# Motorized Travel Management EA
# San Bernardino National Forest

## Water and Soil Resources

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# Introduction

Protection of water quantity and quality is an important part of the mission of the Forest Service (Forest Service Strategic Plan for 2007 to 2012, July 2007). Management activities on national forest lands must be planned and implemented to protect the hydrologic functions of forest watersheds, including the volume, timing, and quality of streamflow. The use of roads, trails, and other areas on national forests for public operation of motor vehicles has potential to affect these hydrologic functions through interception of runoff, compaction of soils, and detachment of sediment (e.g., 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 watershed functions.

The soil resource provides many essential functions for national forest 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. The proposed actions could potentially impact soil productivity and its other ecosystem functions and are therefore addressed here.

# Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

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

**San Bernardino NF Land Management Plan -** The San Bernardino NF was established to protect the watersheds that influence runoff and supply water to local communities and municipalities (SBNF LMP Part 2:27). Local demand for water is greater than can be produced from national forest watersheds (SBNF LMP Part 2:36). The Physical Resources Program emphasis is expected to balance the needs of water users with the resource needs for maintaining or improving stream, riparian, springs, and wetland habitat by procuring water rights and instream flow agreements to address the increased demand for the ground and surface water resources of the national forest (SBNF LMP, Part 2:27 and 36-37).

No watershed related Forest Specific Design Criteria were identified in the San Bernardino NF LMP, Part 2:99-102. There are Standards, Guidelines, Strategies, Tactics provided for watershed (SBNF LMP Part 2:134-136), and Management Direction Design Criteria for the Southern California NF (SBNF LMP Part 3:3-41) provided for water and soil resources.

San Bernardino NF LMP Appendix D – Adaptive Mitigation for Recreation Uses lists actions and practices for all existing and new recreation sites and uses whenever a conflict between uses or sensitive resources is detected. Sensitive resources include riparian habitats, soils, and watersheds.

San Bernardino NF LMP Appendix E – Five-Step Project Screening Process for Riparian Conservation Areas provides direction to ensure riparian conservation areas (RCAs) are recognized, emphasized, and managed appropriately during new project planning and implementation.

## FS Manual Direction

**2500 Watershed and Air Management -** Region 5 Supplement 2500-92-4 to FSM 2540 gives guidance on water uses and developments. This supplement is not applicable to the San Bernardino NF Motorized Travel Management EA; no water uses or developments are proposed.

Region 5 Supplement 2500-92-2 to FSM 2526 discusses riparian area management

Region 5 Supplement 2500-93-1 to FSM 2530 gives guidance on water quality management and the application of Best Management Practices (BMP). Section 2532.03 states "it is the policy of Region 5 that water quality management on National Forest System lands in California shall be conducted within the guidelines and procedures set forth in R-5 FSH 2509.22 Soil and Water Conservation Handbook, and in accordance with the Management Agency Agreement executed in 1981 between the Forest Service and State Water Resources Control Board".

2509.22 Watershed Conservation Practices Handbook – San Bernardino NF Forest Supplement 2509.22-2005-1, effective date November 30, 2005 for the San Bernardino NF provides direction for riparian resources.

2560 and 2880 Groundwater Resources Management Draft direction

**EO 11988 and 11990, Floodplain and Wetland Protection -** Floodplain and wetland delineation will occur as part of this analysis. Floodplain and wetland protection (BMPs) will be integrated into project design. Floodplain and wetland guidance is also found in 2509.22-2005-1 sec 2.3.

**EO 11644 and 11989, Use of Off-Road Vehicles on Public Lands -** These Executive Orders establish "policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands …" (Section 1). Section 3 (1) establishes that "Areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands." Section 9 (a) allows the agency head to close trails to use if the use is causing effects to the soil, vegetation, and other resources until the adverse effects have been eliminated and measures are implemented to prevent future recurrence.

**Clean Water Act of 1948 (as amended in 1972 and 1987) -** The 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 (The California Water Code, including the Porter-Cologne Water-Quality Act (as amended in 2006)).

The state of California, in accordance with EPA and as required by the Clean Water Act (CWA), Section 303(1) (A), has identified water bodies impaired by specific pollutants.

Impaired water bodies may not fully support their designated beneficial uses and are placed on the State 303(d) list for further study or development of a TMDL plan for the pollutant deemed to be impairing use.

**Water Quality Management for Forest Service System Lands in California, 2000 -** Non-point source pollution on national forests is managed through the Regional Water Quality Management Plan (USDA Forest Service 2000), which relies on implementation of BMPs. The Water Quality Management Plan includes one BMP for non-highway legal vehicle use (4-7) and 28 BMPs related to road construction and maintenance (2-1 to 2-28) (Watershed Project File WAT-9). All NFS roads and trails open to non-highway legal vehicle use are required to comply with these BMPs.

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

Watershed Project File WAT-9 contains a BMP checklist for the San Bernardino NF Motorized Travel Management EA. Region 5 BMP Practices are referenced in USDA-FS Sept 2000. BMP monitoring procedures are referenced in USDA-FS June 2002. San Bernardino National Forest Riparian Conservation Area guidance is found in 2509.22-2005-1 sec 2.5.

