Soil Resource

Introduction

A healthy and functional watershed relies on an equilibrium, or balance, in the soil productivity, soil quality, water quantity and water quality. The soil resource provides many essential functions for National Forest System lands. It sustains plant growth that provides forage, fiber, wildlife habitat and watershed protection. It absorbs precipitation, stores water for plant growth and gradually releases surplus water which attenuates runoff rates. It sustains microorganisms which recycle nutrients for continued plant growth. The National Forest Management Act of 1976 and other acts recognized the fundamental need to protect and where appropriate improve, the quality of soil.

Protection of soil resource is an important part of the mission of the Forest Service. Management activities on National Forest System lands must be planned and implemented to protect soil quality and the hydrologic functions of forest watersheds. The use of roads, trails and other areas on National Forests for public operation of motor vehicles has potential to affect the soil resource through interception of runoff, compaction of soils and detachment of sediment (Foltz, 2006). Management decisions to eliminate cross-county motorized travel, add new routes and areas to the National Forest Transportation System (NFTS) and make changes to the existing NFTS must consider effects on soils and watersheds.

Analysis Framework: Statute, Regulation, Forest Plan (LRMP) and Other Direction

Direction relevant to the Proposed Action as it affects the soil resource includes the following:

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-FS 1991b) 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 National Forest planning.

Pacific Southwest Region Soil Management Handbook Supplement: The Forest Service Pacific Southwest Region Soil Management Handbook Supplement (R5 FSH Supplement 2509.18-95-1) establishes regional soil quality analysis standards. The 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 are to be used for 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.

Regional Forester's Letter (dated Feb 5, 2007): This letter provided clarification to Forest Supervisors on the appropriate use of the Pacific Southwest Region Soil Management Handbook Supplement (R5 FSH Supplement 2509.18-95-1). It states in part:

> "Analysis or evaluation of soil condition is the intended use of the thresholds and indicators in Pacific Southwest Region FSH Supplement 2509.18-95-1. They are not a set of mandatory standards or requirements. They should not be referred to as binding or mandatory requirements in NEPA documents. Standards and guidelines in Forest Land

and Resource Management Plans provide the relevant substantive standards to comply with NFMA.

The thresholds and indicators represent desired conditions for the soil resource. Use of the thresholds and indicators provides a consistent method to analyze, describe and report on soil condition throughout the region."

Forest Plan (LRMP) Soils Standards and Guidelines for General Forest

The LRMP provides for management standards and guidelines to all management areas and analysis areas or aggregates of analysis areas (USDA-FS 1991). These standards and guidelines (S&G) are as follows:

1. Improve water quality and protect soil productivity by restoring deteriorated watersheds on the basis of economic efficiency and severity of problems and its impact on downstream beneficial uses (see LRMP S&G 122).
2. Apply appropriate erosion prevention measures on all ground disturbing activities (FSH 2409.23) prior to fall storms (October 1) and immediately upon completion of activity begun after November 1 (see LRMP S&G 127).
3. Apply appropriate erosion prevention measures on high erosion hazard soils under the following conditions: (see LRMP S&G 128).
    a. When exposed soils from an average of several 500-foot linear transects:
        i. Exceed 150 feet on slopes of 15-35 percent,
        ii. Exceed 75 feet on slopes 35-65 percent,
        iii. Exceed 25 feet on slopes over 65 percent,
    b. On linear disturbances, such as skid trails and firelines, cross-drain area at the following intervals:

Interval between Cross-Drain (feet)

percent Slope	HEHR	VHEHR
0-15	150	125
15-35	75	45
35-65	35	20
65+	15	15

4. Road construction on areas with High and Very High Erosion Hazard will follow standards on areas with High and Very High Erosion Hazard will follow standards in FSM 2521 Sierra Supplement No. 8, which gives direction concerning stabilization and road surface drainage (see LRMP S&G 129, USDA-FS 1991 and LRMP Letter of Correction, USDA-FS 2009).

Effects Analysis Methodology

Soil quality effects analysis was based on identifying areas of risk on the SNF. This used GIS and the published Order 3 Soil Resource Inventory (SRI) to rank proposed unauthorized motorized trails by erosion potential (Giger and Schmitt, 1993).

An analysis of soil data was conducted on all inventoried routes to determine erosion hazard rating, sensitivity and hydrologic function. This analysis resulted in a soil risk assessment that identified routes that are most susceptible to erosion and have the highest potential for degraded

soil productivity. The results of this assessment was to determine which routes did not need to be reviewed in the field and which routes needed to be reviewed in the field. The assessment assigned a rating of 1 to 5 based on the following criteria:

1. The route was considered; a field visit is not necessary; the effects of adding the route to the NFTS will not be adverse assuming routine maintenance.
2. The route was considered, a field visit was made and the effects will not be adverse assuming routine maintenance.
3. The route was considered, a field visit was made and site specific mitigation is prescribed to reduce the effects to less than adverse.
4. The route was considered, a field visit was made and a determination was made that the effects would be adverse (red flag route). The route is not recommended by the specialist for inclusion.
5. The route was considered, more information is needed to make a determination.

This assessment was used to prioritize field review. The following is a description of the methodology:

1. From the Order 3 SRI the Maximum Erosion Hazard Rating (MEHR), soil texture and rock fragments was tabulated.
2. Routes with high gradients (>15 percent grade) and high or very high MEHR were considered high risk, assuming routine maintenance.
3. Routes with lower gradients and moderate MEHR were considered low risk, assuming routine maintenance.
4. Routes with higher gradients and high or very high MEHR were considered high risk. These routes were further evaluated by GIS and field work to determine potential for adverse effects such as loss of water control on roads and trails. A secondary indicator, Hydrologic Function Class (HFC) was used to predict where some roads may be sensitive to damage and loss of hydrologic function. HFC was used as a tool for prioritizing field work and as an indicator to compare alternatives. The red/yellow/green monitoring criteria was used to evaluate the observed trail condition and to validate the initial office GIS risk assessment.
5. Unauthorized motorized trails were evaluated for surface condition using a green, yellow, red surface condition class and to validate the initial office GIS risk assessment. Green condition class indicates a trail in good condition with little sign of erosion. Yellow condition class indicates a trail segment that is experiencing some erosion because cross ditches are only partially functional or there is an insufficient frequency of cross ditches per linear distance along the trail. Red condition class indicates a trail segment that is eroding severely and the cross ditches are not functioning.
6. Trails in a red condition class or have a high potential for adverse effects (surface erosion and loss of water control) were considered for mitigation or closure. Mitigation was documented by route. See Appendix A, B and the project record for specific mitigation measures for routes. Where routes were recommended for closure site specific concerns were given.

