of the Forest. The American, Yuba and Feather River systems appear to have similar sediment yields.

Water Quality Management

According to the California Water Plan Update (CA DWR 1998) the TNF is encompassed by three major hydrologic regions. One region is on the Westside of the Sierra Nevada crest (the Sacramento River); the North and South Lahontan regions are on the eastern side. The Central Valley Regional Water Quality Control Board oversees and sets the standards for the Feather, Yuba, Bear and American River systems. The Lahontan Regional Water Quality Control Board oversees and sets the standards for the Truckee River. The Forest Service has a memorandum of understanding with the State that names the Forest Service as a "Designated Management Agency" that will prescribe and implement a water quality control program to protect the waters of the state to meet state and federal regulations as well as the standards set in the Central Valley Water Quality Control Board Basin Plan as amended for commercial silvicultural practices by Resolution R5-2006-0026 (2006).

The TNF generally produces surface water of excellent quality, suitable for almost any use. Contaminant levels in most waters are lower than amounts specified in the States of California and Nevada stream quality standards (Kattelmann 1996). Most runoff would be suitable as drinking water except for the risk of bacteria and pathogens, such as *Giardia lamblia*, *Campylobacter* ssp., and *Cryptosporidium* ssp. In the backcountry, inadequate disposal of human waste and pathogens carried by mammals have caused sufficient contamination to make drinking untreated water risky. Low-level release of nutrients from human activities along wilderness lakes may have stimulated increased plant growth on some lake bottoms (Kattelmann 1996) reducing clarity and causing shifts in aquatic communities as well as reducing the aesthetics of natural lake conditions. Generally, very little water from National Forests in

the Sierra Nevada region is heavily polluted or contaminated by chemicals, bacteria, or parasites at concentrations above background levels (Kattelmann 1996). Most waters satisfy the fishable and swimmable objectives of the Clean Water Act (1987).

Water quality in forested areas can be impacted by many activities. Most pollutants come from non-point sources, i.e. from diffuse sources not concentrated into pipes, drains, flumes, or ditches (Clean Water Act, 1987). Examples include erosion from roads and parking areas. Sediment at levels above natural rates of erosion is the most common non-point source pollutant in forested ecosystems. Roads can pollute groundwater, as well as, surface water. Forest roads potentially add more sediment to streams than any other forest operation. Research has shown that 90 percent of the sediment that ends up in our nation's waters from forested lands is associated with improperly designed and maintained roads. Water quality in lakes, streams, springs, and wetlands can be protected by proper road location and construction and adequate maintenance. A few rural communities and abandoned mining sites within national forests constitute point sources of pollution.

There are six water bodies on the TNF that are listed as impaired on the EPA's 303(d) List. These are the Truckee River (sediment); Stampede Lake (pesticides of unknown origin), Donner Lake (PCBs), Kanaka Creek (arsenic), and Humbug Creek (lead, sediment, etc.). Table 3.02-29 displays the 303(d) listed water bodies and the reason for listing.

Table 3.02-29. Impaired Water Bodies on the TNF Listed on the EPA 303(d) List

Water Body Name	Pollutant/Stressor	Source	Area Affected
Humbug Creek	Copper, Mercury, Zinc, Sedimentation/Siltation	Resource extraction abandoned mines	9 miles
Kanaka Creek	Arsenic	Resource extraction abandoned mines	1 mile
Donner Lake	Priority Organics	Source Unknown	960 acres
Stampede Reservoir (recommended for delisting)	Pesticide (lindane)	Source Unknown	3,444 acres
Squaw Creek	Sedimentation/Siltation	Construction/Land development, Other Urban Runoff, Hydro modification, Drainage/Filling of Wetlands, Highway Maintenance And Runoff, Natural Sources, Recreational Activities, Nonpoint Source	8 miles
Truckee River	Sedimentation/Siltation	Source Unknown	106 miles

The Truckee River, Squaw Creek, and Humbug Creek (Middle Yuba River) are currently listed on the Impaired Water body list (303(d)) for sediment. The Lahontan Regional Water Quality Control Board recently developed a Total Maximum Daily Load (TMDL) for sediment. Effects of this project on these watersheds are discussed under Environmental Consequences in the cumulative effects section.

Existing Motor Vehicle Use and Water Quality

Route densities near streams such as the densities of roads and trails within Riparian Conservation Areas and stream crossing densities serve as relative measures of route connectivity to stream systems. Most routes are located along ephemeral streams. When routes are adjacent to perennial streams the potential

for impacts to aquatic resources can be greater. Highest route densities on the TNF are generally found in the Truckee River watershed. The lowest route densities are found in the North Fork American River watershed.

There are 8,340 miles of roads and trails on the TNF. Average route density is 3.9 miles per square mile. There are 1,719 miles of roads and trails within Riparian Conservation Areas (RCAs) on the TNF. Average route density of the RCAs is 4.3 miles per square mile. There are approximately 21,347 motorized stream crossings on forest (2,175 perennial, 2,064 intermittent, and 17,108 ephemeral). This estimate is based on GIS analysis. Field review of the GIS base data shows that there are often fewer ephemeral crossings in the field than on the GIS layers. Sometimes routes that parallel a stream show up in GIS as multiple crossings.

Figure 3.02-5 shows the existing route density by HUC7 watershed and within RCAs. The majority of the watersheds on the TNF have route densities less than four miles per square mile. RCA route density is generally higher than the route densities in watersheds with route densities greater than six miles per square mile.

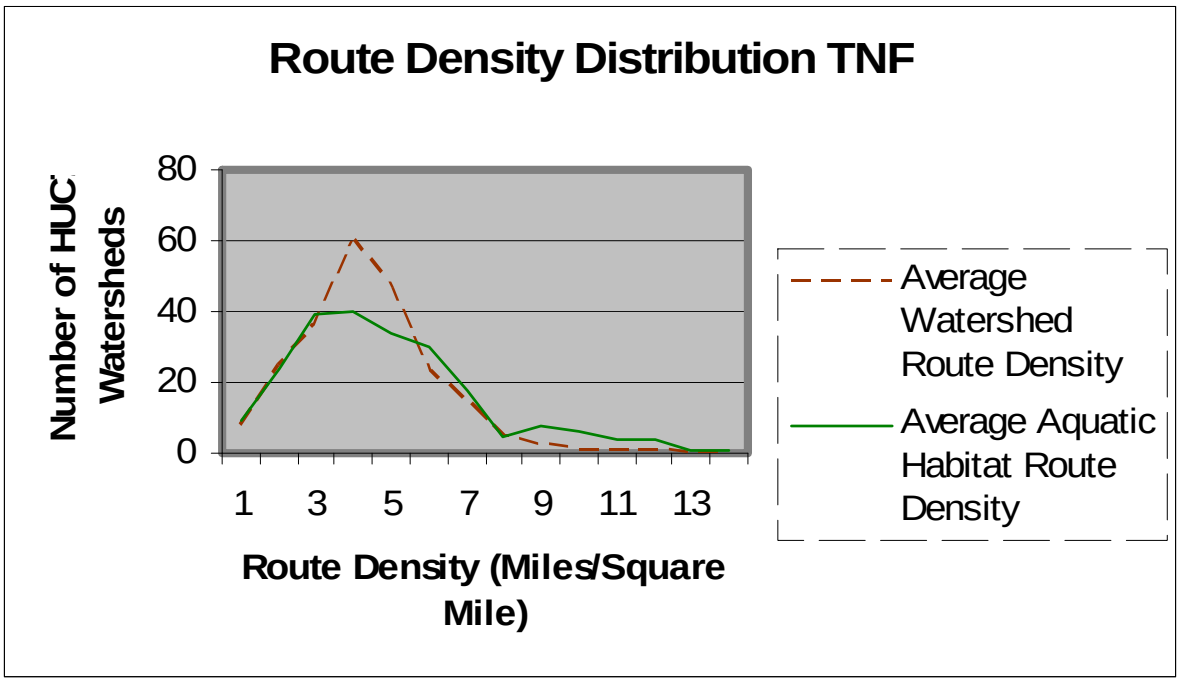

Figure 3.02-5 Distribution of Route Density on the Tahoe National Forest

Existing Watershed Connectivity Risk Assessment

Routes that are hydrologically connected to streams bring sediment or other contaminants from the road or trail surface to the stream system (Furniss et al. 1999). Routes on steep slopes that have inside ditches and cross drains are commonly linked to the stream system and act as extensions to the drainage network. When routes on steep slopes are also located in watersheds with soils that have high erosion and high

precipitation, the effects are magnified even more (Refer to soils section for a more thorough discussion). Changing use from motorized to non-motorized use may decrease effects to watershed resources.

Near stream roads and trails as depicted above are commonly connected to the stream system, when these routes cross streams the potential for connectivity is even greater. The number of existing stream crossings across the forest is significant. Every road and motorized trail stream crossing has a design failure point and is expected to fail at some point under extreme weather conditions. Road stream crossings constructed with culverts have been identified as a significant source of road derived sediment (Hagans and Weaver 1987, Best et al 1995, Weaver et al 1995, Park et al 1998) as reported by Moll 1998. Erman at al. (1977) stated that the most significant impacts to invertebrate communities are below road failures and culverts. Decreasing the number of motorized crossings would reduce the risk of impacts caused by motorized vehicle use.

The potential risk of hydrologic connectivity has been modeled using the Ecosystem Management Decision Support Model (EMDS). The risk to water quality and stream channels was based on stream crossing density and route-steam proximity. Route position on slope was incorporated into the risk assessment after the modeled risk was computed. Hydrologic connectivity was assessed at all surveyed stream crossings.

Existing Watershed Connectivity

Watershed connectivity refers to the ease of movement, or rates of exchange, with which water, energy, nutrients, and organisms pass from one area to another, unhindered in the absence of impediments, such as dams, diversions, roads and bridges, large habitat openings, and recreational developments. As ecosystems become fragmented and disconnected, the scale and rate at which essential processes, such as nutrient and energy cycling and gene flow, operate become restricted.

A physical example of connectivity is the exchange of surface flow and groundwater within streambeds and floodplain soils (Boulton and others 1998). Another example is the dynamic interaction of a river with its riparian zone at flood stage when water transports sediments and organic materials from one area and deposits them in another. Chemical connectivity refers to the movement of nutrients from the terrestrial to the aquatic environment, and back. Biological connectivity refers to the continuity of habitats necessary for organisms to successfully complete their life cycles. For example, aquatic insects, fish, and amphibians migrate between different habitats at different stages in their development.

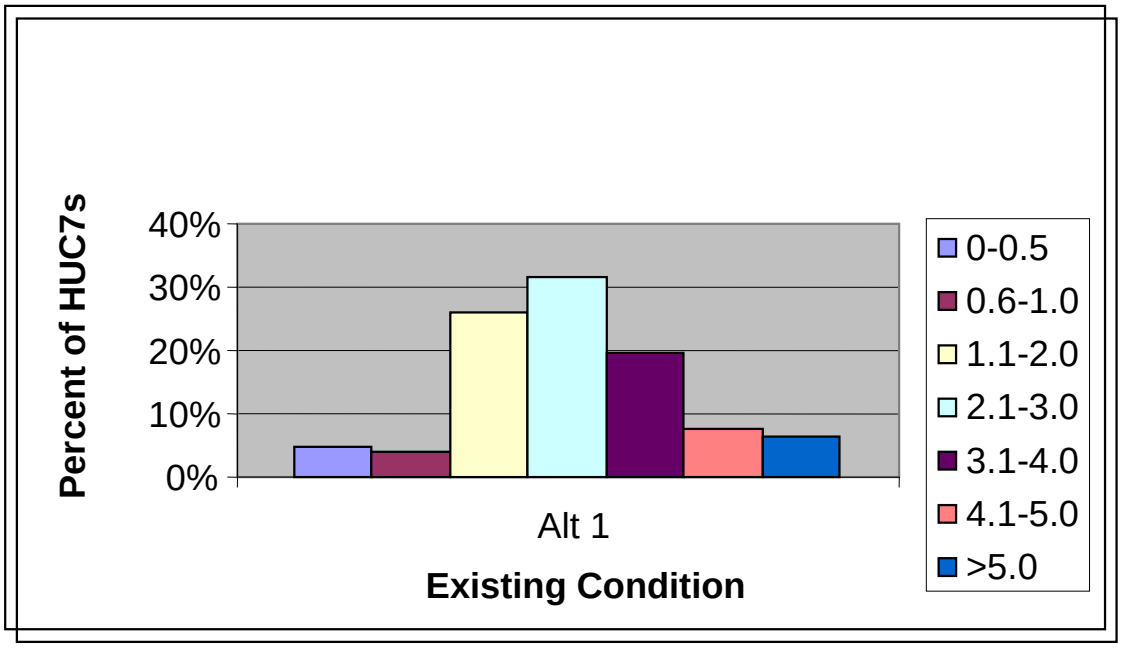

Figure 3.02-6. Native surface, motorized route ("Higher Risk Route") density within RCAs by Percent of HUC7 Watersheds on TNF

Existing Near Stream Route Densities

Earlier in this chapter "Higher Risk Routes" were defined as all native surface roads and motorized trails. Near stream "Higher Risk Route" densities such as the densities within Riparian Conservation Areas (RCAs) serve as a relative measure of hydrologic connectivity of routes and stream systems. Figure 3.02-6 shows "Higher Risk Route" densities within the RCAs that currently exist on the TNF and the percent of the TNF watersheds with the different density classes. The majority of watersheds on the TNF have RCA "Higher Risk Route" densities between one and four miles of route per square mile per square mile of RCA. The is the two to three miles per square mile category is found in slightly more than 30 percent of the TNF HUC7s. Twenty percent of the HUC7s have a RCA "Higher Risk Route" density of three to four miles per square mile. Around 25 percent of the watersheds have RCA "Higher Risk Route" densities of one to two miles per square mile.