**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 non point-source pollution and BMPs.

**The Porter-Cologne Water-Quality Act, as amended in 2006 -** The Porter-Cologne 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 Board and the Regional Water Quality Control Boards, which are authorized by the US Environmental Protection Agency (US EPA) to enforce the Clean Water Act of California. Section 13263 of the Porter Cologne Act requires compliance with the Provisions of the Federal Water Pollution control Act as amended in 1972 (also known as the CWA) and preparation of a Pollution Prevention Plan for all projects.

Grant money from the State of California for non-highway legal route implementation contains a stipulation that the project will conform to state laws and policies. The Pollution Prevention Plan for this project is found in the Watershed Project File WAT-9.

## Direction relevant to the proposed action as it affects soil resources includes:

**San Bernardino National Forest LMP -** No watershed related Forest Specific Design Criteria were identified in the San Bernardino NF LMP, Part 2:99-102. There are

Standards, Guidelines, Strategies, Tactics provided for watershed (SBNF LMP Part 2:134-136), and Management Direction Design Criteria for the Southern California NF (SBNF LMP Part 3:3-41) provided for water and soil resources.

San Bernardino NF LMP Appendix D – Adaptive Mitigation for Recreation Uses lists actions and practices for all existing and new recreation sites and uses whenever a conflict between uses or sensitive resources is detected. Sensitive resources include riparian habitats, soils, and watersheds.

**EO 11644 and 11989, Use of Off-Road Vehicles on Public Lands -** These Executive Orders establish "policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands …" (Section 1). Section 3 (1) establishes that "Areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands." Section 9 (a) allows the agency head to close trails to use if the use is causing effects to the soil, vegetation, and other resources until the adverse effects have been eliminated and measures are implemented to prevent future recurrence.

**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.

**Region 5 Soil Management Handbook Supplement -** The Forest Service Region 5 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 R5 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 R5 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. Utilization of the thresholds and indicators provides a consistent method to analyze, describe and report on soil condition throughout the Region.

# Effects Analysis Methodology

## Data Sources

1. Soil and water resources were field reviewed by Terry Carlson, Forest Service Hydrologist and Soil Scientist, November 18, 19, and 20, 2006 (Watershed Project File WAT-1: Soil and Water Review). Over 25 miles of the proposed routes were reviewed focusing on the Cleghorn and Pilot Rock Fuelbreaks, Green Valley and Crab Cr Routes, Cactus Flats area, and short routes around the housing development on the north shore of Lake Arrowhead. In addition, a restoration plan was developed for the Green Valley Staging Area and proposed staging area locations for Summit, Miller Canyon, and Crab Flat were reviewed. These routes and staging areas were field reviewed with the Forest Motorized Trail Ranger. Information about routes not field reviewed in November was obtained from discussions with the Forest Motorized Trail Ranger (Jan 2007, March 2007).

   Review methods included driving routes identified with special watershed concerns and those areas needing restoration. Notes and pictures were taken (Photos are found in Watershed Project File WAT-7). Because of the dispersed nature of the project areas, site-specific soil data and stream data was not collected, however as noted above, pictures and observational notes were taken. GIS resources, topographic maps, and conversations with the Forest ORV Ranger provided route specific information. The data is useful to provide a characterization of the area but is not intended to provide trend or baseline monitoring data.

   Soil and water resources were also field reviewed by Greg Hoffman, San Bernardino NF Motorized Trail Ranger, August 2007. Greg has education and experience in watershed science as well as extensive knowledge of the Forest non-highway legal routes.

   The Watershed Specialist Report was peer reviewed by Robert Taylor, San Bernardino Forest Hydrologist.

   Information on impaired water bodies was obtained from the California Department of Water Resources website (California DEQ 2007).

2. The San Bernardino NF provided GIS data runs for road density, meadow and stream buffers, road/stream intersections (crossings), soil erosion and slope, as well as 7$^{th}$ level subwatershed basins. GIS products are found in the Watershed Project File WAT-4. GIS numbers are useful to compare between alternatives. There is error associated with the numbers (*e.g.*, GPS and locational errors when inputting points and lines into GIS, lack of full GIS coverage); the numbers do not represent absolute values.

3. Soils within the analysis area have been mapped and are described in the San Bernardino National Forest Land System Inventory (USDA NRCS 1981). The survey, completed in 1981, was a broad reconnaissance level survey. For this project, the survey was used to provide landscape level information related to the soil resource (Watershed Project File WAT-1: Soil Series Information). This Soil Resource Inventory was correlated under the National Cooperative Soil Survey with NRCS (Natural Resources Conservation Service).

4. Erosion and Runoff Risk Modeling was completed using FS WEPP - Disturbed WEPP. This is a computer model that allows users to evaluate quickly erosion and sediment delivery potential from forest activities and roads (Watershed Project File WAT-2: WEPP run for mitigations). Documentation of the model, assumptions, and limitations can be found on the web site: http://forest.moscowfsl.wsu.edu/fswepp. Bill Elliot is the Project Leader.

   The modeling illustrates to decision makers and the public various erosion and runoff risks associated with the typical soil found on the forest. In addition, two different stream crossing egress trail widths were modeled (Table WAT 5).

   Experience using the model for other projects shows that in general as you increase slope, increase traffic, and decrease vegetation on sandy soils, erosion will increase; thus erosion modeling was not conducted for all channel crossings or along all routes considered (Elliot 2007 personal communication). This modeling provides a baseline to compare alternatives.