Data Sources

1. Route specific data collected in the field using established protocols for road erosion inventories and motor vehicle red/yellow/green inventories (see project record OHV Track Evaluation Forms).
2. Inventoried routes identified in Alternatives 2, 4 and 5 and provided in GIS spatial form and associated tabular data sets.
3. SNF soil survey GIS spatial form and associated tabular data sets.
4. Assessment for passive recovery of routes closed to motor vehicle traffic (Rojas 2008).

Soil Resource Indicators

- Miles of unauthorized motorized trails displayed by MEHR (as defined by the R-5 Maximum Erosion Hazard Rating).
- Miles of unauthorized motorized trails displayed by Hydrologic Function Class (HFC).

The indicator, HFC is a soil hazard interpretation that predicts where roads and trails are prone to failure of drainage structures and loss of water control. HFC is a function of mechanical rutting potential, erosion potential and loss of water control. Some roads are more sensitive to damage of the road surface from rutting, erosion and loss of water control. Soil engineers may state this as a loss of hydrologic function. In extreme cases a loss of the facility is possible. HFC is based on soil properties, including soil texture and course fragment content, that determine how a native surface road or trail will mechanically rut and erode with traffic. Hydrologic Function Classes are adapted from the FS Pacific Southwest Region Soil Interpretations (USDA-FS 1999b). HFC is a filter or method to predict weak areas in the trail system that may require a higher level of maintenance, mitigation and in some cases a recommendation to close the trail.

Classes and soils are described below:

- *Mechanical Rutting and High Erosion* is most prevalent on soils that are considered sensitive on the SNF. Sensitive soils include Holland family, Auberry family and Ultic Haploxeralfs and are known to rut and erode easily. These soils have argillic or clay loam subsoils that are highly susceptible to rutting and erosion when exposed and wet. If these soils are used under wet conditions, cross drain features such as waterbars are easily breached and erosion can develop into severe gully erosion. High erosion potential is greater on unauthorized motorized trails with steep gradients (16 to 25 percent) and very steep gradients (26 percent and higher).

Table 82. Hydrologic Function Class – Susceptibility to Mechanical Rutting and High Erosion

Factors Affecting	Slight	Moderate	Severe
Soil texture of family particle size control section	COSL and coarser Coarse Textured Sandy Loams	L, SL, FSL, SIL, VFSL Medium Textured Loams	C, SIC, SC, CL, SICL, SCL Fine Textured Clay Loams
Coarse fragments (percent) by volume	>25	10 - 25	<10
MEHR	Moderate or less	High	Very High

COSL- coarse sandy loam; L- loam; SL- sandy loam; FSL- fine sandy loam, SIL- silty loam; VFSL-very fine sandy loam; C-clay; SIC- silty clay; SC- sandy clay; CL- clay loam; SICL- silty clay loam, SCL sandy clay loam.

GIS was used to sort route segments that have mechanical rutting and erosion concerns based on the above hazard classes. The hazard classes are not hypothetical; they were verified by field observation.

Soil Resource Methodology by Action

1. Direct/Indirect effects of the prohibition of cross-country motor vehicle travel.

The prohibition of cross-country travel is focused on the effects from unauthorized use. Considerations and the indicators of effects are given below:

> **Indicator(s)**: Miles of unauthorized routes displayed by (1) MEHR and (2) Hydrologic Function Class. Both indicators are a soil hazard interpretation that ranks miles of route by potential for erosion and loss of water control. The assumption is that effects are related to the miles of unauthorized routes to remain open under current use with no maintenance.
>
> **Direct Effects from unauthorized use**: Generally for the existing unauthorized routes, direct effects have already occurred. The direct effects were: physical displacement of soil caused by unauthorized motor vehicle traffic; loss of soil productivity from the displacement and loss of soil depth; loss in soil hydrologic function due to loss of soil and loss of soil cover.
>
> **Indirect Effects from unauthorized use**: The removal of vegetation and exposure of soil in unauthorized routes will result in erosion. These unauthorized use areas were not designed and have no runoff water control to protect the soil resource. Accelerated erosion is occurring on several unauthorized routes and off the routes to the point that soil surface horizons have been destroyed and soil productivity has been lost. Further loss of productivity will occur and diminished hydrologic function. A loss of water control and accelerated erosion on the un-maintained trail is an indirect effect.
>
> **Methodology:** Unauthorized routes open for motor vehicle use are compared to GIS layers displaying MEHR and Hydrologic Function Class.
>
> **Short-term time frame**: The 1-year time frame looks at routes over the short-term. It does not provide time for passive recovery on closed routes.
>
> **Long-term time frame:** The 20-year time frame looks at routes over the longer term. It provides time for passive recovery on closed routes. Passive recovery is assumed to be a benefit. Factors such as soil type, precipitation and temperature affect rates of vegetative recovery.
>
> **Spatial boundary:** Sierra National Forest.
>
> **Rationale**: General guidelines in the National Soil Management Handbook and Pacific Southwest Region Soil Management Handbook Supplement.

2. Direct/Indirect Effects of adding facilities (presently unauthorized roads, trails and/or areas) to the NFTS, including identifying seasons of use and vehicle class.

The effects of adding facilities are focused on presently unauthorized roads and trails proposed to be added to the NFTS of trails. This is a change from unauthorized and un-maintained to NFTS status. Considerations and the indicators of effects are given below:

> **Indicators**: Miles of unauthorized routes added to the system displayed by MEHR and Hydrologic Function Class.

Direct Effects: Generally direct affects have already occurred from the soil displacement caused by the unauthorized use. The effects are a loss of soil productivity from the displacement and loss of soil depth and a loss in soil hydrologic function due to loss of soil and loss of soil cover. The assumption is that effects are related to total miles of route converted from unauthorized to authorized status.