To be consistent with the rest of the analysis in this section, RCA "Higher Risk Route" density is divided by quartiles. These quartiles are 0-1.5, 1.6-2.3, 2.4-3.5, and greater than 3.5. The existing RCA "Higher Risk Route" density by quartile and major river basin within the TNF are shown in Figure 3.02-7.

Figure 3.02-7 shows that the highest existing RCA "Higher Risk Route" densities on the TNF are found in the Truckee and Feather River Basins. These rivers are on the eastside of the TNF where the land is flatter and access to rivers, streams, lakes, and reservoirs is generally easier. The Middle Fork of the American River has the lowest RCA motorized, native surface route densities on the TNF.

Table 3.02-30 shows the density and miles of near stream "Higher Risk Route" density by major river basin. The Truckee River Basin has the highest existing near stream "Higher Risk Route" densities. The lowest near stream "Higher Risk Route" densities are found in the Bear River drainage.

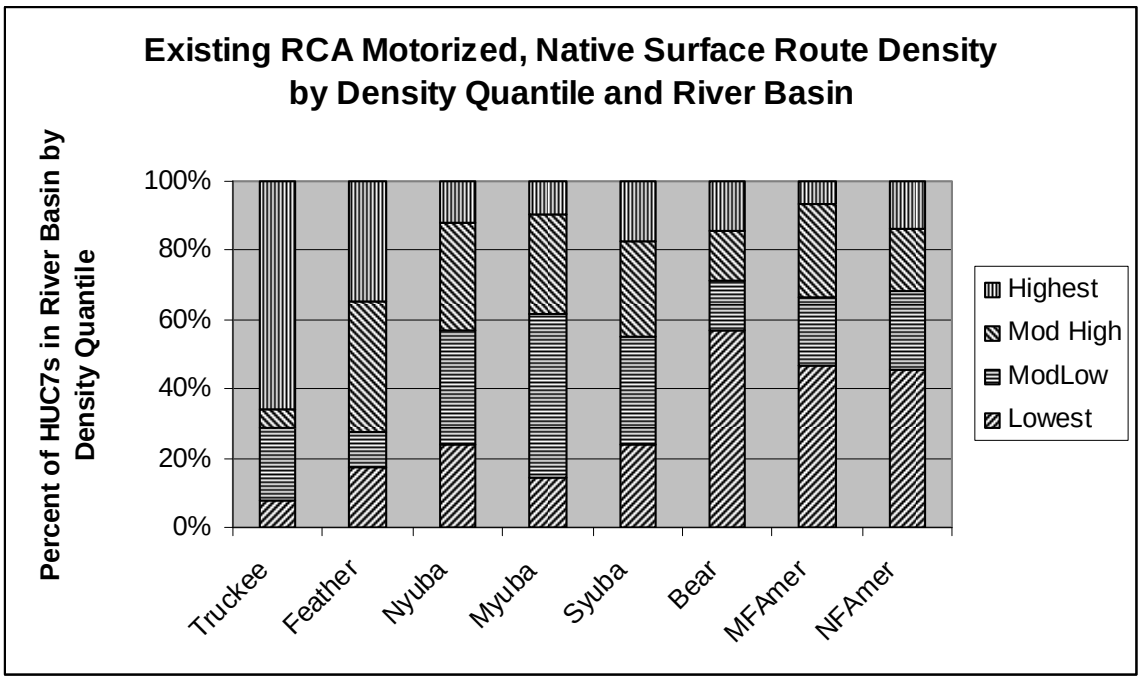

Figure 3.02-7. Existing RCA motorized, native surface ("Higher Risk Route") density by quartile and river basin

Table 3.02-30 "Higher Risk Route" density by major river basin

River Basin	Existing "Higher Risk Route" density (mi./sq. mi.)
Truckee River	4.4 (200.5)
Feather River	3.6 (62.3)
North Yuba River	2.5 (143.4)
Middle Yuba River	2.2 (33.0)
South Yuba River	2.6 (95.1)
Subtotal Yuba River	2.5 (271.5)
Bear River	1.6 (10.0)
Middle Fork American River	2.1(63.4)
North Fork American River	2.1 (66.5)
Subtotal American River	2.1 (130.0)
Total TNF	**2.8 (674.2)**

Existing Stream Crossing Density

Another common measure of hydrologically connected routes is "Higher Risk Route" stream crossing densities. Many "Higher Risk Route"-stream crossings have the potential to divert streamflow if drainage structures plug or fail. The number of crossings with diversion potential on the Tahoe National Forest is not known, so for the purpose of this analysis, all crossings are assumed to have diversion potential. The likelihood of diversions is therefore related to the numbers and densities of "Higher Risk Route" stream crossings.

The GIS layer used for the assessment of the ephemeral stream system has not been fully field verified. Field surveys associated with this project have not found as many crossings as predicted. So while the ephemeral stream crossing layer is used to guide the risk assessment for potential areas of concern, the assessment of projected stream crossing density is separated by type of crossing (perennial, intermittent, and ephemeral). Ephemeral streams are included in the RCA "Higher Risk Route" density

analysis which should cover concerns for motorized "Higher Risk Route" use in these areas. Inventoried ephemeral crossings are also considered in this throughout this analysis.

Table 3.02-31 shows the density "Higher Risk Route" stream crossings by major river basin as measure in number of crossings per square mile of RCAs. The Feather River has the highest density of "Higher Risk Route" stream crossings. The North Fork American River has the lowest "Higher Risk Route" stream crossing density.

Table 3.02-31. "Higher Risk Route" stream crossings density by major river basin (number of crossings per square mile of RCAs)

River Basin	Existing "Higher Risk Route" stream crossing density
Truckee River	8.4
Feather River	13.7
North Yuba River	6.7
Middle Yuba River	8.4
South Yuba River	6.4
Subtotal Yuba River	7.0
Bear River	6.8
Middle Fork American River	6.8
North Fork American River	4.3
Subtotal American River	5.6
Total TNF	**7.5**

Table 3.02-32 shows the HUC7 watersheds with the greatest "Higher Risk Route" perennial and intermittent stream crossing densities. Twelve of the these watersheds are in the Truckee River Basin, four are in the Feather River, two in the North Yuba, one in the South Yuba and one in the Middle Fork American River.

Table 3.02-32. HUC7 Watersheds with the greatest existing "Higher Risk Route" perennial and intermittent stream crossing densities (number of crossings per square mile of RCAs)

HUC7 Watershed	Watershed Name	Existing Stream Crossing Density
16050102010201	Donner Lake	11.8
16050102010305	Prosser Creek Reservoir	14.2
16050102010403	Middle Martis Creek	17.4
16050102010405	Lower Martis Creek	14.5
16050102020203	Kyburz Flat	15.5
16050102020302	Lower Sagehen Creek	17.8
16050102020402	Upper Sardine Valley	17.3
16050102020404	Hoke Valley	9.9
16050102020405	Stampede Reservoir	18.6
16050102020501	Little Truckee River-Canyon	10.1
16050102020502	Russell Valley	20.6
16050102020503	Boca Reservoir	12.6
18020123020101	Smithneck Creek-Trosi Canyon	16.7
18020123020104	Upper Bear Valley Creek	15.7
18020123020301	Upper Cold Stream	13.7
18020123020304	Lower Cold Stream	20.7
18020125010506	Cherokee Creek	15.0
18020125010507	North Yuba River-Indian Creek	9.2
18020125040106	South Yuba River-Pierce Meadow	12.8
18020128060101	Upper North Shirttail Canyon	15.3

Existing Seasonal Closures

The condition of "Higher Risk Routes" can quickly decline during winter or wet weather use due to rutting. Rutting is the process where soils are displaced and deform to the shape of the tire tracks that make their way through saturated soils. Rutting during the wet season can cause the break down of drainage control structures and increases the risk of runoff concentration and erosion; both from the tread surface and off the trail. Rutting can occur if traffic enters the area before the soils have sufficient drying time. To some extent wet season damage can be influenced by soil type, but all soil types are susceptible to wet season use. "Higher Risk Routes" are most susceptible to damage by motor vehicles when wet. Currently there are 3,388.7 miles of "Higher Risk Routes" that are open year round. Two hundred and thirty one miles of roads and trails are closed seasonally.

Existing Cross Country Travel

There are currently 717,900 acres containing 1,400 miles of motorized trails un-authorized for motorized use which are open to cross country travel on the Tahoe National Forest. Some of these motorized trails un-authorized for motorized use are stable and others are causing erosion and sediment delivery to water channels (See Appendix A, Road Cards). Existing cross-country prohibitions would continue on 86,500 acres.

Existing Equivalent Road Acres

The cumulative effects of this project on watershed resources are analyzed for the whole geographic area of the Tahoe National Forest are analyzed at several scales (Forest, HUC7 Watershed, and RCA (See Riparian Conservation Objective Analysis, Appendix R)). They represent the additive, incremental effects of past, present, and reasonably foreseeable future activities, actions, and decisions on the soil resource.

The Forest-wide CWE analysis run for a recent Forest-wide fire planning exercise and project specific NEPA documents were used to identify HUC 7 watersheds that are at or over Threshold of

Concern (TOC). Table 3.02-33 displays the number of watersheds and acres that are currently over the Threshold of Concern.

Table 3.02-33. Watersheds and acres that are currently over the Threshold of Concern

Threshold of Concern	Number of Watersheds	Acres
Over 100% Threshold of Concern	2	3,500
Under 100% Threshold of Concern	224	816,900

Currently there are two HUC7 watersheds that have been identified as being over TOC. These watersheds are Trout Creek and Alder Creek. The majority of the ERA disturbance in the Trout Creek and Alder Creek watersheds is due to the Tahoe Donner Subdivision on private land. This project does not propose to change the existing disturbance footprint, so the above referenced CWE results would still apply. Projects listed in Appendix Q (Wildlife Cumulative Effects) have been incorporated into this analysis.

Hydrology Environmental Consequences

This analysis is focused on the effects of three actions: (1) the prohibition of cross-country travel, (2) additions to the national forest transportation system (NFTS), and (3) changes to the class of vehicle and/or season of use on the National Forest Transportation System (NFTS).

Cross-country motorized vehicle travel increases the amount of native surface routes on the Tahoe National Forest. The motorized trails being considered for addition to the NFTS are native surface wheel tracks that currently exist on the ground, so the hydrologic footprint of the routes already exists. The primary change considered in this analysis are the prohibition of cross country travel, changes in miles of motorized use on existing “Higher Risk Routes” and changes in class of vehicle or season of use on the existing NFTS. Therefore, the effects of route designation on soil and watershed resources focus on “Higher Risk Routes” and private roads (with native surface) within the FS boundary. These are the roads and motorized trails where effects on soil and watershed resources are most likely to occur. Surfaced roads are not included because generally mechanical soil loss by erosion and subsequent sediment production is very low on them.

Methods Used to Assess Environmental Consequences

Metrics, such as, equivalent road acres, near stream route density, density of crossings, and/or presence of highly erodible sites/topography are being used to track changes in potential environmental effects to watershed resources. Tables of soil and watershed data used in this analysis can be found in Appendix D, Watershed Risk Assessment.