   Finally, FS WEPP Roads modeling was completed to determine the estimated road slope at which accelerated erosion occurs. For this exercise, Lake Arrowhead climate parameters where combined with sandy loam soils (Watershed Project File WAT-2: WEPP run for mitigations). All road parameters were held constant with the road slope changing from 0.3 to 25 percent. The estimated road prism erosion was graphed and reviewed for jumps in erosion rates. Based on the constants, erosion increased most between 0.3 and 5 percent slope and again between 15 and 20 percent. Given the shear stress and compressive effects of wheeled vehicles on slopes, a slope range of 15-20 percent was determined to be most sensitive to non-highway legal vehicle traffic. This slope range corresponds to soil sensitivities document in the San Bernardino NF Soil Survey and literature. Refer to the effects section of this document for information on the effects of non-highway legal traffic on soil and water resources and literature citations.

   **Limitations of Disturbed WEPP and WEPP Roads include:**

   Model results indicate the magnitude of change likely to occur following implementation. The accuracy of a predicted runoff or erosion event is at best 50% (+/-) (Elliot 2000). The results are most useful for comparing alternatives. Underlying the WEPP model is the USLE (universal soil loss equation), a model developed to help farmers estimate and limit top soil loss from individual fields. Elliot and others have improved the model based on research to capture some of the variability of forested landscapes, but predicting sediment delivery from complex watersheds to streams remains a challenge.

The model runs are not site-specific, thus they do not determine the exact amount of erosion or runoff produced. Climate and soil variables were not altered by the modeler, pre-set pull down menus were used.

The model assumes a smooth slope from the ridge to the bottom and does not account for microsites that would capture and slow flow and sediment (Zhang *et al.* 2006:12). Road parameters selected for modeling are found in Watershed Project File WAT-2: WEPP run for mitigations.

The climate model used for WEPP is PRISM developed by extrapolating precipitation information between weather stations and then adjusted by state climatologists. This model predicts storm events and their effect on erosion. It is possible that the model predicts storms that do not occur or does not predict a large storm that does occur. Because WEPP uses average climatic conditions, the occurrence of large events the year of implementation could nullify estimates of sediment contributions. Lake Arrowhead climate data was selected since it is closest in proximity to proposed non-highway legal routes.

5. Numbers presented in the following tables and throughout this discussion are useful to compare between alternatives. There is error associated with the numbers (*e.g.*, GPS and locational errors when inputting points and lines into GIS, lack of full GIS coverage); the numbers do not represent absolute values.

## Water and Soil Resource Issues

Water and soil issues were raised through both an internal and public scoping process for the proposed action. Issues are incorporated into mitigations and discussed in this analysis.

- Clean Water Act (CWA)
- Water quality limited water bodies.
- Changes to water quality.
- Stream Channel Stability, at route crossings or where the route and channel are in close proximity.
- Increase in slope erosion and in-channel sediment. Coarse textured soils and slopes greater than 15-20 percent result in a moderate to high erosion hazard.
- Riparian Areas, wetlands, floodplains: project effects to these resources.

## Water and Soil Resource Issue Statements and Measures

1. The effects of implementing the San Bernardino NF Motorized Travel Management EA on surface water quality (sediment, nutrients, and metals)

   Measure: Miles of routes added to NFTS system (net change)

   Measure: Miles designated for public motorized use within 150 feet of perennial streams

Measure: Miles designated for public motorized use within 150 feet of intermittent streams

Measure: Miles proposed for decommissioning

Measure: Miles proposed for restoration of unauthorized routes

2. The effect of implementing the San Bernardino NF Motorized Travel Management EA on stream channel stability.

   Measure: Number of intermittent stream crossings to be closed to public motorized use

3. The effect of implementing the San Bernardino NF Motorized Travel Management EA on soil erosion rates.

   Measure: Acres to be closed to public motorized use on severe erosion risk soils

4. The effect of implementing the San Bernardino NF Motorized Travel Management EA on wetland and meadow hydrology.

   Measure: Miles designated for public motorized use within Rouse Meadows

# Water and Soil Resource Methodology by Action

## 1. Direct/indirect effects of the prohibition of cross-country motorized vehicle travel and the restoration of unauthorized routes.

Cross-country motorized travel is currently prohibited in the San Bernardino NF. Motorized vehicle use is restricted to designated routes by the SBNF LMP, Part 3, S35:8-9 and Forest Order 5, pursuant to 36 CFR 261.56 (July 22, 1996). The effect of this prohibition on cross-country motorized travel has been to end traffic on routes and areas beyond the authorized NFTS.

Since closure of the cross-country motorized travel routes, passive restoration has begun the healing process although disturbed areas have not change much because removal of vegetation, compaction of soils, and alteration of drainage patterns require time to heal without active restoration. Elimination of traffic on unauthorized routes and areas has reduced erosion caused by wheel abrasion, but the routes still intercept and concentrate surface flows and produce sediment. In the long term, some or all unauthorized routes and areas would probably revegetate and regain some of their hydrologic and geomorphic functions, although use of these routes by non-motorized traffic could delay or prevent recovery.

This EA proposes to add selected unauthorized routes to the NFTS system and perform active restoration on identified unauthorized routes. Identified routes are those tied to a legal settlement agreement through the Southern California Conservation Strategy and portions of 2W47X (Cleghorn Ridge Fuelbreak). The effects of passive and active restoration are described in Effects Common to All Alternatives and Watershed Project File PF-WAT-6. Recovery potential is discussed in Appendix A – Water and Soil Existing Resources Report.