Indirect Effects: Indirect effects to the soil resource from the addition of a previously unauthorized use route to the designated system will be dependent upon what soil type the route is located on, its erosion potential and Hydrologic Function Code (HFC) and various factors associated with the routes, such as slope. Additional water runoff control (dips, cross ditches, etc.) measures may be needed to avoid indirect effects before authorized use can be allowed. The degree of indirect effects will be dependent on whether water control measures will be implemented or the effectiveness of the water control measures. Indirect effects occur later in time and/or offsite. Examples of indirect effects are uncontrolled runoff causing erosion downslope of the trail or sediment generated from erosion of a trail depositing in channel.

Field observations of soil response are used to formulate the expected direct, indirect and cumulative soil effects for each alternative.

Methodology: Unauthorized routes and use areas were located by TEAMS. TEAMS is a Forest Service Enterprise Unit that was utilized to locate and GPS unauthorized routes. Unauthorized routes added to the system are compared to GIS layers displaying MEHR and Hydrologic Function Class. Routes are compared with zones of varying erosion potential risk.

Short-term time frame: The 1-year time frame looks at routes over the short-term. It does not provide time for passive recovery on closed routes.

Long-term time frame: The 20-year time frame looks at routes over the longer term. It provides time for passive recovery on closed routes. Passive recovery is assumed to be a benefit. Factors such as soil type, precipitation and temperature affect rates of vegetative recovery.

Spatial boundary: Sierra National Forest.

Rationale: Analysis guidelines in the National Soil Management Handbook and Pacific Southwest Region Soil Management Handbook Supplement.

3. Changes to the existing NFTS (changing season of use and year round prohibitions).

Changes to existing NFTS include (1) closed to open; (2) open to closed; (3) changes in vehicle type and season of use. Considerations and the indicators of effects are given below:

Indicator(s): Miles of NFTS routes (closed to open/open to closed) displayed by (1) MEHR and (2) Hydrologic Function Class. The indicators are a soil hazard interpretation that ranks miles of route by potential for erosion and loss of water control.

Direct Effects: The important effects are those focused on existing NFTS (closed to open/open to closed) roads. These are maintenance level 1 roads that change in status from (open to closed) or (closed to open) under action alternatives. Opening level 1 roads poses a higher risk of causing negative soil effects compared with the effects of closing routes or the effects of changing vehicle type. The assumption is that a change in vehicle type will either keep the existing road width the same or the road will eventually narrow if used by ATVs or motorcycles. A change in vehicle type only would represent no increase of soil or land area for routes.

Indirect Effects: An action alternative may place control on the season of use for an area. This will generally have a positive indirect effect because it will reduce damage to the facility tread and its erosion control structures during the most susceptible time of the year. Placing control on the season of use will reduce the risk not and not eliminate erosion to soil down slope.

Methodology: GIS analysis to compare the location of the trail/roads in each alternative with the zones of varying erosion potential risk. Field observations of soil type response formulate the discussion of expected effects for each alternative.

Short-term timeframe: 1 year

Long-term timeframe: 20 years

Spatial boundary: Sierra National Forest.

Rationale: Analysis guidelines in the National Soil Management Handbook and Pacific Southwest Region Soil Management Handbook Supplement.

4. Cumulative Effects

Cumulative soil effects have been addressed under the cumulative watershed effects (CWE) section under the water resources section. Analysis of cumulative soil effects use the Equivalent Roaded Acre (ERA) Model, which is used in the CWE analysis. The ERA model quantifies disturbance based on the degree of disturbance as compared to an acre of road and measured relative to disturbance in a given watershed. ERAs reflect changes to Soil Hydrologic Function and are an indicator of rutting potential, erosion potential and loss of water control. See CWE analysis description for a full description of assessment and assumptions including list of past, present and future foreseeable actions. The FS Pacific Southwest Region methodology is used to determine the overall disturbed footprint. The disturbed footprint is a semi-quantitative measure of acres of detrimental soil disturbance and hence an approximation of change in Soil Quality as defined by the Pacific Southwest Region Soil Quality Standards (USDA 1995a).

Short-term timeframe: Not applicable; cumulative effects analysis will be done only for the long-term time frame.

Long-term timeframe: The long-term time frame used for Cumulative Watershed Effects is 30 years.

Spatial boundary: The analysis area is the Sierra National Forest.

Indicator(s): (1) Cumulative effects on soil productivity from unauthorized use (No Action); (2) Cumulative effects on soil productivity in unauthorized areas that are expected to recovery (in the given long term analysis time period) after cross-country prohibition is implemented: (3) Cumulative effects on soil productivity in areas that are not expected to recover passively (in the given long-term analysis period) after a cross-country prohibition is implemented; (4) Cumulative effects on soil productivity from implementation of the particular travel system for each alternative.

Methodology: Utilize observations and understanding of short term effects to soil productivity to estimate long term expected cumulative effects on soil productivity. Utilize the ERA analysis as a semi-quantitative measure of acres of detrimental soil disturbance and hence an approximation of change in Soil Quality.

Rationale: Analysis guidelines in the National Soil Management Handbook and Pacific Southwest Region Soil Management Handbook Supplement.

Affected Environment

The affected environment was modeled and is described as Alternative 1 (No Action) and includes all of the inventoried unauthorized routes.

The no action alternative provides a baseline for comparing the other alternatives. Under the no action alternative, current management consists of managing off-highway use as determined by the Forest Supervisor in April 1977 (USDA-FS 1977a). This decision was implemented by Forest Order 15-77-3. The plan identified areas where motorized travel was prohibited or motorized travel was restricted to designated routes. On the SNF these areas can be described as lands approximately above 6800 ft in elevation. In this alternative, 660,000 acres of National Forest System lands would remain open to motorized cross-country use. The current National Forest Transportation System (NFTS) of roads is defined under the SNF 1999 Road Closure Plan and implemented by Forest Order R5-83-3.

No changes would be made to the current NFTS and no cross-country travel prohibition would be put into place. The Travel Management Rule would not be implemented and no Motor Vehicle Use Map (MVUM) would be produced. Motor vehicle travel by the public would not be limited to designated routes, except within areas described in the 1977 ORV Plan. Unauthorized routes would continue to have no status or authorization as NFTS facilities.

- Continues prohibition of motorized cross-country travel where motorized travel was prohibited or motorized travel was restricted to designated routes.
- Adds no new NFTS facilities.
- Allows motorized cross-country travel in areas on the SNF outside those where motorized travel was prohibited or motorized travel was restricted to designated routes.