The approach used for analyzing watershed effects in this document relies on a road/trail-related erosion sensitivity analysis (EMDS Erosion Risk model), a watershed health assessment (a comparison of the route related stressors identified above), site-specific inventory data, and profession knowledge of the TNF summarized at the HUC7 watershed (2,500-10,000 acres), the River Basin, and the Forest scales.

This effects analysis considers all roads and motorized trails including private on the TNF, but focuses on “Higher Risk Routes” previously defined as native surface (dirt) roads and motorized trails.

Not incorporated in the focused analysis were surfaced roads, non-motorized trails, over-snow routes, private roads, and county and state roads.

Direct and Indirect Effects to Watershed Resources

Direct impacts to soils, watersheds and stream courses that result from this project are limited. There are no new ground disturbing activities proposed with this project. The routes being evaluated in this analysis already exist on the ground, but may require upgrading to NFTS standards as well as periodic maintenance. They are compacted and generally lack vegetation. Runoff from the surface is collected and discharged as potentially erosive flows at points below the road or motorized trail. Some are eroded or causing erosion, others are stable and are not causing any negative resource impacts. From the standpoint of watershed resources, most adverse impacts associated with these roads and motorized trails has already occurred. Therefore, on these routes the potential effects on watershed resources are related to sustaining road or trail function and protecting water quality. It should be noted that most roads and motorized trails on the Tahoe National Forest have some site specific risk to water resources. Many of these risks can be mitigated.

Road and trail closures may result in less erosion to the extent that recurrent disturbance of the soil surface by OHV traffic is the primary cause of erosion. In many situations, however, erosion and subsequent sediment delivery to water bodies is the result of a combination of factors that include motorized use, as well as, season of use, a lack of drainage, inadequate maintenance, and poor trail design or location. If non-motorized trail users continue to use the routes some erosion and sediment transport could continue to occur.

The primary concern or effect of this project on the watershed resource is the potential for soil erosion and subsequent effects of sediment transport and deposition. Subsequent sediment deposition can damage terrestrial plants and aquatic organisms. High levels of sediment deposition can also reduce the utility of facilities for water storage and diversion and hydroelectric production. Activities in and near stream channels have the greatest potential for altering sediment deliver and storage as well as channel form. Because this document covers existing wheel tracks, the impacts to hydrologic function, and buffering capacity have already taken place.

The erosion that may occur from the trail or road surface is a concern regarding loss or degradation of the facility, but not a particular concern for the watershed resource, because the travel way surface is a dedicated use and no longer dedicated to growing vegetation. The effects analysis for the soil resource will focus on the risk of soil erosion from trail/road runoff water to the soil adjacent to or down slope from the route. Erosion and sediment generated by the trail or road surface may be a concern to water quality if there is the potential for its delivery to a drainage feature.

The most serious impacts of roads and motorized trails occur where they are in close proximity to streams or wetlands (See Road Cards, Appendix A and RCO Analysis, Appendix R. Stream crossings have direct effects on the channel and local sediment regime. The basic problem comes down to disturbing the stream bed, banks, floodplain, and terraces of the stream. Streamflow diversions at road and motorized trail-stream crossings can result in significant erosion of road surfaces and hillslopes (for example, Best, 1995). Because the crossing is coincident with the channel, there is little opportunity to

buffer any impacts of the crossing. Also, ditches near the crossing drain directly into the stream, often contributing sediment to the stream. Although any stream crossing can have some impact on the channel, careful engineering, construction, and maintenance can limit the severity of the impacts.

All alternatives would have indirect effects on watershed resources, but they vary by alternative. Route designation would indirectly affect soil erosion and subsequent sediment delivery to streams to the extent that activities resulting from designation or closure (1) affect the amount of *traffic* on routes; (2) areas add motorized trails to the NFTS with highly erosive soils; (3) affect types of *maintenance*; and (4) affect the potential for *recovery* and restoration.

Recovery: See Soils section above

Projected Effects on Watershed Resources on the TNF

Projected Water Supply (direct, indirect, cumulative)

Because this project only designates the class of vehicles and season of use on existing routes and does not propose to construct any new routes, none of the action alternatives would impact water supply.

Projected Water Quality

There are six water bodies on the Tahoe National Forest that are listed as impaired on the EPA's 303(d) List. These are the Truckee River (sediment); Stampede Lake (pesticides of unknown origin), Donner Lake (PCBs), Kanaka Creek (arsenic), Squaw Creek (sediment and siltation) and Humbug Creek (lead, sediment, etc.). Table 3.02-34 displays the 303(d) listed water bodies, the reason for listing and any potential impacts which may contribute to the reasons for their listing.

Humbug Creek is listed as a 303(d) Impaired Water Body by EPA due to Copper, Mercury, Zinc, Sedimentation and Siltation. While the source of the Copper, Mercury and Zinc contamination is unknown, it is generally felt to be generated by abandon mines. There is no change under any of the alternatives to the number of abandon mines potentially contributing to this contamination.

The water body is also listed for sedimentation and siltation. Native surface roads and trails and their season of use can contribute to sedimentation and siltation. Virtually all of the native surface roads in this watershed are privately owned. None of the alternatives change the amount of private roads or their season of use. The Forest Service has jurisdiction of less than one mile of motorized trail un-authorized for motorized use in this watershed. All of the action alternatives except Alternative 5 prohibit use of this trail by motorized vehicles. In Alternative 5 this motorized trail is added to the National Forest Transportation System (NFTS), however seasonal restrictions prohibit use of this motorized trail during the wet time of the year thereby reducing the potential for sedimentation and siltation.

Cross country travel by motorized vehicles can also have an impact of sedimentation and siltation. Cross country travel is prohibited in all of the action alternatives.

Kanaka Creek is listed as a 303(d) Impaired Water Body by EPA due to Arsenic. While the source of the Arsenic contamination is unknown, it is generally felt to be due the number of abandon mines in the area and the type of rock formations. None of the alternatives change the number of abandon mines nor alter the rock formations.

Donner Lake is listed as a 303(d) Impaired Water Body by EPA due to Priority Organics (PCB). While the source of the Priority Organics contamination is unknown, it is generally felt to be due historic activity associated with the transportation utility corridor running through the watershed. None of the alternatives change the activities associated with the transportation utility corridor.

Table 3.02-34. 303(d) listed water bodies, the reason for listing and potential impacts

Impaired Water Body	Pollutant/Stressor	Indicator of Potential Impact	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Humbug Creek	Copper, Mercury, Zinc, Sedimentation & Siltation	National Forest System Native Surface Roads and Trails Open Year Round (Miles)	<1	0	0	0	0	0	0
		National Forest System Native Surface Roads and Trails Open Seasonally (Miles)	0	0	0	0	<1	0	0
		Private Ownership Native Surface Roads and Trails Open Year Round (Miles)	4	4	4	4	4	4	4
		Cross Country Travel	Continues	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
		Abandon Mines	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Kanaka Creek	Arsenic	Mining, Rock Formations	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Donner Lake	Priority Organics	Transportation Utility Corridor Activity	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Stampede Reservoir	Pesticide (lindane)	Pesticide Applications	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Squaw Creek	Sediment & Siltation	National Forest System Native Surface Roads and Trails Open Year Round (Miles)	<1	0	0	0	0	0	0
		National Forest System Native Surface Roads and Trails Open Seasonally (Miles)	0	0	0	0	<1	0	0
		Private Ownership Native Surface Roads and Trails Open Year Round (Miles)	40	40	40	40	40	40	40
		Cross Country Travel	Continues	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
Truckee River	Sediment & Siltation	National Forest System Native Surface Roads and Trails Open Year Round (Miles)	685	494	434	0	3	3	451
		National Forest System Native Surface Roads and Trails Open Seasonally (Miles)	0	0	0	449	598	488	0
		Private Ownership Native Surface Roads and Trails Open Year Round (Miles)	628	628	628	628	628	628	628
		OHV Open Areas (Number)	4	4	1	1	4	4	4
		Cross Country Travel	Continues	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

Stampede Reservoir is listed as a 303(d) Impaired Water Body by EPA due to Pesticides (lindane). While the source of the Priority Organics contamination is unknown, it is generally felt to be due historic pesticide applications in the area. None of the alternatives change the activities associated with pesticide applications in the area.

Squaw Creek is listed as a 303(d) Impaired Water Body by EPA due to Sedimentation and Siltation.

Native surface roads and trails and their season of use can contribute to sedimentation and siltation. Virtually all of the native surface roads in this watershed are privately owned. None of the alternatives change the amount of private roads or their season of use. The Forest Service has jurisdiction of less than one mile of motorized trail un-authorized for motorized use in this watershed. All of the action alternatives except Alternative 5 prohibit use of this trail by motorized vehicles. In Alternative 5 this motorized trail is added to the NFTS, however seasonal restrictions prohibit use of this motorized trail during the wet time of the year thereby reducing the potential for sedimentation and siltation.

Cross country travel by motorized vehicles can also have an impact of sedimentation and siltation. Cross country travel is prohibited in all of the action alternatives.

The **Truckee River** is listed as a 303(d) Impaired Water Body by EPA due to Sedimentation and Siltation.

Native surface roads and trails and their season of use can contribute to sedimentation and siltation. Approximately half (628 miles) of the native surface roads in this watershed are privately owned. None of the alternatives change the amount of private roads or their season of use. The Forest Service has jurisdiction of 685 miles of native surface roads and motorized trails within this watershed. All of the action alternatives reduce the number of native surface roads and motorized trails available for use by motorized vehicles by approximately 100 miles (15%). In addition Alternatives 4, 5 and 6 include seasonal restrictions which prohibit use of these roads during the wet time of the year thereby reducing the potential for sedimentation and siltation.

There are also 4 OHV open areas within this watershed. The Prosser Pits OHV Open Area is already designated as an “Open Area.” Any sedimentation being generated by this area would continue under all alternatives. Boca, Prosser and Stampede Reservoirs are currently managed to allow access to the shoreline below the high water line by motor vehicles when the soils are dry. Speeds are generally slow and since this access is allowed on dry soils only any additional sediment generated by vehicles accessing the shoreline is minimal. Some fugitive dust could be created by the vehicles on the dry soils and possible drift into the reservoir, but the amount is also felt to be minimal. These reservoirs are designated as “Open Areas” for shoreline access by motorized vehicles in Alternative 2. The use of these dry lake beds by motorized vehicles is prohibited in Alternatives 3, 4, 5, 6 and 7. Use is not prohibited at these reservoirs in Alternative 1.

Cross country travel by motorized vehicles can also have an impact of sedimentation and siltation. Cross country travel is prohibited in all of the action alternatives.

Stream crossings and “Higher Risk Routes” within close proximity to streams are the areas of highest potential sediment delivery to the stream channel. Figure 3.02-8 shows “Higher Risk Route” perennial and intermittent stream crossing density by alternative. Figure 3.02-9 shows the “Higher Risk Route”

density in RCAs by alternative. All action alternatives would decrease the density of "Higher Risk Routes" within RCAs and "Higher Risk Route" stream crossings.