**Short-term timeframe:** N/A the Forest prohibition on cross-country travel has been in effect since 1996.

**Long-term timeframe:** 20 years (for passive restoration)

**Spatial boundary:** Forest

**Indicator(s):** Miles proposed for restoration of unauthorized routes

**Methodology:** GIS analysis of existing unauthorized routes

**Rationale:** Published studies (see Reference section) have documented that erosion of native-surface roads is increased by traffic. General guidelines in the National Soil Management Handbook and Region 5 Soil Management Handbook Supplement.

**Water Resource Direct and Indirect Effects:** The major effects of cross-country motorized travel and route proliferation on water resources included increased peak flows and sediment loads due to compacted and unvegetated route surfaces and detachment of sediment by vehicles. For existing NFTS and unauthorized routes, direct and indirect effects have already occurred. The short-term effects of proposed changes to the San Bernardino NFTS system will be small and unquantifiable reductions in traffic-related sediment and related pollutants.

Indirectly, the removal of vegetation and exposure of soil in unauthorized routes have result in erosion. These unauthorized use areas were not designed or constructed to standards and have no runoff water control to protect the soil resource. Further loss of productivity has occurred and diminished soil hydrologic function. Indirect effects to the soil resource will continue into the future because passive recovery of previously disturbed areas will be slow given the soil texture and climatic regime. Active recovery may speed healing depending on the type of active restoration practices utilized (Watershed Project File WAT-6). Site-specific active restoration plans have not been prepared for the unauthorized routes included in active restoration.

**Soil Resource Direct and Indirect Effects:** For existing NFTS and unauthorized routes, direct soil effects have already occurred. The direct effects were: physical displacement of soil during construction of a NFTS facility or caused by the initial unauthorized motorized 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. Indirectly, the removal of vegetation and exposure of soil in unauthorized routes have result in erosion. These unauthorized use areas were not designed or constructed to standards and have no runoff water control to protect the soil resource. Further loss of productivity has occurred and diminished soil hydrologic function. Indirect effects to the soil resource will continue into the future because passive recovery of previously disturbed areas will be slow given the soil texture and climatic regime. Active recovery may speed healing depending on the type of active restoration practices utilized (Watershed Project File WAT-6). Site-specific active restoration plans have not been prepared for the sites included in active restoration.

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

The Forest is considering adding presently unauthorized roads and trails to the NFTS as well as the construction of new trail routes.

**Short-term timeframe:** 1 year

**Long-term timeframe:** 20 years

**Spatial boundary:** Forest

**Indicator(s):** (1) Miles of routes added to NFTS system (net change); (2) Miles designated for public motorized use within 150 feet of perennial streams; (3) Miles designated for public motorized use within 150 feet of intermittent streams

**Methodology:** GIS analysis to compare the location of the trails/roads in each alternative

**Rationale:** Published studies (see Reference section) have documented that streamflow diversions are a major cause of road-related erosion. Analysis guidelines in the National Soil Management Handbook and Region 5 Soil Management Handbook Supplement.

**Water Resource Direct and Indirect Effects:** A direct effect of designating selected unauthorized routes and added the route to the San Bernardino NF trail system would be an upgrade of the route to meet Forest and Region 5 BMPs prior to being placed in the NFTS. Other direct and indirect effects have already occurred since the routes are physically on the landscape. These effects include modification of surface-water runoff timing and magnitude owing to interception of surface and subsurface runoff by routes during rainfall and snowmelt. Additional effects include increased erosion of route surfaces, hillslopes, and channels with consequent increases in fluvial loads of sediment and sediment-related pollutants such as nutrients, heavy metals, and pesticides.

New route construction would be to Forest and Region 5 standards. Construction effects include erosion, soil displacement and compaction, as well as changes to hillside hydrology. Over time the construction effects would diminish and route effects would be the result of motorized use.

**Soil Resource Direct and Indirect Effects:** Generally direct affects have already occurred from the soil displacement, compaction, or loss caused by the unauthorized use. The effects were 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. New route construction would be to Forest and Region 5 standards. Construction effects include erosion, soil displacement and compaction, as well as changes to hillside hydrology. Over time the construction effects would diminish and route effects would be the result of motorized use.

Water and Soil Resource Direct and Indirect Effects related to the addition of facilities are discussed in depth in the sections titled "Effects Common to All Alternatives" and "Alternative Specific Effects".

## 3. Changes to the existing NFTS (includes closing routes to motorized use (decommissioning), changing the type of use to administrative or special use permits, and changing the vehicle class).

The Forest is considering closing routes to motorized use (decommissioning), changing the type of use to administrative or special use permits, and changing the vehicle class.

**Short-term timeframe:** 1 year

**Long-term timeframe:** 20 years

**Spatial boundary:** Forest

**Indicator(s):** (1) Miles designated for public motorized use within 150 feet of perennial streams; (2) Miles designated for public motorized use within 150 feet of intermittent streams; (3) Miles proposed for decommissioning; (4) Number of intermittent stream crossings to be closed to public motorized use; (5) Miles designated for public motorized use within Rouse Meadows; and (6) Acres to be closed to public motorized use on severe erosion risk soils

**Methodology:** GIS analysis to compare the location of the trails/roads in each alternative

**Rationale:** Published studies (see Reference section) have documented that streamflow diversions are a major cause of road-related erosion. Analysis guidelines in the National Soil Management Handbook and Region 5 Soil Management Handbook Supplement.