The SNF has a high diversity of soil types. Elevation and geology control patterns of soil at the landscape scale. Elevations range from 3,000 to 8,000 feet within the footprint of the proposed actions. Soils are formed from granitic, volcanic and meta-sedimentary parent materials. There are approximately 523 miles of inventoried unauthorized motorized trails that are not part of the NFTS of trails that are underlain with 27 soil types, including rock outcrop, that combine into 75 soil map units. The 10 most dominant soil map units affected by the project are described in Table 83.

Table 83. Ten Most Prevalent Dominant Soil Map Units Affected by Unauthorized Motorized Routes

Soil Map Unit	Soil Map Unit Name
139	Holland-Chaix families complex, 35 to 65 percent slopes
137	Holland Family, 35 to 65 percent slopes
140	Holland-Chawanakee families complex, 35 to 65 percent slopes
136	Holland faily, 5 to 35 percent slopes
113	Cagwin Family-Lithic Xeropsamments-rock outcrop complex , 15 to 45 percent slopes
161	Sirretta Family and Umpa family, wet, 2 to 25 percent s lopes
126	Chawanakee Family-Rock Outcrop complex, 35 to 65 percen t slopes
138	Holland-Chaix families complex, 5 to 35 percent slopes
120	Chaix Family, deep, 5 to 45 percent slopes
143	Ledford Family-Entic Xerumbrepts-Rock Outcrop association, 10 to 45 percent slopes

Several sensitive soil types that would be affected by the proposed unauthorized motorized trails are described in Table 64. Sensitive soils include Holland family, Auberry family and Ultic Haploxeralfs. A full description of these soils can be found in the Order 3, Soil Survey of the SNF (Giger and Schmitt 1993).

These are sensitive soils that rut and erode easily and are prone to a loss of water control and soil hydrologic function. These soils have an argillic (clay) subsoil, that when exposed to rainfall and runoff can develop accelerated erosion in the form of severe gully erosion. Unauthorized motorized trails are difficult to maintain when used during wet weather conditions, because cross drain structures, such as water bars can be breached. As shown in Table 84, there is a total of approximately, 194.65 miles of inventoried unauthorized motorized trails that are located on soil map units with sensitive soil types. Some of these soil map units consist of multiple soils types that are not considered sensitive.

Table 84. List of Sensitive Soil Map Units and Unauthorized Motorized Routes

Soil Map Unit	Soil Map Unit Name	Route (mi)
136	Holland family, 5 to 35 percent slopes	38.34
140	Holland-Chawanakee families complex, 35 to 65 percent slopes	31.66
141	Holland-Chawanakee families-rock outcrop complex, 15 to 35 percent slopes	20.77
137	Holland Family, 35 to 65 percent slopes	19.85
139	Holland-Chaix families complex, 35 to 65 percent slopes	17.39
138	Holland-Chaix families complex, 5 to 35 percent slopes	13.56
142	Holland-Neuns families association, 15 to 45 percent slopes	11.21
171	Ultic Haploxeralfs-Dystric Lithic Xerochrepts complex, 15 to 50 percent slopes	7.46
108	Auberry-Ahwahnee Families association, 35 to 65 percent slopes	5.01
124	Chaix-Holland Families complex, 15 to 35 percent slopes	4.35
110	Auberry-Tollhouse Families-rock outcrop association, 25 percent slopes	4.27
107	Auberry-Ahwahnee Families Association, 5 to 35 percent slopes	3.97
173	Ultic Haploxeralfs-Dystric Lithic Xerochrepts complex, 50 to 85 percent slopes	3.16
171	Ultic Haploxeralfs, deep, 15 to 50 percent slopes	2.64
127	Coarsegold-Auberry Families association, 35 to 65 percent slopes	2.62
125	Chaix-Holland families complex, 35 to 65 percent slopes	2.61
105	Auberry Family, 5 to 35 percent slopes	1.71
106	Auberry Family, 35 to 65 percent slopes	1.68
130	Dystric Lithic Xerochrepts-Ultic Haploxeralfs-rock outcrop association, 50 to 80 percent slopes	1.58
128	Coarsegold-Auberry Families-rock outcrop association, 35 to 85 percent slopes	0.80
109	Auberry Family-Rock Outcrop complex, 35 to 75 percent slopes	0.02
Total (miles)		**194.65**

Unauthorized routes were initially reviewed to determine if the soil that the route is located on is considered sensitive. Unauthorized routes on non-sensitive soils were given a rating of 1 and were considered not to need a field review from a soil resource perspective. Unauthorized routes located on sensitive soils were field reviewed and based upon a field review were given a rating of 2, 3 or 4. See effects methodology section for a description of the rating system. Further analysis of the routes and soils determined the soil Hydrologic Function Class according to the ranking criteria. This HFC class is used to determine the potential effects on the proposed routes

to the soil resource. Any route with a severe HFC rating will require intensive and annual erosion control measures.

Affected Environment by Analysis Unit

South Fork

There is a total of 22.5 miles of unauthorized routes in the South Fork analysis unit. Approximately 20.34 miles of unauthorized motorized trails are located on sensitive soils. These routes all have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

Westfall

The Westfall analysis unit has approximately 112.59 miles of unauthorized routes. Approximately 84.1 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential. Monitoring of the Miami Motorcycle Trail Network for erosion and surface condition was conducted on 24.3 miles of motor vehicle trails in June, 2000. The results of the monitoring found 16 percent of the trails in a red surface condition class, 25.4 percent in a yellow surface condition class and 58.6 percent in a green surface condition class. Recommendations in this monitoring report include rerouting trail segments in a red surface condition class to more gentle and less erosive terrain (Roath 2000).

Globe

The Globe analysis unit has approximately 65.15 miles of unauthorized routes. Approximately 2.6 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

Mammoth

The Mammoth analysis unit has approximately 38.59 miles of unauthorized routes. Approximately 15.86 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

Gaggs

The Gaggs analysis unit has approximately 82.91 miles of unauthorized routes. Approximately, 20.90 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

Jose-Chawanakee

The Jose-Chawanakee analysis unit has approximately 21.57 miles of unauthorized routes. Approximately, 14.77 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

Dinkey-Kings

The Dinkey-Kings analysis unit has approximately 60.84 miles of unauthorized routes. Approximately, 32.65 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

Stump Springs-Big Creek

The Stump Springs-Big Creek analysis unit has approximately 18.07 miles of unauthorized routes. Approximately, 3.29 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

East of Kaiser Pass

The East of Kaiser Pass analysis unit has approximately 20.90 miles of unauthorized routes. Approximately, 0.14 miles of unauthorized motorized trails are located on sensitive soils. The unauthorized routes with sensitive soils have a sandy clay loam subsoil, have less then 25 percent coarse fragment content and have a severe mechanical rutting and high erosion potential.