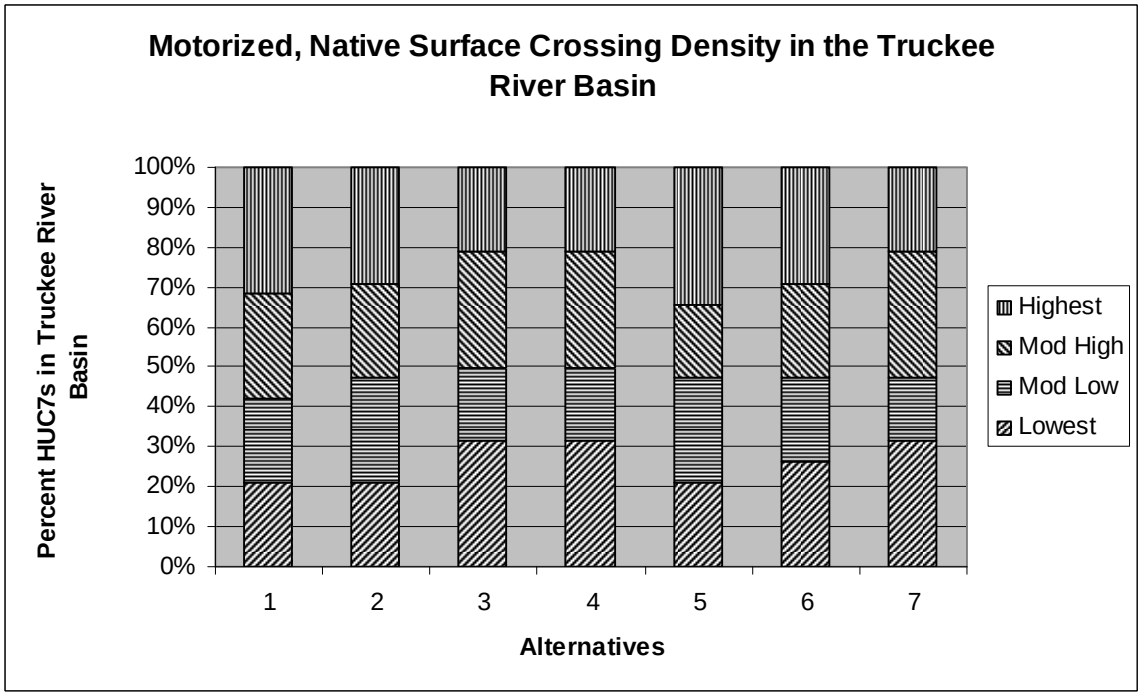

Figure 3.02-8. "Higher Risk Route" crossing density in the Truckee River Basin (within the TNF boundary) by Alternative

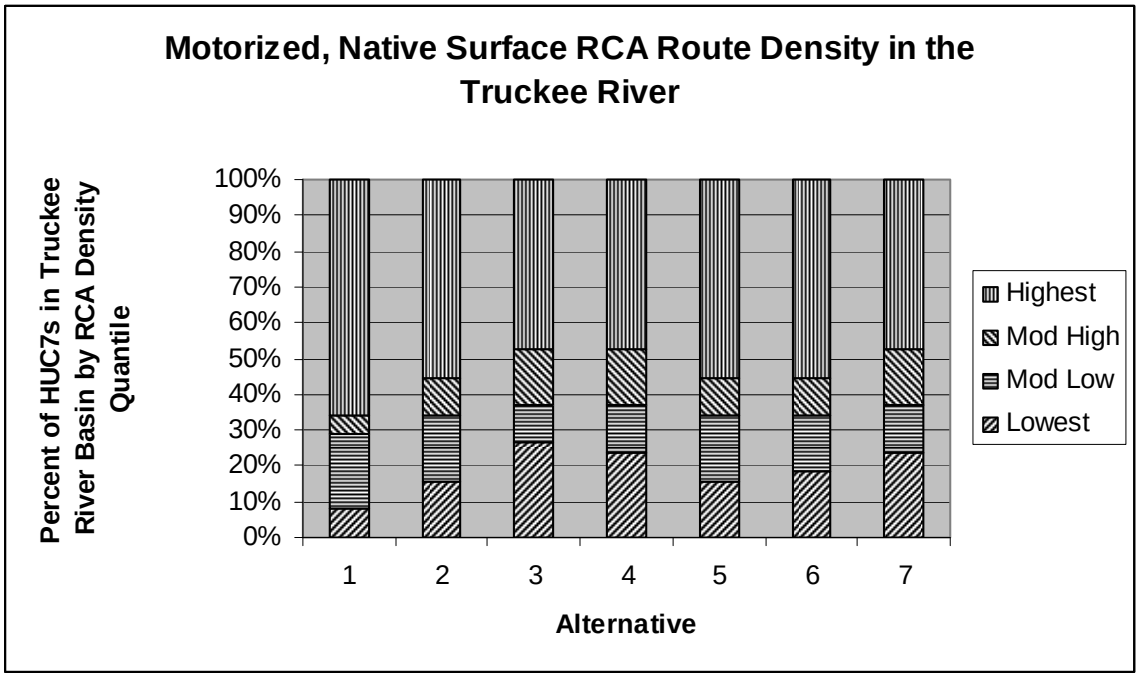

Figure 3.02-9. "Higher Risk Route" density in RCAs in the Truckee River Basin (within the TNF boundary) by Alternative

Projected Watershed Connectivity

Connectivity refers to the ease of movement, or rates of exchange, with which water, energy, nutrients, and organisms pass from one area to another, unhindered in the absence of impediments, such as dams, diversions, roads and bridges, large habitat openings, and recreational developments. As ecosystems become fragmented and disconnected, the scale and rate at which essential processes, such as nutrient and energy cycling and gene flow, operate become restricted. Effects on watershed connectivity are estimated using the following metrics:

- Near Stream Route Density and
- Stream Crossing Density

Projected Near Stream "Higher Risk Route" density

Densities of native surface roads and motorized trails ("Higher Risk Routes") within Riparian Conservation Areas (RCAs) serve as a relative measure of watershed connectivity. The greater the density of "Higher Risk Routes" open to motorized vehicles within RCAs, the greater the potential risk to watershed connectivity.

Table 3.02-35 shows the density of "Higher Risk Routes" within RCAs by major river basin and alternative. The No Action alternative (Alternative 1) has the greatest density of "Higher Risk Routes" within RCAs. All action alternatives would result in a lower density of "Higher Risk Routes" in RCAs than in the existing condition (Alt. 1). Alternatives 3, 4 and 7 would have the lowest density of "Higher Risk Routes" in RCAs. Alternative 6 densities would be slightly higher than alternatives 3, 4 and 7. Alternatives 2 and 5 would result in the largest density of "Higher Risk Routes" in RCAs of all the action alternatives.

Table 3.02-35. "Higher Risk Route" density in RCAs by river basin and alternative (mi./sq. mi.)

River Basin	HUC 7 Watershed Acres	RCA Acres	Alt. 1 Density	Alt. 2 Density	Alt. 3 Density	Alt. Density	Alt. 5 Density	Alt. 6 Density	Alt. 7 Density
Truckee River	135,794	28,912	3.2	2.5	2.3	2.3	2.5	2.4	2.3
Feather River	57,896	11,091	1.8	1.7	1.2	1.3	1.7	1.5	1.3
North Yuba River	152,490	36,322	1.7	1.2	1.0	1.0	1.5	1.1	1.0
Middle Yuba River	47,291	9549	0.9	0.6	0.5	0.6	0.6	0.6	0.5
South Yuba River	104,205	23,813	1.6	1.5	1.3	1.3	1.5	1.5	1.3
Subtotal Yuba River	**303,986**	**69,684**	**1.5**	**1.2**	**1.0**	**1.0**	**1.3**	**1.1**	**1.0**
Bear River	12,452	3909	1.1	1.0	0.7	0.8	1.1	1.0	0.8
Middle Fork American River	87,674	19,070	1.2	1.2	1.0	1.0	1.3	1.1	1.0
North Fork American River	92,713	20,159	1.5	1.2	1.1	1.1	1.2	1.1	1.1
Subtotal American River	**180,387**	**39,229**	**1.3**	**1.2**	**1.0**	**1.0**	**1.2**	**1.1**	**1.0**
Total TNF	**1,174,888**	**261,738**	**1.7**	**1.4**	**1.2**	**1.2**	**1.5**	**1.4**	**1.2**

For the purposes of this analysis, a density of more than 3.5 miles per square mile of "Higher Risk Routes" within Riparian Conservation Areas was considered to be a high density (highest existing density quartile). Table 3.02-36 and Figure 3.02-10 shows the percent of watersheds on the TNF with the highest and lowest "Higher Risk Route" densities in RCAs. The percent of watersheds with RCA "Higher Risk Route" densities less than 1.6 miles per square mile of RCA (lowest density) would increase from the existing 26 percent to 40 to 50 percent in the action alternatives. The river basins with higher RCA route densities would have higher risk of negative watershed effects than areas of lower RCA route densities.

- Alternative 1 (No Action) would maintain the existing 26 percent of HUC7 watersheds with RCA "Higher Risk Route" densities that less than 1.6 miles per square mile and 24 percent with RCA "Higher Risk Route" densities that exceed 3.5 miles per square mile.
- Alternative 2 would result in 41 percent of HUC7 watersheds with RCA "Higher Risk Route" densities that are less than 1.6 miles per square mile and 19 percent with RCA "Higher Risk Route" densities that exceed 3.5 miles per square mile.
- Alternative 3 would result in 51 percent of HUC7 watersheds with RCA "Higher Risk Route" densities that are less than 1.6 miles per square mile and 14 percent with RCA "Higher Risk Route" densities that exceed 3.5 miles per square mile.
- Alternatives 4 and 7 would result in 50 percent of HUC7 watersheds with RCA "Higher Risk Route" densities that are less than 1.6 miles per square mile and 14 percent with RCA "Higher Risk Route" densities that exceed 3.5 miles per square mile.
- Alternative 5 would result in 40 percent of HUC7 watersheds with RCA "Higher Risk Route" densities that are less than 1.6 miles per square mile and 20 percent with RCA "Higher Risk Route" densities that exceed 3.5 miles per square mile.
- Alternative 6 would result in 44 percent of HUC7 watersheds with RCA "Higher Risk Route" densities that are less than 1.6 miles per square mile and 16 percent with RCA "Higher Risk Route" densities that exceed 3.5 miles per square mile.

All action alternatives would lower the potential impacts to soil and watershed resources by decreasing the amount of all season motorized use on unmaintained routes in RCAs.

Table 3.02-36. Percent of watersheds with "Higher Risk Route" density greater than 3.5 and less than 1.6 miles per square mile in Riparian Conservation Areas

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Percent of Watersheds with a high density (>3.5 Miles/Square Mile) of "Higher Risk Routes" In Riparian Conservation Areas	24%	19%	14%	14%	20%	16%	14%
Percent of Watersheds with a low density (<1.6 Miles/Square Mile) of "Higher Risk Routes" In Riparian Conservation Areas	26%	41%	51%	50%	40%	44%	50%

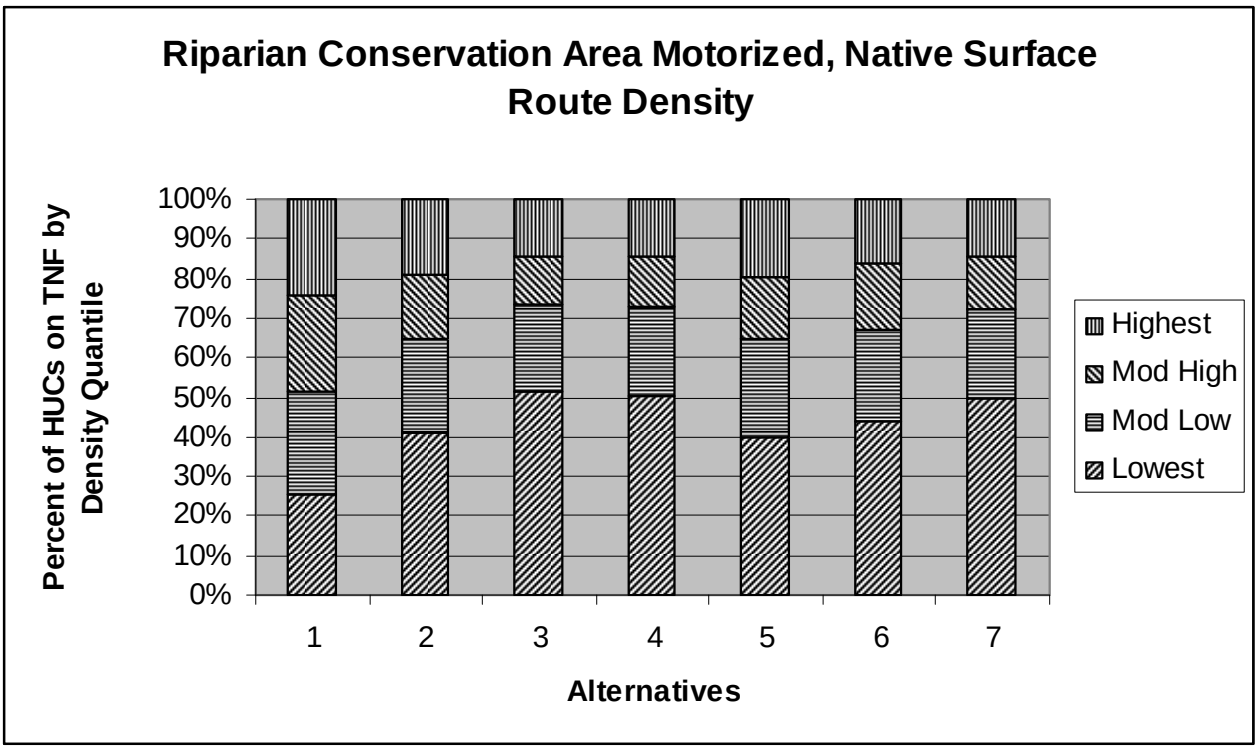

Figure 3.02-10. Density of "Higher Risk Routes" (Miles per Square Mile) in Riparian Conservation Areas

Riparian Conservation Area Route Density

Prohibition on Cross Country Travel: All of the action alternatives prohibit cross country travel. This prohibition will reduce the "Higher Risk Route" density in Riparian Conservation Areas (RCAs) in all watersheds across the forest. It would also prevent the proliferation of any new motorized trails un-authorized for motorized use which could increase "Higher Risk Route" density in RCAs. The impacts on "Higher Risk Route" density in RCAs resulting from the prohibition on cross country travel is displayed in Table 3.02-37. All action alternatives would decrease the density of "Higher Risk Routes" in RCAs by less than 1 mile per square mile. The largest decreases in all action alternatives are found in the Truckee River Basin (0.9 mi/sq mi). Decreases in "Higher Risk Route" density in RCAs would average 0.3 miles/square mile in the American and Bear River Basins and 0.5 miles/square mile in the Yuba River Basin. The prohibition of cross country travel would also decrease the average "Higher Risk Route" density in RCAs across the Tahoe National Forest by 0.5 mi/ square mile.