**Water Resource Direct and Indirect Effects:** In the San Bernardino NF Motorized Travel Management EA, actions that change the existing NFTS include those that close routes to public motorized use (*e.g.*, decommissioning of a route or changing use to administrative) or actions that change the type of vehicle that can use a route. Actions that close routes to public motorize use limit wheel action on the trail surface and reduce the risk of erosion.

**Soil Resource Direct and Indirect Effects:** An action alternative may also change the type of vehicle for which use is permitted. For example, a route may now only be used for motorcycles, but the alternative may allow four-wheeled vehicles as well. It is likely that the width of the route may widen due to the change in larger, wider vehicles. This would represent a commitment of more soil or land area for routes.

Water and Soil Resource Direct and Indirect Effects related to the addition of facilities are discussed in depth in the sections titled "Effects Common to All Alternatives" and "Alternative Specific Effects".

### 4. Cumulative Effects

Cumulative effects are discussed in detail at the end of this report.

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

**Long-term timeframe:** 20 years

**Spatial boundary:** Forest

**Indicator(s):** Narrative discussion

**Methodology:** Utilize observations and understanding of short term effects to soil productivity and water resources to estimate long term expected cumulative effects.

**Rationale:** Published studies (see Reference section) have documented that streamflow diversions are a major cause of road-related erosion. Analysis guidelines in the National Soil Management Handbook and Region 5 Soil Management Handbook Supplement.

# Affected Environment

A discussion of the affected environment, the existing condition for soil and water resources, can be found at the end of this report in Appendix A.

# Mitigations

Pursuant to San Bernardino NF Forest Plan Supplement 2509.22 Stream Protection Measures, Section 3.21:20) all applicable Forest-Wide Standards and Guidelines, Design Criteria for the Southern California Forests, and Guidelines in Supplement 2509 apply.

The mitigations, monitoring, and maintenance plans associated with this analysis constitute the Pollution Prevention Plan for the San Bernardino NF Motorized Travel Management EA. Mitigations may change following consultation and acceptance of the Pollution Prevention Plan by the State of California Santa Anna Water Pollution Board.

**Channel Buffers and Stream Crossings**

1. Provide 100-foot (30 meter) buffer around all wetlands, springs, or seeps adjacent to non-highway legal routes. Re-route non-highway legal trail sections as needed.
2. Provide 330-foot (100 meter) buffer on each side of a perennial stream for any new construction or non-highway legal trail re-route.
3. Provide 100-foot (30 meter) buffer on each side of an intermittent stream for any new construction or non-highway legal trail re-route.
4. Provide 50-foot (15 meter) buffer on each side of an ephemeral stream for any new construction or non-highway legal trail re-route.

5. Span perennial or intermittent stream channels with bridges, vented and/or hardened fords, or culverts sized to accommodate the 100-year storm event plus debris. Delineate the crossing and restrict vehicle use to prevent widening.
6. Span ephemeral draws with a hardened rolling dip or constructed ford so that upstream and downstream portions of the draw is connected. Objective: get water across the road and reduce risk of water diverting down the road or trail.
7. Harden the outside edge of the road at all stream crossings. Objective: prevent erosion and damage to the downstream side of the road or trail.
8. When stabilizing damaged streambanks, use methods that emphasize natural stream restoration designs and vegetation (*e.g.*, bioengineering techniques).

**Water Quality Pollution Prevention Plan**

9. Implement the Soil and Water BMPs found in Watershed Project File WAT-9. Applicable BMPs are highlighted and include comments related to their application.
10. Implement additional Soil and Water BMPs upon the recommendation of the Forest Hydrologist or Soil Scientist
11. Visitor use and route maintenance activities would be controlled. Vehicles would be restricted to designated travelways. Undeveloped areas within 15 feet of designated travel routes would be kept as free from trampling as possible to encourage the maintenance and development of 60 percent effective soil cover to reduce hillslope erosion and streambank damage.

**Route Maintenance**

12. Implement route maintenance plans.
13. Add energy dissipation structures below the “Mac” drains to slow and disperse water and catch and store sediment. Place slash, erosion matting, or erosion fencing below the drains. Objective: spread the concentrated drain flow to reduce erosion and encourage the capture and storage of erosional material and flows.
14. Keep route width the minimum needed for the specified vehicle. Delineate the road surface. Objective: keep vehicles on established treads.
15. Avoid berms on the downhill side of road if road is outsloped. Objective: allow water to sheet off the road rather than collect in a rill or gully or be confined within the tread.
16. Stabilize cut and fill slopes with bioengineering structures (for example, erosion control blankets, log grids, contour logs, etc). Objective: prevent erosion and provide microsites for vegetation establishment and water collection.
17. Reduce overland flow and sheet erosion above the road by dispersing water with slash, contour logs, or log contour basins.
18. Drain dips and water bars: Place drain dips and/or waterbars as recommended by the immediate route terrain and slope. Rather than rely on a “distance between structures” chart, place drain dips or waterbars frequently enough so water energy does not increase or concentrate. Construct water diversion features where water can

be safely dispersed onto undisturbed ground and so that it does not run back onto the route. Objective: get water off the route surface quickly to prevent erosion and gully formation.

**Route Decommissioning, Restoration, or Stabilization**

19. Implement route decommissioning, restoration, or stabilization as needed to protect sensitive soil and water resources.