Tamarack-Dinkey

The Tamarack-Dinkey analysis unit has approximately 108.61 miles of unauthorized routes. There are no sensitive soils in the Tamarack-Dinkey analysis unit. The Bald Mountain OHV area is located within the Tamarack-Dinkey analysis unit. Monitoring of the Bald, Brewer and Spanish OHV Trail Network for erosion and surface condition was conducted on 21.2 miles of motor vehicle trails in October, 2002. The results of the monitoring found 99 percent of the trails in a Green Surface Condition Class in the Brewer Area, 95.1 percent in a Green Surface Condition Class and 4.9 percent in a Yellow Surface Condition Class in the Spanish Area. Recommendations in this monitoring report include limiting multiple trails and cross ditching (Roath 2002).

Environmental Consequences

Effects Analysis

1. The principal concern or effect to be assessed for the soil resource is the potential for soil erosion and subsequent effects on soil productivity or the ability of the soil to produce vegetation.
2. Secondary effects from erosion are the loss of soil depth, infiltration capacity and permeability or reduction in the soil hydrologic function.
3. The effects analysis for the soil resource should focus on the risk of soil erosion from trail/road runoff water to the soil next to or downslope.

Soil Productivity

The erosion that may occur from the authorized trail or road surfaces is a concern regarding loss or degradation of the facility, but not a particular concern for the soil resource, because the route surface is a dedicated use and no longer dedicated to growing vegetation. Basically, soil productivity is not a particular concern 1) if an unauthorized route is converted to a system route (NFTS); or 2) if the unauthorized route is closed and re-vegetated (passive recovery).

Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative there is concern for the soil resource for 38.5 miles of unauthorized motorized trails that were given a soil rating of 3 and 4 out of 106 miles assessed. See effects methodology section for a description of the rating system. This is not all of the inventoried unauthorized motorized trails. There is 8.5 miles of unauthorized motorized trails with a 4 rating and at least 50 percent of the route with a red rating using the green, yellow, red soil monitoring rating system. This means that the routes will be difficult to completely mitigate and they will have an adverse effect on the soil resource. These routes have severe gully erosion and in several cases there is a bypass route to the motorized trail. The routes with a 3 rating have at least 50 percent of the route with a yellow rating and a portion of the route with a red rating. The routes with a 3 and a yellow rating are in critical need of erosion control measures to prevent the routes from going into a red category. In the Miami Creek area, it was estimated over an 11 year period between 1989 and 2000 that there was an increase of 0.5 miles of unauthorized, unauthorized motorized trails (Roath 2000). Over a 20-year period, using the value found during the 11-year monitoring interval between 1989 and 2000, there could be an increase of at least 10 miles of motor vehicle trails in the Miami Creek area. Unauthorized motorized trails in the other analysis areas would also increase. Passive recovery of the unauthorized motorized trails will not occur. Unrestricted use of these unauthorized motorized trails and continuance of cross-country travel will not meet soil standard and guidelines.

There is over 243 acres of inventoried and GPS, unrestricted use areas that will continue to be used and enlarged by the motorized recreation community. This could result in degradation of the soil resource and loss of soil productivity. These areas will not meet soil standard and guidelines. Unauthorized routes and use areas were located using GPS by TEAMS.

There is approximately 502 miles of NFTS roads open all year that have a native surface and were rated as having a severe HFC. It is unknown whether the road surface condition is meeting the intent of the LRMP standard and guideline that calls for stabilization and providing road surface drainage (see LRMP S&G 129, USDA-FS 1991 and LRMP Letter of Correction, USDA-FS 2009).

Cumulative Effect:

The cumulative watershed effects (CWE) (Gallegos 2009) analysis established that existing past impacts had raised some sub-watersheds to percent Equivalent Roaded Acres (percent ERAs) levels that exceeded their respective lower Threshold of Concern (TOC) ERA value and above the upper TOC ERA value. The CWE assessment evaluated 487 HUC 8 subwatersheds over the area where inventoried unauthorized motorized trails occurred. There are a total of 534 channel crossings, within 25 subwatersheds, associated with unauthorized motorized trails proposed in this alternative. Fifteen subwatersheds have a low potential for CWE, five subwatersheds have a moderate potential for CWE and five subwatersheds have a high potential for CWE. See the CWE Assessment report in the project record for specific details.

Alternative 2 – Proposed Action

The proposed action is comprised of the prohibition of cross-country motorized travel, the proposed changes to the existing NFTS and the additions to the NFTS as described in the NOI published September 11, 2007 (Volume 72, Number 175) with some modifications:

- Prohibits cross-country motorized travel

- Adds 40 miles of NFTS motorized trails (103 routes)
- Adds 6 miles of NFTS roads (33 roads)
- Adds 6.1 acres within one use area open to motor vehicle use
- Changes the seasonal open period for 753 miles of existing NFTS roads (839 road segments)
- Changes vehicle class on 159 miles of existing NFTS roads (58 roads)
- Prohibits all vehicle use on 204 miles of existing NFTS roads (395 roads)
- Changes 0 miles of NFTS roads to operate as combined use roads under California State Vehicle Code 38026

Direct and Indirect Effects

Under this alternative, 8.3 miles of unauthorized motorized trails that will be included in the authorized system, were given a soil rating of 4 and at least 50 percent of the route has a red rating using the green, yellow, red soil monitoring rating system. This means that the routes will be difficult to completely mitigate and they will have an adverse effect on the soil resource (see Table 85). These routes have severe gully erosion and in several cases there is a bypass route to the unauthorized motorized trail.