Table 3.02-37. Changes in "Higher Risk Route" density in Riparian Conservation Areas (RCAs) by river basin due to the prohibition of cross country travel (mi./sq. mi.)

River Basin	RCA Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	28,912	0.0	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
Feather River	11,091	0.0	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
North Yuba River	36,322	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Middle Yuba River	9549	0.0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
South Yuba River	23,813	0.0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Subtotal Yuba River	**69,684**	**0.0**	**-0.5**	**-0.5**	**-0.5**	**-0.5**	**-0.5**	**-0.5**
Bear River	3909	0.0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Middle Fork American River	19,070	0.0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
North Fork American River	20,159	0.0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Subtotal American River	**39,229**	**0.0**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**
Total TNF	**261,738**	**0.0**	**-0.5**	**-0.5**	**-0.5**	**-0.5**	**-0.5**	**-0.5**

Motorized Trail Additions to the National Forest Transportation System (NFTS). There are no motorized trail additions to the NFTS under Alternative 1. The action alternatives would add between 31.2 and 282.8 miles of native surface, motorized trails to the NFTS. Motorized trail additions to the NFTS would have minimal effects to soil resources, because these trails are already part of the disturbance footprint and would be managed according to TNF trail and resource standards. Appendix A, Road Cards, has the mitigation requirements that are needed to add the motorized trails to the NFTS with minimal impacts to soil resources.

Table 3.02-38 displays changes in "Higher Risk Route" density in RCAs due to motorized trail additions to the NFTS. There would be no change to the current "Higher Risk Route" density in due to additions to the NFTS under Alternatives 1 and 3. Alternatives 4 and 7 would result in increases of 0.1 mile per square mile in the Truckee and Yuba River basins. Alternative 6 would increase "Higher Risk Route" density in RCAs by 0.1-0.5 miles per square mile in all watersheds. Alternatives 2 and 5 would increase "Higher Risk Route" density in RCAs by 0.2-0.9 miles per square mile in all watersheds.

Table 3.02-38. Changes in "Higher Risk Route" density in Riparian Conservation Areas (RCAs) due to motorized trail additions to the National Forest Transportation System (mi./sq. mi.)

River Basin	RCA Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	28,912	0.0	0.3	0.0	0.1	0.4	0.2	0.1
Feather River	11,091	0.0	0.9	0.0	0.0	0.9	0.4	0.0
North Yuba River	36,322	0.0	0.4	0.0	0.0	0.7	0.2	0.0
Middle Yuba River	9549	0.0	0.0	0.0	0.0	0.1	0.0	0.0
South Yuba River	23,813	0.0	0.3	0.0	0.0	0.3	0.2	0.0
Subtotal Yuba River	**69,684**	**0.0**	**0.5**	**0.0**	**0.1**	**0.5**	**0.5**	**0.1**
Bear River	3909	0.0	0.3	0.0	0.0	0.5	0.2	0.0
Middle Fork American River	19,070	0.0	0.2	0.0	0.0	0.2	0.1	0.0
North Fork American River	20,159	0.0	0.2	0.0	0.0	0.2	0.0	0.0
Subtotal American River	**39,229**	**0.0**	**0.2**	**0.0**	**0.0**	**0.2**	**0.1**	**0.0**
Total TNF	**261,738**	**0.0**	**0.2**	**0.0**	**0.0**	**0.2**	**0.2**	**0.0**

Changes to Class of Vehicles and/or Season of Use: Changing the class of vehicle allowed to use a particular NFTS road from "Highway Legal Vehicles Only" to "All Vehicles" could change the impacts to soil and watershed resources due to the change in road surface. Therefore, these roads are considered high risk even though they already have "hardened" surfaces that lack vegetation. It is likely that direct impacts to soil and watershed resources occurred when the road was constructed. Impacts may still be occurring if the road is collecting and concentrating overland flow of water and increasing erosion rates. These indirect and cumulative impacts would continue regardless of the type of vehicle using the road. When the maintenance level of a particular route changes (the maintenance level does not always change when class of vehicle changes), the risk of erosion can increase. However, all roads would be maintained for resource needs no matter what maintenance level. Table 3.02-39 displays changes in "Higher Risk Route" density in RCAs due to changes in class of vehicles on existing NFTS roads by alternative. No changes to class of vehicles in Alternatives 1, 3, 4 and 7. Alternatives 2, 5, and 6 would result in an increase of 0.1 miles per square mile in the Feather River basin and 0.2 miles per square mile over the entire Tahoe National Forest.

Native surface roads and trails ("Higher Risk Routes") are most susceptible to damage by motor vehicles when wet. The condition of "Higher Risk Routes" can quickly decline during winter or wet weather use due to rutting. Wet season use of "Higher Risk Routes" often leaves ruts which channel water and increase the erosive power of that water, this can lead to increased erosion both on the trail and adjacent to the trail. Many of the impacts found during field surveys were caused by wet season use of "Higher Risk Routes".

Implementing seasonal closures would reduce rutting and subsequent channeling of surface water runoff. Seasonal closures would decrease the potential effects of motorized vehicle use on "Higher Risk Routes" by decreasing erosion and sedimentation.

Alternatives 1, 2, 3 and 7 all have the vast majority of "Higher Risk Routes" open year round and, therefore, have a higher risk to watershed resources. The wet weather seasonal closures imposed in

Alternatives 4, 5 and 6 results in all of the "Higher Risk Routes" being closed during the wet time of the year, thus greatly reducing potential negative impacts to soil resources and to water quality. The benefits of seasonal closures would be equal to prohibition on cross country travel and would by far exceed adding between 31.2 and 282.8 miles of native surface, motorized trails (with an existing disturbance footprint) into the NFTS.

Table 3.02-39. Changes "Higher Risk Route" density within Riparian Conservation Areas due to changes in the class of vehicle on existing NFTS roads (mi./sq. mi.)

River Basin	RCA Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	28,912	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feather River	11,091	0.0	0.1	0.0	0.0	0.1	0.1	0.0
North Yuba River	36,322	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Yuba River	9549	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Yuba River	23,813	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Yuba River	**69,684**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Bear River	3909	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Fork American River	19,070	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Fork American River	20,159	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal American River	**39,229**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total TNF	**261,738**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Cumulative Effects: This project would not change the footprint of current wheel-tracks on the Tahoe National Forest. All action alternatives would result in a net reduction in "Higher Risk Route" density in Riparian Conservation Areas (RCAs) across all river basins. All action alternatives would result in a very slight decrease in the risk of negative cumulative effects to watersheds. The cumulative impacts on "Higher Risk Route" density in RCAs resulting from this project are displayed in Table 3.02-40. Alternative 1 represents the existing condition. Alternatives 2 through 7 would represent the risk at twenty years (when motorized trails prohibited to motorized use would have recovered hydrologically). The action alternatives would decrease "Higher Risk Route" density in RCAs by 0.7 to 0.9 miles per square mile in the Truckee River basin, 0.1 to 0.6 miles per square mile in the Feather River basin, 0.2 to 0.5 miles per square mile in the Yuba River basin, 0.1 to 0.4 miles per square mile in the Bear River basin, 0.1 to 0.3 miles per square mile in the American River basin and 0.2 to 0.5 miles per square mile across the Tahoe National Forest. Alternative 1would have the highest risk of negative cumulative effects followed by Alternative 2, Alternative 5, Alternative 6, Alternative 4, Alternative 7, then Alternative 3 in order of highest to lowest potential impact. The differences in the risk of negative impacts between some of the alternatives would be hard to measure.

Table 3.02-40. Cumulative "Higher Risk Route" density in Riparian Conservation Areas after 20 years (mi./sq./mi.)

River Basin	RCA Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	28,912	3.2	2.5	2.3	2.3	2.5	2.4	2.3
Feather River	11,091	1.8	1.7	1.2	1.3	1.7	1.5	1.3
North Yuba River	36,322	1.7	1.2	1.0	1.0	1.5	1.1	1.0
Middle Yuba River	9549	0.9	0.6	0.5	0.6	0.6	0.6	0.5
South Yuba River	23,813	1.6	1.5	1.3	1.3	1.5	1.5	1.3
Subtotal Yuba River	**69,684**	**1.5**	**1.2**	**1.0**	**1.0**	**1.3**	**1.1**	**1.0**
Bear River	3909	1.1	1.0	0.7	0.8	1.1	1.0	0.8
Middle Fork American River	19,070	1.2	1.2	1.0	1.0	1.3	1.1	1.0
North Fork American River	20,159	1.5	1.2	1.1	1.1	1.2	1.1	1.1
Subtotal American River	**39,229**	**1.3**	**1.2**	**1.0**	**1.0**	**1.2**	**1.1**	**1.0**
Total TNF	**261,738**	**1.7**	**1.4**	**1.2**	**1.2**	**1.5**	**1.4**	**1.2**

Projected Stream Crossing Density

Another common measure of hydrologically connected routes is stream crossing densities within Riparian Conservation Areas. A higher density of stream crossings in Riparian Conservation Areas (RCAs) has the potential to adversely impact water quality. There are approximately 21,347 motorized stream crossings currently on the forest (2,175 perennial, 2,064 intermittent, and 17,108 ephemeral). As discussed in the Existing Environment section, the GIS layer used for the assessment of the ephemeral stream system has not been field verified. Field surveys associated with this project have not found as many crossings as predicted. So while the ephemeral stream crossing layer is used to guide the risk assessment for potential areas of concern, it is not being used in the assessment of projected stream crossing density. Ephemeral streams are included in the RCA route density analysis which should cover concerns for motorized, native surface road and trail use in these areas. Inventoried ephemeral crossings are also considered in this throughout this analysis.

This analysis focuses on native surface roads and trails open for motorized use previously defined as ""Higher Risk Routes"." Not incorporated in the focused analysis were surfaced roads, non-motorized trails, over-snow routes, and county and state roads because these routes tend to be more stable.

Table 3.02-41 shows the density of "Higher Risk Route" stream crossings in RCAs by major river basin. The No Action alternative (Alternative 1) has the greatest density of "Higher Risk Route" stream crossings in RCAs. All action alternatives would result in a lower density of "Higher Risk Route" stream crossings in RCAs than in the existing condition (Alt. 1). Alternatives 3, 4 and 7 would have the lowest density of "Higher Risk Route" stream crossings in RCAs. Alternative 6 densities would be slightly higher than Alternatives 3, 4 and 7. Alternatives 2 and 5 would result in the highest stream crossing densities of the action alternatives.