**Monitoring and Reporting**

20. Implement the monitoring and reporting plan found in the Watershed Project File WAT-8.

**Other**

21. Follow any recommendations found in FS Manual 2080 related to weed management.
22. Prepare and distribute conservation education materials for soil, geology, water, and wetlands to non-highway legal vehicle users (Watershed Project File WAT-10: Adaptive Mitigations for Recreation Uses – Soil and Water Resources).

# Monitoring

A monitoring plan for soil and water resources has been developed and is located in the Watershed Project File, WAT-8. The monitoring plan applies to Alternatives 1, 3, and 4. The Forest has an existing non-highway legal trail monitoring program that would be applied under Alternative 2.

# Analysis Area

The analysis area for watershed resources includes the route and a 300-foot buffer along the routes identified in this EA. For erosion analysis, affects will be analyzed downhill or downstream of the travel routes.

# Environmental Consequences

Effects analysis is broken down into three sections; effects common to all alternatives, alternative specific effects, and cumulative effects. Alternative effects are based on the assumption that route maintenance, implementation of BMPs, and monitoring would occur. It also assumes that law enforcement and visitor controls are adequate to prohibit cross-country travel, no new user-created routes are established, and existing user-created routes are kept closed. If these actions or visitor controls are not implemented or effective, expected effects from project implementation related to erosion and riparian impacts may be of greater magnitude than described.

# Direct and Indirect Effects Common to all Alternatives

Similar soil and water resource effects related to actions in the EA are recognized and discussed below. In general, the alternatives vary in the magnitude, number of miles, proposed for action. The differences in magnitude between the alternatives are discussed in the section titled “Alternative Specific Effects”.

## The prohibition of cross-country motorized vehicle travel

Cross-country motorized travel is currently prohibited in the San Bernardino NF. Motorized vehicle use is restricted to designated routes by the SBNF LMP, Part 3, S35:8-9 and Forest Order 5, pursuant to 36 CFR 261.56 (July 22, 1996). The effect of this prohibition has been to end traffic on routes and areas beyond the authorized NFTS. The effect occurred when the Forest Order was enacted.

In general, the prohibition on cross-country travel has been successful in reducing off-route excursions by motorized vehicles. Visitor contacts and education has also been effective and most unauthorized routes have begun to stabilize from an erosion standpoint. Exceptions occur on rilled or gullied surfaces where some level of active stabilization or restoration may be needed.

There are a few popular unauthorized routes where use has not been curtailed, for example the fuelbreak paralleling the Pilot Ridge and Cleghorn Roads. These routes and others are being considered for inclusion into the San Bernardino NF NFTS to provide a variety of experiences to the rider (Table 6). A positive benefit of bringing some of these route segments into the NFTS would be the development and implementation of a route maintenance plan and the application of BMPs to the routes before inclusion into the NFTS. Remaining Pilot Ridge and Cleghorn route sections are proposed for active restoration to control gully formation.

The major effects of cross-country motorized travel and route proliferation on water resources included increased peak flows and sediment loads due to compacted and unvegetated route surfaces and detachment of sediment by vehicles. Soil effects were the physical displacement of soil during construction of a NFTS facility or caused by the initial unauthorized motorized 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. For existing NFTS and unauthorized routes, direct and indirect effects have already occurred. The short-term effects of proposed changes to the San Bernardino NFTS system will be small and unquantifiable reductions in traffic-related sediment and related pollutants.

Indirectly, the removal of vegetation and exposure of soil in unauthorized routes have resulted in erosion. These unauthorized use areas were not designed or constructed to standards and have no runoff water control to protect the soil resource. Further loss of productivity has occurred and diminished soil hydrologic function. Indirect effects to the soil resource will continue into the future because passive recovery of previously disturbed areas will be slow given the soil texture and climatic regime. Active recovery may speed healing depending on the type of active restoration practices utilized (Watershed Project File WAT-6). Site-specific active restoration plans have not been prepared for the unauthorized routes included in active restoration.

## Addition of Motorized Facilities (*e.g.*, New Construction and Add Unauthorized Routes)

Discussed below are the effects of adding motorized facilities. For Alternatives 1, 3, and 4, additional motorized facilities include new construction and the designation of selected unauthorized routes into the NFTS. For Alternative 2 all routes currently designated for

motorized public use would remain open and no unauthorized routes would be added to the San Bernardino NF NFTS.

### *Direct and Indirect Route Effects - Soil and Erosion Risk*

Effects of roads and non-highway legal routes on the landscape, soil, water, and ecological resources have been well documented (Trombulak and Frissell 2000; Luce and Black 2001; Switalski *et al.* 2004; Sheridan *et al.* 2006; Ouren *et al.* 2007; and others). Non-highway legal route impacts can be either linear as in the case of a trail or focused as in the case of a staging area (discussed under Cumulative Effects).

Soils within designated NFTS routes and immediately adjacent would be effected by continued use of the route by vehicles. Common impacts include soil compaction, displacement, and erosion and tie directly to slope, soil type, vegetation, and sensitivity as well as vehicle characteristics and user behavior. The erosion that has occurred from the authorized trail or road surface is a concern from the standpoint of the degradation of the facility. The concern is reduced from a soil standpoint because the route surface is a dedicated use and is no longer dedicated to growing vegetation. 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.