Table 85. Alternative 2 – Proposed Routes with Adverse Effect

Analysis Unit	ID	Length (mi)	Tread Width	Assessment Rating
West Fall	JM-2y	0.50	24-50_INCH	4
West Fall	JM-36	0.65	24-50_INCH	4
West Fall	JM-7ay	1.01	24-50_INCH	4
West Fall	PK25	0.53	24-50_INCH	4
West Fall	PK-5	1.64	24-50_INCH	4
West Fall	SR-45z	0.25	24-50_INCH	4
Total		**4.58**		

There are 35.7 miles of unauthorized motorized trails that were given a soil rating of 1 to 3. Approximately 13.9 miles of unauthorized motorized trails will require special mitigation measures other then general maintenance (see Table 86). These mitigation measures will be required to implement before the route is open to the public. See Appendix B for a description of the special mitigation measures.

Table 86. Alternative 2 – Proposed Routes that Require Additional Mitigation Measures

Analysis Unit	ID	Length (mi)	Assessment Rating	Soil Code
West Fall	JM-23	0.42	3	SW-2, SW-7, SW-27
West Fall	JM-27z	0.28	3	SW-2, SW-7, SW-27
West Fall	PK22	0.49	3	SW-19
West Fall	PK24	0.62	3	SW-2, SW-7, SW-27
West Fall	SR-13z	0.34	3	SW-2, SW-7, SW-27
West Fall	SR-21z	0.83	3	SW-15, SW-16, SW-19, SW-3, SW-2, SW-27, SW-7
West Fall	SR-56z	0.10	3	SW-2, SW-7, SW-27
West Fall	SR-92	0.16	3	SW-2, SW-7, SW-27
West Fall	SR-94	0.21	3	SW-2, SW-7, SW-27
West Fall	SV31	0.11	3	SW-2, SW-7, SW-27
West Fall	SV35	1.18	3	SW-2, SW-7, SW-27
West Fall	TR-08	0.12	3	SW-2, SW-7, SW-27
Total		**4.86**		

There is one, 6.12 acre use area, called HSA-01 that has a slight HFC and is not a concern for the soil resource.

There is approximately 558 miles of inventoried unauthorized motorized trails. Approximately 514 miles of inventoried unauthorized trails will be closed to use and cross-country travel will be eliminated. Approximately 429 miles of unauthorized trails will recover within 20 years. Approximately, 62 miles of unauthorized trails will recover within 20 to 30 years. Approximately, 23 miles of unauthorized trails are expected to take more then 30 years to recover.

The soil concern for changes in the open and seasonal closure of NFTS roads includes using roads with sensitive soils and native surface during the wet season, which could cause rutting of the road and off site erosion. There are 753 miles of NFTS roads that will have changes in the open and season closure period. There is approximately 287 miles of NFTS roads open all year that have a native surface and were rated as having a severe HFC. It is unknown whether the road surface condition is meeting the intent of the LRMP standard and guideline that calls for stabilization and providing road surface drainage (see LRMP S&G 129, USDA-FS 1991 and LRMP Letter of Correction, USDA-FS 2009).

Cumulative Effects:

Thirteen subwatersheds are over their respective lower TOC ERA values in Alternative 2. These subwatersheds include: 501.4002, 501.4003, 501.5101, 503.0002, 503.0003, 503.0052, 503.0053, 503.0054, 503.0055, 520.0017, 520.0056, 520.3002 and 520.5001. There are a total of 144 channel crossings, within the 13 subwatersheds, associated with unauthorized motorized trails proposed in this alternative. Nine subwatersheds have a low potential for CWE, two subwatersheds have a moderate potential for CWE and two subwatersheds have a high potential for CWE. See the CWE Assessment report in the project record for specific details (Gallegos 2009).

Alternative 3

Alternative 3 responds to issues of impacts to natural and cultural resources and impacts to non-motorized recreational experience by prohibiting motorized cross-country travel without adding any additional facilities to the NFTS and by applying seasonal closures to existing NFTS roads and trails where needed. This alternative also provides a baseline for comparing the impacts of other alternatives that propose changes to the NFTS in the form of new facilities (roads, trails, areas). None of the currently unauthorized roads, trails or areas would be added to the NFTS under this alternative.

- Prohibits cross-country motorized travel
- Adds 0 miles NFTS motorized trails (0 routes)
- Adds 0 miles NFTS roads (0)
- Adds 0 areas open to motor vehicle use

Direct and Indirect Effects

There is approximately 558 miles of inventoried unauthorized motorized trails that will not be used and will eventually recover soil productivity. Most of the unauthorized motorized trails will revegetate and soil cover will become established in most of the unauthorized motorized trails.

Approximately 473 miles of unauthorized motorized trails will recover within 20 years. Approximately, 62 miles of unauthorized motorized trails will recover within 15 to 30 years. These unauthorized motorized trails include; JG5, JM-18, JSM61, PK-114z, PK-128, PK-51x, TH-28x, TH-31x, TH-47z, TH-48z, TH-54z, TH-56y, TH-41, JH-11, JH-12, JH-15, JH-18b, JH-40, JH-56, JH-78z, JH-90, JH-91, PK-01z, PK-04, PK-17, PK-22, PK-25, PK-41, PK-64, PK-65, PK-66. Approximately, 23 miles of unauthorized motorized trails will recover within 15 to 50 years. These unauthorized motorized trails include; AE-13, JH-20y, PK-05x, BP48, JSM56, TH-161z, JH-73, JH-77, JH-79, PK-01zf, PK-01zh, PK-01zk, PK-37, PK-39, PK-40, PK-41. Portions of 10 unauthorized motorized trails in the Miami Creek Basin, totaling 8.79 miles will never completely recover. These unauthorized motorized trails have severe gully erosion, up to 3 feet deep and top soil has been displaced and severely disturbed. These routes will require watershed restoration in order to restore these sites to full productivity and reduce erosion and sedimentation into the Miami Creek channel system. These unauthorized motorized trails include: ES1, JM-17z, JM-2y, JM-36, JM-7ay, PK25, PK-5, SR-45z, SV16. There are still a substantial number of unauthorized motorized trails that have not been reviewed and may never completely recover.

The soil concern for changes in the open and seasonal closure of NFTS roads includes using roads with sensitive soils and native surface during the wet season, which could cause rutting of the road and off site erosion. There are 1404 miles of NFTS roads that will have changes in the open and season closure period. There is approximately 502 miles of NFTS roads open all year that have a native surface and were rated as having a severe HFC. It is unknown whether the road surface condition is meeting the intent of the LRMP standard and guideline that calls for stabilization and providing road surface drainage (see LRMP S&G 129, 1991 and LRMP Letter of Correction, USDA-FS, 2009).