Table 3.02-41. "Higher Risk Route" stream crossing density in Riparian Conservation Areas (number of crossings per square mile of RCAs)

River Basin	River Basin Acres	RCA Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	200,500	40,495	8.4	7.5	6.8	6.9	7.6	7.3	6.9
Feather River	112,534	21,927	13.7	12.6	10.2	10.4	12.6	11.8	10.4
North Yuba River	229,995	55,169	6.7	5.7	3.8	3.8	6.5	4.3	3.8
Middle Yuba River	126,370	24,674	8.4	7.1	6.3	6.3	7.1	7.1	6.3
South Yuba River	170,886	36,943	6.4	5.9	5.0	5.0	5.9	5.6	5.0
Subtotal Yuba River	**527,252**	**116,786**	**7.0**	**6.0**	**4.7**	**4.7**	**6.5**	**5.3**	**4.7**
Bear River	20,112	6,067	6.8	5.3	4.3	4.5	5.3	5.3	4.5
Middle Fork American River	146,533	32,590	6.8	6.5	5.5	5.5	7.0	6.3	5.5
North Fork American River	133,107	29,303	4.3	3.5	3.1	3.1	3.5	3.5	3.1
Subtotal American River	**279,639**	**61,893**	**5.6**	**5.1**	**4.4**	**4.4**	**5.3**	**4.9**	**4.4**
Total TNF	**1,946,928**	**247,169**	**7.5**	**6.6**	**5.4**	**5.5**	**6.9**	**6.1**	**5.5**

To be consistent with the rest of the analysis in this section, watersheds were separated into quartiles based on the density of miles open for motorized use of "Higher Risk Routes" as described earlier. These categories are:

Level of Risk	**"Higher Risk Route" density by Watershed** (mi./sq. mi.)
Highest	10.3 Plus
High Risk	6.7 to 10.3
Low Risk	3.9 to 6.6
Lowest Risk	0 to 3.8

Table 3.02-42 shows the watersheds with the highest existing "Higher Risk Route" perennial and intermittent stream crossings densities and the changes in crossing density with each of the action alternative. Thirteen watersheds would have a decrease in crossing densities in all action alternatives. In the South Yuba River-Pierce Meadow watershed crossing densities would stay the same through all action alternatives. One watershed (North Yuba River- Indian Creek) would have an increase in crossing density in Alternatives 2 and 5. The increase in crossing density is due to changes in class of vehicles on existing NFTS roads from "Open to Highway Legal Vehicles Only" to "Open to All Vehicles" and the associated change in road surface.. Five watersheds (Lower Sagehen Creek, Hoke Valley, Little Truckee River-Canyon, Upper Cold Stream, and Lower Cold Stream) would have higher crossing densities in Alternatives 2, 5, and 6 also due to changes in class of vehicles on existing NFTS roads from "Open to Highway Legal Vehicles Only" to "Open to All Vehicles" and the associated change in road surface.

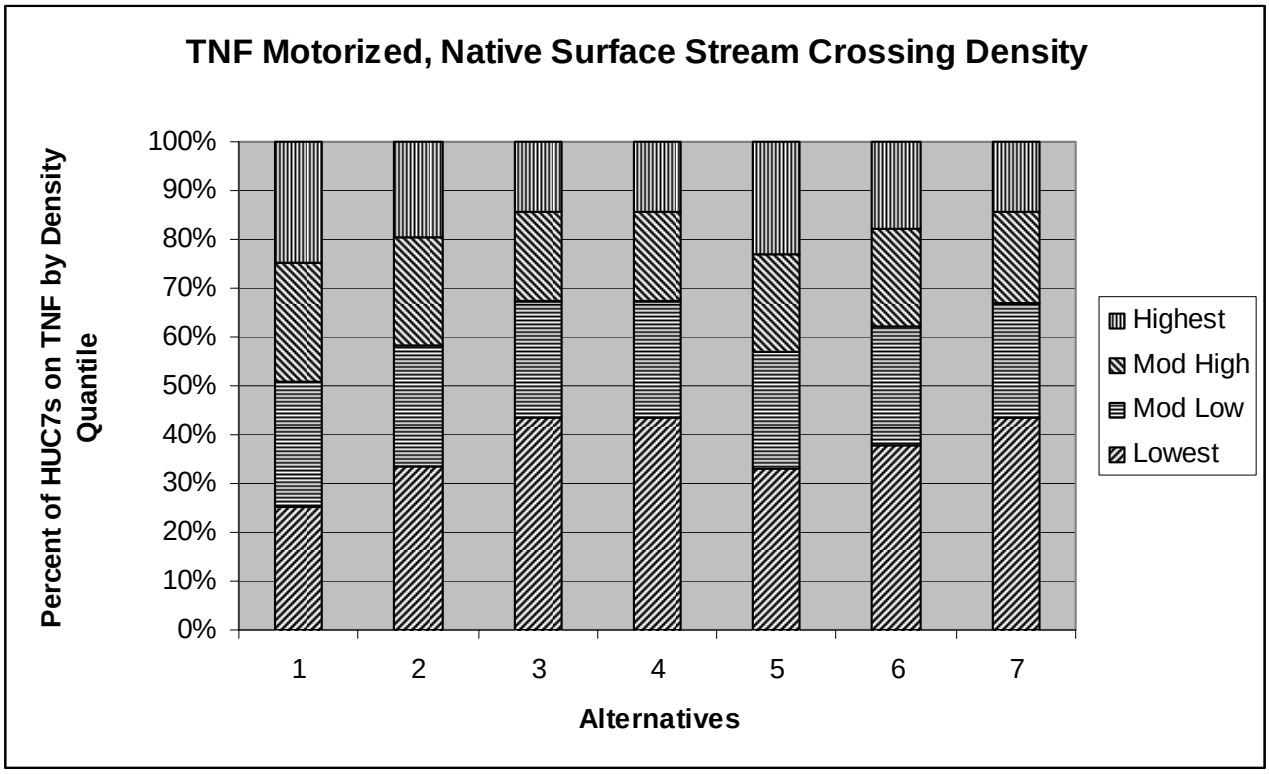

Figure 3.02-11. "Higher Risk Route" perennial and intermittent stream crossing density (crossings per square mile of Riparian Conservation Area)

Figure 3.02-11. shows that all action alternatives would decrease the density of perennial and intermittent "Higher Risk Route" crossings. Alternative 3 would result in the largest decrease in "Higher Risk Route" crossing density and Alternative 5 the smallest decrease.

Table 3.02-42. "Higher Risk Route" crossing density in Riparian Conservation Areas (RCAs) by alternative (crossings/sq. mi. of RCAs)

HUC7 Number	Watershed Name	Alt 1 Density	Alt 2 Density	Alt 3 Density	Alt 4 Density	Alt 5 Density	Alt 6 Density	Alt 7 Density
16050102010201	Donner Lake	11.8	11.1	11.1	11.1	11.1	11.1	11.1
16050102010305	Prosser Creek Reservoir	14.2	10.1	10.1	10.1	10.5	10.1	10.1
16050102010403	Middle Martis Creek	17.4	17.4	17.4	17.4	17.4	17.4	17.4
16050102010405	Lower Martis Creek	14.5	14.5	14.5	14.5	14.5	14.5	14.5
16050102020203	Kyburz Flat	15.5	12.8	12.8	12.8	12.8	12.8	12.8
16050102020302	Lower Sagehen Creek	17.8	20.4	16.5	16.5	20.4	20.4	16.5
16050102020402	Upper Sardine Valley	17.3	12.4	12.4	12.4	12.4	12.4	12.4
16050102020404	Hoke Valley	9.9	12.4	6.2	6.2	12.4	12.4	8.7
16050102020405	Stampede Reservoir	18.6	10.1	8.9	10.1	10.4	10.1	10.1
16050102020501	Little Truckee River-Canyon	10.1	11.3	7.4	7.8	11.6	11.3	7.8

HUC7 Number	Watershed Name	Alt 1 Density	Alt 2 Density	Alt 3 Density	Alt 4 Density	Alt 5 Density	Alt 6 Density	Alt 7 Density
16050102020502	Russell Valley	20.6	17.7	17.3	17.3	18.1	17.7	17.3
16050102020503	Boca Reservoir	12.6	11.2	10.2	10.2	11.2	11.2	10.2
18020123020101	Smithneck Creek-Trosi Canyon	16.7	14.4	13.8	14.4	14.4	14.4	14.4
18020123020104	Upper Bear Valley Creek	15.7	15.7	10.0	10.0	15.7	10.0	10.0
18020123020301	Upper Cold Stream	13.7	14.6	10.0	10.0	14.6	14.6	10.0
18020123020304	Lower Cold Stream	20.7	30.6	16.2	18.0	30.6	26.1	18.0
18020125010506	Cherokee Creek	15.0	5.4	3.6	3.6	13.8	7.8	3.6
18020125010507	North Yuba River-Indian Creek	9.2	13.1	6.8	6.8	13.1	6.8	6.8
18020125040106	South Yuba River-Pierce Meadow	12.8	12.8	12.8	12.8	12.8	12.8	12.8
18020128060101	Upper North Shirttail Canyon	15.3	10.7	10.7	10.7	10.7	10.7	10.7

All Action Alternatives would reduce the density of “Higher Risk Route” stream crossings and thus improve water quality conditions. All Action alternatives would decrease the percent of HUC7 watershed on the Tahoe National Forest with the highest density category of stream crossings in Riparian Conservation Areas. Conversely all of the action alternatives increase the percent of watershed in the lowest category of stream crossing density in Riparian Conservation Areas. Alternatives 3 and 4 would have the largest potential improvement in water quality conditions. Alternative 5 would have the smallest improvement.

“Higher Risk Route” Perennial and Intermittent Stream Crossing Density in Riparian Conservation Areas (RCAs)

Prohibition on Cross Country Travel: All of the action alternatives prohibit cross country travel. This prohibition will reduce the density “Higher Risk Route” perennial and intermittent stream crossings in RCAs in all watersheds across the forest. It would also prevent the proliferation of any new motorized trails un-authorized for motorized use which could increase stream crossing density. The impacts on “Higher Risk Route” stream crossing density in riparian conservation areas resulting from the prohibition on cross country travel is displayed in Table 3.02-43. The action alternatives would decrease the crossing density in the Truckee River basin by 1.7 crossings per square mile of riparian conservation area, the Feather River basin by 3.5 crossings per square mile, the Bear River basin by 2.4 crossings per square mile, the Yuba River basin by 2.3 crossings per square mile, the American river basin by 1.3 crossings per square mile, and 2.0 crossings per square mile on the Tahoe National Forest.

Table 3.02-43. Changes in "Higher Risk Route" stream crossing density in RCAs by river basin due to the prohibition of cross country travel (crossing/sq. mi.)

River Basin	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	0.0	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7
Feather River	0.0	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
North Yuba River	0.0	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9
Middle Yuba River	0.0	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
South Yuba River	0.0	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
Subtotal Yuba River	**0.0**	**-2.3**	**-2.3**	**-2.3**	**-2.3**	**-2.3**	**-2.3**
Bear River	0.0	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Middle Fork American River	0.0	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3
North Fork American River	0.0	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Subtotal American River	**0.0**	**-1.3**	**-1.3**	**-1.3**	**-1.3**	**-1.3**	**-1.3**
Total TNF	**0.0**	**-2.0**	**-2.0**	**-2.0**	**-2.0**	**-2.0**	**-2.0**

Motorized Trail Additions to the National Forest Transportation System (NFTS): There are no motorized trail additions to the NFTS under Alternative 1. The action alternatives would add between 31.2 and 282.8 miles of "Higher Risk Routes" to the National Forest Transportation System as motorized trails. Additions to the system would have minimal effects to soil resources, because these "Higher Risk Routes" are already part of the disturbance footprint and would be managed according to TNF trail and resource standards. Appendix A, Road Cards, has mitigations that are needed to add the motorized trails to the NFTS with minimal impacts to soil resources.

Table 3.02-44 displays changes in "Higher Risk Route" stream crossing density in RCAs due to motorized trail additions to the NFTS by alternative. There would be no change the current stream crossing density due to motorized trail additions to the NFTS under Alternatives 1 and 3. Alternatives 4 and 7 would result in increases of 0.1 "Higher Risk Route" crossings per square mile of RCAs in the Truckee and Feather River basins and 0.2 "Higher Risk Route" crossings per square mile of RCAs in the Yuba River basins. Alternative 6 would increase "Higher Risk Route" RCA crossing density by 0.4-0.8 crossings per square mile in all watersheds. Alternatives 2 and 5 would increase "Higher Risk Route" stream crossing density in RCAs by 0.4-1.6 crossings per square mile in all watersheds. In the North Yuba River, Alternative 5 would increase "Higher Risk Route" stream crossing density by 2.6 crossings per square mile of RCAs.