Physical, chemical, and biologic processes affected by common NFTS route impacts include loss of soil aggregation and organic matter, which in turn changes how mobile soil particles are or how fertile the site is. Soil compaction changes how water and gasses are exchanged or move within the soil profile while soil displacement may result in the loss of fertile organic layers and surface soil. As the risk of erosion increases, risk of gully formation and stream habitat loss also increases. As illustrated, these impacts and effects are interrelated and often cascading.

While sandy and sandy loam soils may not readily compact, they are easily eroded, especially on a slope or where vegetation has been lost. These sandy soils have a severe erosion risk and are common along the routes considered in this EA (Table 1).

Conversely, fine textured soils with organic matter and stable aggregates are harder to erode but compact easily, especially when moist (Douglass *et al.* 1999, Foltz and Meadows 2007; Eckert *et al.* 1979; Tuttle and Griggs 1987; and Ouren *et al.* 2007). Fine textured soils are prone to soil sealing with raindrop splash or when soil aggregates break down. These processes often result in gullies from consolidated flows across compacted and sealed surfaces. It is not uncommon for fine textured soils to “powder” with use. The “powdered” soil has no organic matter or internal cohesion and is easily lost to erosion or contributes to soil sealing.

Fine textured soils can occur in meadow and desert settings. Rouse Meadows (2N25Y) has fine textured soils and is seasonally moist. Desert soils are especially sensitive to disturbance because of low organic mater, sparse vegetation, and the reliance on crytobiotic crusts for stability. Cryptobiotic crusts are easily disturbed with wheel or foot traffic and once disturbed the fine textured soils are easily eroded by water or wind (Eckert *et al.* 1979). The routes in the Cactus Flat and Cajon Junction area would fall into this category of sensitivity.

Changing the vehicle class and type of use allowed on the trails may affect the amount of land area committed to travelways. For example, a route currently used by motorcycles would increase in width if wider non-highway legal or highway legal vehicle use is proposed. None of the proposed changes to vehicle class would result in increased route width.

Vehicle use increases erosion rates and sedimentation through detachment, abrasion, and changes to the road surface, making the local sandy and cohesionless soils susceptible to transport. Four-wheeled vehicles and motorcycles apply a shear stress parallel to the soil surface and a compression stress perpendicular to the surface. These stresses are most destructive on uphill route segments, on curves, or route segments in which the tires may spin. Conservation of the soil resource in non-highway legal vehicle areas requires intense on-site management (Tuttle and Griggs 1987).

Traffic can also change the road surface resulting in rill or gully formation or damage to road drainage. The magnitude of impact is tied to the amount and type of vehicle use as well as the behavior of the rider (Sheridan *et al.* 2006; Foltz and Meadows 2007; Chin *et al.* 2004; Ayala *et al.* 2005; Tuttle and Griggs 1987).

Travel route erosion would continue, under all alternatives, including Alternative 2 (No Action), because the routes identified within this EA exist on the landscape and receive use. Traffic would dislodge soil particles making them susceptible to sheet wash and rill/gully formation during heavy thunderstorms and rain-on-snow events. Existing routes on steep segments without adequate drainage are most susceptible to erosion. Tuttle and Griggs (1987) found sediment yield increased 10-25 times over undisturbed areas on hillclimbs in arid regions of California. The research determined that soil texture and slope length controlled erosion rates. Fine textured soils have a higher degree of slope stability compared to sand loam and other coarse textured soils. While this study was not conducted on the San Bernardino National Forest, similar sediment yields would be expected given similarities in soil texture, landform, and climates.

In landscapes not previously used by off-highway vehicles, a San Dimas Technology Center draft study (USDA-FS Draft 2007; Foltz and Meadows 2007) found multiple passes with a non-highway legal vehicle across the same area reduces the ability of the soil and vegetation to rehabilitate. The study found landscapes to transition from low to medium disturbance in 20-40 passes and from medium to high disturbance in 40-120 passes. Where trails require vehicle wheels to spin or slip (*e.g.*, accelerating uphill on a tight turn), moderate and high disturbance occurs with fewer passes. Similar results are found in Ouren *et al.* (2007). These studies illustrate the importance of proper location, design, and application of BMPs in new route construction as well as the importance of discouraging cross-country travel.

Accentuating existing wheel abrasion are high performance vehicles and skilled riders. The combination of vehicle and skill result in faster and more aggressive moves on slopes and curves. The presence of curves and slope on a trail increased runoff and sediment generation 56 percent and 62 percent, respectively (USDA-FS Draft 2007).

Interestingly, the study (USDA-FS Draft 2007) found road rut depth was determined by the height of vehicle. When ruts get too deep, vehicles would either scrape off the rut,

ride between the ruts breaking down the rut and depositing the soil material in rut, or move over widening the trail.

Even on bedrock, wheel action dislodges particles, especially on the local geology of soft sandstone, limestone, and highly weathered granites. The mechanisms for sediment movement include dry ravel, raindrop splash, and concentrated flow. These mechanisms are most effective on steep slopes or where the route is directly connected to the channel (Ayala *et al.* 2005).

Douglass *et al.* (1999) found that grass communities are more resistant than shrub communities to non-highway legal disturbance, especially in the spring and early summer. Forbs are most easily damaged in the early fall. Douglass *et al.* (1999) found that after eight passes with a non-highway legal vehicle, there is a significant loss of shrub cover and that vegetation was completely lost after approximately 32 passes.