Cumulative Effects

Cumulative soil effects will be reduced from the elimination of unauthorized motorized trails. The unauthorized motorized trails will naturally recover and revegetate and soil cover will become established in most of the unauthorized motorized trails. Sediment will be reduced and channel conditions and aquatic habitat conditions will improve. The ERA values in the 96

subwatersheds that are over their respective lower TOC ERA values will decrease. Some of these subwatersheds will continue to have potential from CWE from other activities occurring in the subwatersheds. The Miami Creek area will be the most affected from natural recovery of unauthorized motorized trails in these subwatersheds. However, some of the unauthorized motorized trails have resulted in severe gully erosion of up to 3 feet deep and top soil has been displaced and severely disturbed. These routes will require watershed restoration in order to restore these sites to full productivity and reduce soil erosion. See the CWE Assessment report for specific details (Gallegos 2009).

Alternative 4

Alternative 4 responds to issues of impacts to motorized access and impacts to natural and cultural resources. This alternative adds roads and areas accessing recreation opportunities such as camping, fishing, picnicking and parking. This alternative provides safe traffic access while maintaining current passenger car recreational uses. This alternative also changes the location of many motorized trails and changes or applies additional seasonal or year round closures (compared to Alternative 2) in cases where natural or cultural resource concerns were raised internally and/or by the public.

- Prohibits cross-country motorized travel
- Adds 42 miles NFTS motorized trails (96 routes)
- Adds 9 miles NFTS roads (43)
- Adds 37.2 acres within 11 use areas open to motor vehicle use
- Changes the seasonal open period for 1404 miles of existing NFT system roads (1271 road segments)
- Changes vehicle class on 175 miles of existing NFT system roads (76 roads)
- Prohibits all vehicle use on 268 miles of existing NFTS roads (547 roads)
- Changes 0 miles of NFTS roads to operate as combined use roads under California State Vehicle Code 38026

Direct and Indirect Effects

There are no routes with potential to cause an adverse effect to the soil resource. There were no routes with a soil rating of 4. All 42 miles of proposed unauthorized motorized trails were given a soil rating of 1-3. Approximately 0.5 miles of unauthorized motorized trails (PK22) will require special soil protection mitigation measures other then general maintenance. These mitigation measures will be required to implement before the route is open to the public.

There are 11 use areas that have a slight to moderate HFC (see Table 87). All 11 of proposed use areas were given a soil rating of 1 or 2. These use areas are not a concern for the soil resource. It is assumed that these use areas will have general maintenance to prevent runoff, erosion and a loss of soil productivity.

Table 87. Alternative 4 – Use Areas

Analysis Unit	Use Area ID	Assessment Rating	HFC
Dinkey-Kings	BLKRCK77	2	Severe
Dinkey-Kings	BLUCYN152	2	Severe
East of Kaiser Pass	KP@MHS9	2	Moderate
Gaggs	GRTRDCRK116	1	Slight
Gaggs	GRTRDCRK117	1	Slight
Tamarack-Dinkey	SFTMRCK179	2	Moderate
Tamarack-Dinkey	TULEMDW1	1	Slight
West Fall	CHPOSDDL390	2	Moderate
West Fall	FRSNODM94	1	Slight
West Fall	MCLDFLT375	2	Moderate
West Fall	VSTDM363	2	Severe

There is approximately 558 miles of inventoried unauthorized motorized trails. Approximately 516 miles of inventoried unauthorized motorized trails will be closed to use and cross-country travel will be eliminated. Approximately 431 miles of unauthorized motorized trails will recover within 20 years. Approximately 62 miles of unauthorized motorized trails will recover within 15 to 30 years. Approximately 23 miles of unauthorized motorized trails will recover within 15 to 50 years.

The soil concern for changes in the open and seasonal closure of NFTS roads includes using roads with sensitive soils and native surface during the wet season, which could cause rutting of the road and off site erosion. There are 1404 miles of NFTS roads that will have changes in the open and season closure period. There is approximately 176 miles of NFTS roads open all year that have a native surface and were rated as having a severe HFC. It is unknown whether the road surface condition is meeting the intent of the LRMP standard and guideline that calls for stabilization and providing road surface drainage (see LRMP S&G 129, USDA-FS 1991 and LRMP Letter of Correction, USDA-FS 2009).

Cumulative Effects:

There are a total of 61 channel crossings, within 18 subwatersheds, associated with unauthorized motorized trails proposed in this alternative. There is a low potential that CWE will occur in 16 of these subwatersheds including: 501.0023, 501.4002, 501.4003, 501.5101, 503.0003, 503.0011, 503.0052, 503.0055, 503.0056, 503.3051, 504.2102, 504.2151, 519.3053, 520.0017, 520.3002 and 520.5001. Two subwatersheds have a moderate potential for CWE and zero subwatersheds have a high potential for CWE. See the CWE Assessment report for specific details (Gallegos 2009).

Alternative 5

Alternative 5 responds to the issues of impacts to motorized access and motorized use and ownership conflicts. This alternative adds some trails to provide a greater number and variety of motorized recreational experiences and more roads and areas accessing recreation opportunities such as camping, fishing, picnicking and parking. Seasonal and year round closures are applied where needed for resource protection. This alternative provides safe traffic access while adding motorized trails to address the concerns raised by the public that concentrating motorized use to

fewer designated routes and areas would cause overcrowding and possible degradation of the motorized recreational experience.

- Prohibits cross-country motorized travel
- Adds: 71 miles NFTS motorized trails (167 routes)
- Adds: 14 miles NFTS roads (62)
- Adds 113.1 acres within 20 areas open to motor vehicle use
- Changes the seasonal open period for 1551 miles of existing NFTS roads (1508 road segments)
- Changes vehicle class on 302 miles of existing NFTS roads (130 roads)
- Prohibits all vehicle use on 155 miles of existing NFTS roads (368 roads)
- Changes 47 miles of NFTS roads to operate as combined use roads under California State Vehicle Code 38026

Direct and Indirect Effects

Under this alternative there is concern for the soil resource for 1.61 miles of unauthorized motorized trails that were given a soil rating of 4 and at least 50 percent of the route has a red rating using the green, yellow and red soil monitoring rating system. This means that the routes will be difficult to completely mitigate and they will have an adverse effect on the soil resource (see Table 88). These routes have severe gully erosion and in several cases there is a bypass route to the unauthorized motorized trail.