Table 3.02-44. Changes in "Higher Risk Route" stream crossing density in Riparian Conservation Areas (RCAs) due to motorized trail additions to the National Forest Transportation System (crossing/sq. mi.)

River Basin	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	0.0	0.6	0.0	0.1	0.6	0.3	0.1
Feather River	0.0	1.6	0.0	0.1	1.6	0.8	0.1
North Yuba River	0.0	1.7	0.0	0.0	2.6	0.4	0.0
Middle Yuba River	0.0	0.4	0.0	0.0	0.5	0.4	0.0
South Yuba River	0.0	0.8	0.0	0.0	0.9	0.5	0.0
Subtotal Yuba River	**0.0**	**1.2**	**0.0**	**0.0**	**1.6**	**0.4**	**0.0**
Bear River	0.0	0.4	0.0	0.2	0.4	0.4	0.2
Middle Fork American River	0.0	0.7	0.0	0.0	1.2	0.5	0.0
North Fork American River	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal American River	**0.0**	**0.5**	**0.0**	**0.0**	**0.8**	**0.4**	**0.0**
Total TNF	**0.0**	**0.9**	**0.0**	**0.0**	**1.2**	**0.4**	**0.1**

Changes to Class of Vehicles and/or Season of Use: Changing the class of vehicle allowed to use a particular National Forest Transportation System (NFTS) road could change the impacts to watershed resources due to the change in road surface. Therefore, these NFTS roads are considered become high risk even though they already have "hardened" surfaces that lack vegetation. It is likely that direct impacts to watershed resources occurred when the road was constructed. Impact may still be occurring if the road is collecting and concentrating overland flow of water and increasing erosion rates. These indirect and cumulative impacts would continue regardless of the type of vehicle using the route. When the maintenance level of a particular road changes (the maintenance level does not always change when class of vehicle changes), the risk of erosion can increase. However, all roads would be maintained for resource needs no matter what maintenance level. Table 3.02-45 displays the changes in High Risk stream crossing density in RCAs due to changes in class of vehicle by alternative. No changes to class of vehicles would occur in Alternatives 1 and 3. Alternatives 2, 5, and 6 would result in increases of 0.2 to 0.8 stream crossings per square mile of RCAs in the all river basins and 0.3 crossings per square mile over the entire Tahoe National Forest.

Native surface roads and trails ("Higher Risk Routes") are most susceptible to damage by motor vehicles when wet. The condition of "Higher Risk Routes" can quickly decline during winter or wet weather use due to rutting. Wet season use of "Higher Risk Routes" often leaves ruts which channel water and increase the erosive power of that water, this can lead to increased erosion both on and adjacent to the "Higher Risk Route". Many of the impacts found during field surveys were caused by wet season use of "Higher Risk Routes". Implementing seasonal closures would reduce rutting and subsequent channeling of surface water runoff. Seasonal closures would decrease the potential effects of motorized vehicle use on "Higher Risk Routes" by decreasing erosion and sedimentation. The benefits of seasonal closures would be equal to prohibition on cross country travel and would by far exceed adding between 31.2 and 282.8 miles of "Higher Risk Routes" (with an existing disturbance footprint) into the NFTS. Alternatives 1, 2, 3 and 7 all have the vast majority of "Higher Risk Routes" open year round and, therefore, have a higher risk to watershed resources. The wet weather seasonal closures imposed in Alternatives 4, 5 and 6

results in all of the "Higher Risk Routes" being closed during the wet time of the year, thus greatly reducing potential negative impacts to soil resources and to water quality.

Table 3.02-45. Changes in "Higher Risk Route" stream crossing density in RCAs due to changes in class of vehicle on existing National Forest Transportation roads. (crossings/sq. mi.)

River Basin	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	0.0	0.3	0.0	0.0	0.3	0.3	0.0
Feather River	0.0	0.8	0.0	0.0	0.8	0.8	0.0
North Yuba River	0.0	0.2	0.0	0.0	0.2	0.2	0.0
Middle Yuba River	0.0	0.4	0.0	0.0	0.4	0.4	0.0
South Yuba River	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Subtotal Yuba River	**0.0**	**0.2**	**0.0**	**0.0**	**0.2**	**0.2**	**0.0**
Bear River	0.0	0.5	0.0	0.0	0.5	0.5	0.0
Middle Fork American River	0.0	0.4	0.0	0.0	0.4	0.4	0.0
North Fork American River	0.0	0.3	0.0	0.0	0.3	0.3	0.0
Subtotal American River	**0.0**	**0.2**	**0.0**	**0.0**	**0.2**	**0.2**	**0.0**
Total TNF	**0.0**	**0.3**	**0.0**	**0.0**	**0.3**	**0.3**	**0.0**

Cumulative Effects: This project would not change the footprint of current wheel-tracks on the Tahoe National Forest. All action alternatives would result in a net reduction in "Higher Risk Route" perennial and intermittent stream crossing density in all river basins. All action alternatives would result in a very slight decrease in the risk of negative cumulative effects to watersheds. The cumulative impacts on "Higher Risk Route" stream crossing density in RCAs resulting from this project are displayed in Table 3.02-46. Alternative 1 represents the existing condition. Alternatives 2 through 7 would represent the "Higher Risk Route" Stream crossing density in RCAs after twenty years (when "Higher Risk Routes" not added to the National Forest Transportation System would have recovered hydrologically). The action alternatives would decrease "Higher Risk Route" stream crossing density by 0.8 to 1.2 crossings miles per square mile in the Truckee River basin, 1.1 to 3.5 crossings per square mile in the Feather River basin, 1.0 to 2.3 crossings per square mile in the Yuba River basin, 1.5 to 2.5 crossings per square mile in the Bear River basin, 0.3 to 1.2 crossings per square mile in the American River basin and 0.6 to 2.1 crossings per square mile on the Tahoe National Forest.

Table 3.02-46. "Higher Risk Route" stream crossing density in Riparian Conservation Areas after 20 years due to cumulative effects of all proposed actions (crossings/sq. mi.)

River Basin	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	8.4	7.6	6.8	6.9	7.6	7.3	6.9
Feather River	13.7	12.6	10.2	10.4	12.6	11.8	10.4
North Yuba River	6.7	5.7	3.8	3.8	6.5	4.3	3.8
Middle Yuba River	8.4	7.1	6.3	6.3	7.1	7.1	6.3
South Yuba River	6.4	5.9	5.0	5.0	5.9	5.6	5.0
Subtotal Yuba River	**7.0**	**6.0**	**4.7**	**4.7**	**6.5**	**5.3**	**4.7**
Bear River	6.8	5.3	4.3	4.5	5.3	5.3	4.5
Middle Fork American River	6.8	6.5	5.5	5.5	7.0	6.3	5.5
North Fork American River	4.3	3.5	3.1	3.1	3.5	3.5	3.1
Subtotal American River	**5.6**	**5.1**	**4.4**	**4.4**	**5.3**	**4.9**	**4.4**
Total TNF	**7.5**	**6.6**	**5.4**	**5.5**	**6.9**	**6.1**	**5.5**

Cumulative Effects on Hydrology Resources

The cumulative effects on watersheds are for the whole geographic area of the Tahoe National Forest analyzed at several scales (Forest, River Basin, and HUC7). Short-term effects generally occur within 5 years. Long-term effects occur within 20-30 years. They represent the additive, incremental effects of past, present, and reasonably foreseeable future activities, actions, and decisions on the hydrology resource. The current condition of the roads and trails, the number of private roads, and the watershed damage at primitive campsites are all a reflection of past and current management activities.

Management actions affect traffic, motorized trails un-authorized for motorized use, maintenance, the effectiveness of closures, and recovery of closed routes. Cumulatively, these actions influence tread wear and soil erosion. Wet season use of native surface routes often leaves ruts which channel water and increase the erosive power of that water. This would lead to increased erosion both on the trail and adjacent to the trail. This could also lead to increased sediment delivery to streams.

Fuels treatments open up stands, create fire lines and temporary roads, and generally create opportunities for unauthorized OHV use. This has been and would continue to be a problem in urban-interface areas and in other areas with easy access to the Forest. The foothills Forest-urban interface is one of the most rapidly growing areas in the State, and OHV registrations in this area are increasing at an even faster rate (Widell, 2002). Because the baby boomer generation is aging and becoming less mobile, but still desires to recreate in the Forest, there is increasing demand for motorized recreation, especially on ATVs. All of this increasing demand will increase use levels on National Forest Transportation System roads and motorized trails and also increase the pressure for cross country travel.

Equivalent Road Acres: Equivalent Road Acres (acres of disturbance divided by acres of HUC7 watershed) are a measure of watershed disturbance typically used in watershed cumulative effects analysis. Cumulative Watershed Effects (CWE) are the combined effects of past, present, and future land management activities within a watershed that may affect the watershed's structure or process. While this project does not include any new construction it does decide 1) If cross country travel should be prohibited, 2) which if any existing motorized trails un-authorized for motorized use should be added to

the National Forest Transportation System (NFTS), and 3) any changes to be made in the class of vehicle or season of use allowed on the existing (NFTS).

The Forest-wide CWE analysis run for a recent Forest-wide fire planning analysis and project specific NEPA documents were used to identify HUC 7 watershed that are at or over Threshold of Concern (TOC). Currently there are three HUC7 watersheds that have been identified as being over TOC. These watersheds are Trout Creek, Alder Creek, and Campbell Hot Springs. The majority of the ERA disturbance in the Trout Creek and Alder Creek watersheds is due to the Tahoe Donner Subdivision on private land. The Campbell Hot Springs watershed modeled as being over Threshold of Concern due to overlapping vegetation management treatments. This project does not propose or change the disturbance footprint, so the modeled CWE results found in project specific NEPA documents would still apply.

Projects listed in Appendix Q (Wildlife Cumulative Effects) have been incorporated into this analysis. Most fuels and vegetation management projects include road maintenance projects as a part of the proposal. Some projects include decommissioning of unnecessary routes. Projects listed in Chapter 3.00 as reasonable foreseeable actions have also been considered in this analysis.

Since the scope of this project is limited to deciding 1) If cross country travel should be prohibited, 2) which if any existing motorized trails un-authorized for motorized use should be added to the National Forest Transportation System (NFTS), and 3) any changes to be made in the class of vehicle or season of use allowed on the existing (NFTS); a typical Cumulative Watershed Effects analysis using Equivalent Road Acres shows no measurable changes between the alternatives in the short term (1 year from the date of action) and would have beneficial effects over the long term (20 or 30 years) owing to passive restoration of unused routes. For example, the Donner Lake HUC7 currently has 85 miles of roads and trails (1.3% ERA). All action alternatives would result prohibiting motorized use on 3.7 miles of these roads and trails. If these 3.7 miles are converted to ERAs (square feet of routes converted to acres divided by acres in HUC7) they would equal 0.1% ERA. Assuming a twenty year recovery rate, the Donner Lake HUC7 route-related ERAs would decrease by 0.003% ERA each year for twenty years. Therefore, metrics, such as, near stream route miles/density, number/density of crossings, and/or presence of highly erodible sites/topography are also being used to track changes in potential environmental effects to watershed resources. Tables of soil and watershed data used in this analysis can be found in Appendix D, Watershed Risk Assessment.

Cumulative Watershed Effects of Proposed Actions Using Equivalent Road Acres (ERA) Methodology

Table 3.02-47 shows the Equivalent Road Acres ERA associated with roads, motorized trails and “Open Areas” by river basin and Alternative. Alternative 1 represents existing ERAs. The action alternatives show reductions at 20 years, after hydrologic recovery of trails prohibited to motorized use. The highest existing road and motorized trail related ERAs are in the Bear (1.2 percent) and Truckee River basins (1.1 percent). The Feather and Yuba River basins have road and motorized trail related ERAs of 0.8 percent. The American River has the lowest existing basin ERA at 0.7%. The average ERAs percentage on the Tahoe National Forest is 0.8%. All of the action alternatives would result in lower of road and motorized trail related ERAs over the long term (20 years). The Truckee and Feather River basins ERAs would be reduced by 0.2 percent in all action alternatives. The Yuba River basin ERA would be reduced by 0.2

percent in Alternatives 2, 3, 4, 6 and 7 and 0.1 percent in Alternative 5. The Bear River basin ERAs would be reduced by 0.2 percent in Alternatives 2, 4, 5, 6 and 7 and 0.3 percent in Alternative 3. The American River basin ERAs would be reduced by 0.1 percent in all action alternatives. The action alternatives would result in a 0.1 percent reduction in ERAs over the Tahoe National Forest (at 20 years, after hydrologic recovery). Alternative 1 has the highest percent ERA, followed by Alternative 5. Alternatives 2, 4, 6 and 7 show differences in effects at this scale. Alternative 3 would result in slightly lower ERAs (0.1%) in the Bear River.