Table 88. Alternative 5 – Proposed Routes with Adverse Effects

Analysis Unit	ID	Length (mi)	Tread Width	Assessment Rating	HFC
West Fall	JM-2y	0.50	24-50_INCH	4	Severe
West Fall	JM-36	0.65	24-50_INCH	4	Severe
West Fall	SV16	0.46	24_INCH	4	Severe
Total		**1.61**			

There are 74.23 miles of unauthorized motorized trails that were given a soil rating of 1-3. Approximately, 8.53 miles of unauthorized motorized trails will require special mitigation measures other then general maintenance (see Table 89). These mitigation measures will be required to implement before the route is open to the public.

Table 89. Alternative 5 – Proposed Routes That Require Additional Mitigation Measures

Analysis Unit	ID	Length (mi)	Assessment Rating	Soil Code
West Fall	JM-14x	0.33	3	SW-2, SW-7, SW-27
West Fall	JM-22y	0.34	3	SW-2, SW-7, SW-27
West Fall	JM-23	0.42	3	SW-2, SW-7, SW-27
West Fall	JM-27z	0.28	3	SW-2, SW-7, SW-27
West Fall	JM-41	0.61	3	SW-2, SW-7, SW-27
West Fall	PK24	0.62	3	SW-2, SW-7, SW-27
West Fall	SR-13z	0.34	3	SW-2, SW-7, SW-27
West Fall	SR-56z	0.10	3	SW-2, SW-7, SW-27
West Fall	SR-92	0.16	3	SW-2, SW-7, SW-27
West Fall	SR-94	0.21	3	SW-2, SW-7, SW-27
West Fall	SV25	0.08	3	SW-2, SW-7, SW-27
West Fall	SV31	0.11	3	SW-2, SW-7, SW-27
West Fall	SV35	1.18	3	SW-2, SW-7, SW-27
West Fall	TR-08	0.12	3	SW-2, SW-7, SW-27
West Fall	JM-36	0.65	4	SW-19
West Fall	PK22	0.49	3	SW-19
West Fall	SR-21z	0.83	3	SW-15, SW-16, SW-19, SW-3, SW-2, SW-27, SW-7
West Fall	JM-2y	0.50	4	SW-15, SW-16, SW-19, SW-3, SW-2, SW-27
West Fall	SV16	0.46	4	SW-15, SW-16, SW-19, SW-3, SW-2, SW-27
Total		**7.83**		

There are 11 use areas that have a slight to moderate HFC (see Table 90). All 11 of proposed use areas were given a soil rating of 1 or 2. These use areas are not a concern for the soil resource. It is assumed that these use areas will have general maintenance to prevent runoff, erosion and a loss of soil productivity.

Table 90. Alternative 5 – Use Areas

Analysis Unit	Use Area ID	SOIL RATING	HFC
Dinkey-Kings	BLKR7CK8	2	Severe
Dinkey-Kings	BLKR7CK8	2	Severe
Dinkey-Kings	BLKRCK77	2	Severe
Dinkey-Kings	BLUCYN152	2	Severe
Dinkey-Kings	BLUCYN4	2	Severe
Dinkey-Kings	BLUCYN6	2	Severe
East of Kaiser Pass	KP@MHS9	2	Moderate
East of Kaiser Pass	ONSPRGSOF13	1	Slight
Gaggs	BSR373	2	Severe
Gaggs	CNTRLCMPSPR345	1	Slight
Gaggs	GRTRDCRK116	1	Slight
Gaggs	GRTRDCRK117	1	Slight
Gaggs	RCKCRKSPR391	2	Moderate
Gaggs	WHSKYFLLS351	1	Slight
Jose-Chawanakee	SGRLFHL223	2	Severe
Tamarack-Dinkey	SFTMRCK179	2	Moderate
Tamarack-Dinkey	TULEMDW1	1	Slight
West Fall	CHPOSDDL390	2	Moderate
West Fall	FRSNODM94	1	Slight
West Fall	MCLDFLT375	2	Moderate
West Fall	VSTDM363	2	Severe

There is approximately 558 miles of inventoried unauthorized motorized trails. Approximately 482 miles of inventoried unauthorized motorized trails will be closed to use and cross-country travel will be eliminated. Approximately 397 miles of unauthorized motorized trails will recover within 20 years. Approximately 62 miles of unauthorized motorized trails will recover within 15 to 30 years. Approximately 23 miles of unauthorized motorized trails will recover within 15 to 50 years.

The soil concern for changes in the open and seasonal closure of NFTS roads includes using roads with sensitive soils and native surface during the wet season, which could cause rutting of the road and off site erosion. There are 1551 miles of NFTS roads that will have changes in the open and season closure period. There is approximately 176 miles of NFTS roads open all year that have a native surface and were rated as having a severe HFC. It is unknown whether the road surface condition is meeting the intent of the LRMP standard and guideline that calls for stabilization and providing road surface drainage (see LRMP S&G 129, 1991 and LRMP Letter of Correction, USDA, 2009).

Cumulative Effects

There are a total of 160 channel crossings, within the 22 subwatersheds, associated with unauthorized motorized trails proposed in this alternative. There is a low potential that CWE will occur in 17 subwatersheds including: 501.0023, 501.4002, 501.5101, 503.0002, 504.2008, 503.0011, 503.0055, 503.0056, 503.3051, 504.2102, 504.2151, 519.3053, 519.4051, 520.0017, 520.0056, 520.3002 and 520.5001. Three subwatersheds have a moderate potential for CWE and

two subwatersheds have a high potential for CWE. See the CWE Assessment report for specific details (Gallegos 2009).

Summary of Effects Analysis across All Alternatives

Table 91. Soil Resources, Summary of Effects Analysis across All Alternatives

Comparison Criteria	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Miles of Unauthorized routes with 4 Soil Rating (red)	8.5	8.3	N/A	0.5	1.61
Miles of Unauthorized routes with Special Mitigation	38.5	13.89	N/A	0	8.53
Miles of Unauthorized routes that will Passively Recover within 20 Years	0	429	473	431	397
NFTS Roads On Native Surface (sensitive soils) open all year	502	287	502	176	176