Table 3.02-47. Road and motorized trail related Equivalent Road Acres (ERAs) by river basin Alternative (ERA percents of watershed)

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt7
Truckee River	227,393	1.1%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
Feather River	107,594	0.8%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
North Yuba River	229,995	0.8%	0.5%	0.5%	0.5%	0.6%	0.5%	0.5%
Middle Yuba River	126,370	0.9%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
South Yuba River	170,886	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Subtotal Yuba River	**527,252**	**0.8%**	**0.6%**	**0.6%**	**0.6%**	**0.7%**	**0.6%**	**0.6%**
Bear River	20,108	1.2%	1.0%	0.9%	1.0%	1.0%	1.0%	1.0%
Middle Fork American River	146,533	0.8%	0.6%	0.6%	0.6%	0.7%	0.6%	0.6%
North Fork American River	133,107	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
Subtotal American River	**279,639**	**0.7%**	**0.6%**	**0.6%**	**0.6%**	**0.6%**	**0.6%**	**0.6%**
Total TNF	**1,161,987**	**0.8%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**

Equivalent Road Acres (measured as percent of watershed acres in ERA density classes)

Prohibition on Cross Country Travel: All of the action alternatives prohibit cross country travel. This prohibition will reduce equivalent road acres across the forest in the long term. It would also prevent the proliferation of any new motorized trails un-authorized for motorized use which could increase ERAs. The impacts to ERAs resulting from the prohibition on cross country travel are displayed in Table 3.02-48. Alternative 1 represents existing ERAs. The action alternatives show reductions at 20 years, after hydrologic recovery of routes not designated for motorized use. Reductions would be 0.9 ERAs in the Truckee River basin, 0.6 ERAs in the Feather River basin, 0.5 ERAs in the Yuba River basin, 0.3 ERAs in the Bear and American River basin, and 0.5 ERAs across the Tahoe National Forest.

Table 3.02-48. Changes in Equivalent Road Acres by river basin due to the prohibition of cross country travel (ERA percents of watershed)

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	227,393.26	0.0%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
Feather River	107,594.21	0.0%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
North Yuba River	229,995.4	0.0%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
Middle Yuba River	126,370.19	0.0%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
South Yuba River	170,885.91	0.0%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
Subtotal Yuba River	**527,251.50**	**0.0%**	**-0.2%**	**-0.2%**	**-0.2%**	**-0.2%**	**-0.2%**	**-0.2%**
Bear River	20,108.42	0.0%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
Middle Fork American River	146,532.57	0.0%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
North Fork American River	133,106.89	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
Subtotal American River	**279,639.46**	**0.0%**	**-0.1%**	**-0.1%**	**-0.1%**	**-0.1%**	**-0.1%**	**-0.1%**
Total TNF	**1,161,986.90**	**0.0%**	**-0.2%**	**-0.2%**	**-0.2%**	**-0.2%**	**-0.2%**	**-0.2%**

Motorized Trail Additions to the National Forest Transportation System (NFTS): There are no additions to the NFTS under Alternative 1. The action alternatives would add between 31.2 and 282.8 miles of motorized trails to the National Forest Transportation System (NFTS). Additions to the NFTS would have minimal effects to watershed resources, because these trails are already part of the disturbance footprint and would be managed according to TNF trail and resource standards. Appendix A, Road Cards, has mitigations that are needed to add these motorized trails to the NFTS with minimal impacts to soil resources.

Table 3.02-48 displays changes in ERAs due to motorized trail additions to the NFTS by alternative. There would be no change in ERAs due to motorized trail additions to the NFTS under Alternatives 1 and 3. The usual Cumulative Watershed Effects analysis using the ERA methodology does not get more detailed than tenth's of a percent (e.g., 2.5%). Table 3.02-49 shows the changes in ERAs due to the additions to the NFTS. Looking at the changes at the typical ERA detail (tenth's of a percent, 2.5%), there are no measurable changes due to the addition of the proposed routes in any alternative. This is because the change in ERA is so small it does not show up. For example, the change in ERAs due to the additions to the NFTS was the largest in Alternative 5 (0.002%) in the Bear River.

Table 3.02-49. Changes in Equivalent Road Acres Due to Additions to the National Forest Transportation System (ERA percents of watershed)

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt7
Truckee River	227,393.26	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Feather River	107,594.21	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North Yuba River	229,995.40	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Middle Yuba River	126,370.19	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
South Yuba River	170,885.91	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal Yuba River	**527,251.5**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Bear River	20,108.42	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Middle Fork American River	146,532.57	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North Fork American River	133,106.89	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal American River	**279,639.46**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total TNF	**1,161,986.90**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Changes to Class of Vehicles and/or Season of Use: Changing the class of vehicle allowed to use a particular National Forest Transportation System (NFTS) road could change the impacts to soil and watershed resources due to the change in road surface. Therefore, these roads are considered to become "Higher Risk Routes" (previously defined as native surface roads and motorized trails) even though they already have "hardened" surfaces that lack vegetation. It is likely that direct impacts to watershed resources occurred when the road was constructed. Impacts may still be occurring if the route is collecting and concentrating overland flow of water and increasing erosion rates. These indirect and cumulative impacts would continue regardless of the type of vehicle using the road. When the maintenance level of a particular road changes (the maintenance level does not always change when class of vehicle changes), the risk of erosion can increase. However, all roads would be maintained for resource needs no matter what maintenance level. Tables 3.02-50 displays the changes in ERAs by river basin and alternative due to changes in the class of vehicle on NFTS roads from "Open to Highway Legal Vehicles Only" to "Open to All Vehicles." No changes to class of vehicles would occur in Alternatives 1 and 3, 4. Alternatives 2, 5 and 6 would result in the ERAs in the Bear River increasing by 1.0% ERAs at the river basin scale.

Native surface roads and trails (defined as "Higher Risk Routes") are most susceptible to damage by motor vehicles when wet. The condition of "Higher Risk Routes" can quickly decline during winter or wet weather use due to rutting. Wet season use of "Higher Risk Routes" often leaves ruts which channel water and increase the erosive power of that water, this can lead to increased erosion both on the trail and adjacent to the trail. Many of the impacts found during field surveys were caused by wet season use of "Higher Risk Routes". Implementing seasonal closures would reduce rutting and subsequent channeling of surface water runoff. Seasonal closures would decrease the potential effects of motorized vehicle use on "Higher Risk Routes" by decreasing erosion and sedimentation. The benefits of seasonal closures would be equal to prohibition on cross country travel and would by far exceed adding between 31.2 and 282.8 miles of "Higher Risk Routes" (with an existing disturbance footprint) into the NFTS. Alternatives 1, 2, 3 and 7 all have the vast majority of "Higher Risk Routes" open year round and, therefore, have a higher risk to watershed resources. The wet weather seasonal closures imposed in Alternatives 4, 5 and 6

results in all of the "Higher Risk Routes" being closed during the wet time of the year, thus greatly reducing potential negative impacts to soil resources and to water quality.

Table 3.02-50. Changes in Equivalent Road Acres (ERAs) due to changes in Class of Vehicles on existing NFTS roads (ERA percents of watershed)

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt7
Truckee River	227,393.26	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Feather River	107,594.21	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North Yuba River	229,995.40	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Middle Yuba River	126,370.19	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
South Yuba River	170,885.91	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal Yuba River	**527,251.50**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Bear River	20,108.42	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.0%
Middle Fork American River	146,532.57	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North Fork American River	133,106.89	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Subtotal American River	**279,639.46**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total TNF	**1,161,986.90**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Cumulative Effects: This project would not change the footprint of current wheel-tracks on the Tahoe National Forest. All action alternatives would result in a net reduction in ERAs in all river basins. All action alternatives would result in a very slight decrease in the risk of negative cumulative effects to watersheds. The cumulative impacts on ERAs resulting from this project are displayed in Table 3.02-51. Alternative 1 represents the existing condition. Alternatives 2 through 7 would represent the ERAs in twenty years (after hydrologic recovery). The highest existing road and trail related ERAs are in the Bear (1.2 percent) and Truckee River basins (1.1 percent). The Feather and Bear River basins have road and trail related ERAs of 0.8 percent. The American has the lowest existing basin ERA at 0.7%. The average ERAs percentage on the Tahoe National Forest is 0.8%. All of the action alternatives would result in lower of road and trail related ERAs over the long term (20 years). The Truckee and Feather River basins ERAs would be reduced by 0.2 percent in all action alternatives. The Yuba River basin ERA would be reduced by 0.2 percent in Alternatives 2, 3, 4, 6 and 7 and 0.1 percent in Alternative 5. The Bear River basin ERAs would be reduced by 0.2 percent in Alternatives 2, 4, 5, 6 and 7 and 0.3 percent in Alternative 3. The American River basin ERAs would be reduced by 0.1 percent in all action alternatives. The action alternatives would result in a 0.1 percent reduction in ERAs over the Tahoe National Forest (at 20 years, after hydrologic recovery). Alternative 1 has the highest percent ERAs, followed by Alternative 5. Alternatives 2, 4, 6 and 7 show only minor differences in effects at this scale. Alternative 3 would result in slightly lower ERAs (0.1%) in the Bear River.

Table 3.02-51. Equivalent Road Acres associated with roads trails due to cumulative effects of all proposed actions (ERA percents of watershed)

River Basin	Basin Acres	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Truckee River	227,393	1.1%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
Feather River	107,594	0.8%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
North Yuba River	229,995	0.8%	0.5%	0.5%	0.5%	0.6%	0.5%	0.5%
Middle Yuba River	126,370	0.9%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
South Yuba River	170,886	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Subtotal Yuba River	**527,252**	**0.8%**	**0.6%**	**0.6%**	**0.6%**	**0.7%**	**0.6%**	**0.6%**
Bear River	20,108	1.2%	1.0%	0.9%	1.0%	1.0%	1.0%	1.0%
Middle Fork American River	146,533	0.8%	0.6%	0.6%	0.6%	0.7%	0.6%	0.6%
North Fork American River	133,107	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
Subtotal American River	**279,639**	**0.7%**	**0.6%**	**0.6%**	**0.6%**	**0.6%**	**0.6%**	**0.6%**
Total TNF	**1,161,987**	**0.8%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**

Summary of Effects to Geologic, Soil and Watershed Resources

This project defines where motorized vehicle traffic use is authorized on the Tahoe National Forest. Therefore, direct impacts to soils and adjacent watersheds and stream courses that result from this project are limited. There are no new ground disturbing activities proposed with this project. The roads, motorized trails and “Open Areas” being evaluated in this analysis already exist on the ground, but may require upgrading to NFTS standards as well as periodic maintenance. They are compacted and generally lack vegetation. Runoff from the surface is collected and discharged as potentially erosive flows at points below the road or motorized trail. Some are eroded or causing erosion, others are stable and are not causing any negative resource impacts. From the standpoint of soil productivity and growing vegetation, these roads, motorized trails and “Open Areas” are already non-productive. Therefore the potential effects on soil and watershed resources are related to sustaining road or trail function, protecting adjacent soils from runoff and gully erosion, protecting water quality, or restoring the routes to a productive state. Given that Alternative 1 (no action, the existing hydrologic footprint) is the largest proposed all action alternatives would reduce the footprint of motorized use.

It should be noted that although many roads and motorized trails on the Tahoe National Forest have some site specific risks to geology, soil and/or water resources, most of these risks can be mitigated. The field surveys performed for this assessment found site specific concerns to be mitigated, but with regular maintenance and control of wet season use the roads, motorized trails and “Open Areas” seem to be sustainable.

Conclusion

Prohibition on cross country travel and wet season closures are the two most important potential actions proposed in this project. Prohibiting cross country travel would limit the expansion of the road and trail related disturbance footprint. Equally as important in limiting the negative effects of motorized travel on geologic, soil and watershed resources, is the wet season closure. The positive effects of these two actions would far outweigh the proposed additions of motorized trails to the National Forest Transportation

System or the changes in vehicle class. The order of potential cumulative effect of the alternatives, from highest potential to lowest potential, would be Alternative 1, Alternative 2, Alternative 7, Alternative 3, Alternative 5, Alternative 6, and then Alternative 4.