A study conducted in the Tahoe Basin, CA, used WEPP Road Batch Model to determine the recommended spacing for water diversion structures. Breibart (2007) found that reducing the trail grade from 16 to 10 percent resulted in a decline of road erosion by 10 percent, while increasing the stream buffer width from 50 feet to 100 feet resulted in a 45 percent reduction. Finally, decreasing the water diversion structure spacing from about 656 feet to 164 feet resulted in a decline of road erosion by 79 percent. Breibart (2007) found the greatest reduction in potential road erosion by reducing trail grade to 10 percent, providing spacing between water diversion structures of 164 feet (average), and maintaining a 100 feet buffer between the trail and stream.

This recommendation works well where gullied pathways or diffuse overland flow is the primary mechanism for flow or sediment generation (Takken *et al.* 2008). Diffuse flows are defined as those originating from overland flow; these flows are not connected directly to a stream channel. Where routes cross numerous drainages and route-stream conductivity is high, stream crossings are the primary mechanism for runoff and sediment delivery. Along these routes, relocation or removal may be the only choice to reduce in-channel sedimentation.

These studies point to road location as well as adequate and maintained drainage structures to reduce road and trail related impacts to soil and water resources. Providing for road drainage to be captured and stored on the hillslopes reduces in-channel sedimentation. These principles have resulted in BMPs for road and trail design, layout, construction, and maintenance (Watershed Project File WAT-9).

Table WAT 1 compares and contrasts acres of moderate and severe erosion risk on routes identified within this EA. The numbers for Alternative 2 represent no action to decommission system routes or change use to administrative or permit holder use only.

**Table 1. Erosion Risk Ratings**

| | ROUTES TO BE DESIGNATED FOR MOTORIZED PUBLIC USE | | ROUTES TO BE CLOSED TO PUBLIC USE | |
|---|---|---|---|---|
| | **Moderate Erosion Class (Acres)** | **Severe Erosion Class (Acres)** | **Moderate Erosion Class (Acres)** | **Severe Erosion Class (Acres)** |
| Alternative 1 | 405 | 2675 | 1276 | 4955 |
| Alternative 2 | 578 | 4635 | 1103 | 2993 |
| Alternative 3 | 498 | 2311 | 1259 | 4447 |
| Alternative 4 | 397 | 2526 | 1289 | 5028 |

Data Source: Watershed Project File WAT-4: GIS Slope, GIS Soils

## *Direct and Indirect Route Effects - Stream Channels, Flow Regimes, and Water*

NFTS routes have effects similar to roads on the landscape (Gucinski *et al.* 2001; Trombulak and Frissell 2000; Luce and Black 2001; Sheridan *et al.* 2006; Luce and Wemple 2001; Furniss *et al.* 2000; and others). NFTS routes have the potential to increase peak flows and change timing of storm runoff in adjacent intermittent and perennial streams. The routes generate overland flow from impermeable running surfaces and cutslopes; in addition, the routes intercept subsurface water along cutslopes generating additional runoff through the conversion of subsurface flow to surface flow. Drainage structures, for example inboard ditches or cross drains, collect and concentrate flows. These processes are most pronounced during small to moderate storm events. As storm events become large, the size and intensity of the storm event may overshadow the road effect on streamflow.

Hydrologically connected non-highway legal routes are routes with stream crossings or road flow that runs directly into a stream channel or ephemeral draw. Since routes identified in this document exist on the landscape today, changes in ephemeral draw or stream channel hydrology occurred at the time the routes were constructed or initially developed by users and continue into the present. Data is not available as to stream flow prior to the existing route construction or development.

A confounding factor across the forest is urban and suburban development. Differentiating streamflow changes related to the non-highway legal route system from that of other development was not done. For example, an ephemeral draw associated with Pilot Rock Route 2N33 flows water when the golf coarse upstream is being irrigated. Urban and suburban development effects are discussed in the cumulative effects analysis.

Given the arid climate, it is expected that channel function would continue to be governed by climatic events, for example the timing, duration, and intensity of snowmelt, large storms, or rain-on-snow events. Luce and Black (2001) suggest that large-magnitude; low-frequency flow and sediment events may dominate long-term sediment delivery to stream systems. These pulse sediment events appear to drive stream

morphology. Conversely, chronic sediment events (*e.g.*, annual sediment delivery from roads) tend to have a big affect from a biological standpoint.

Along ephemeral draws and intermittent streams, bank vegetation is sparse and the coarse textured soils subject to erosion during runoff events. There would be no change to this existing condition with implementation of any alternative. However where routes are maintained, *e.g.*, maintenance of route drainage and hardening of stream crossings, improved riparian and channel function would be realized. In addition, visitor controls at the crossings would limit off-route travel, crossing expansion, or the creation of multiple ingress/egress tracks (Watershed Mitigations 7 and 11).

Chronic sediment sources from routes alter water quality and channel habitat (Luce and Black 2001; Douglass *et al.* 1999; Chin *et al.* 2004). These and other researchers have found elevated levels of fine sediment below stream crossings or where cross-drains and ditches are hydrologically connected to the stream. This situation was observed during field review in November 2006. Fine sediment was collecting immediately downstream of the crossing in pools or between cobbles. Sediment production from motor vehicle use of native-surface NFS routes is increased by higher levels of traffic and is reduced by maintenance of road drainage features (culverts, waterbars, ditches). Maintenance and mitigations are proposed to reduce route effects (Watershed Mitigations). Erosion is discussed in detail in the Soil Resource Report.

Route 3N95, along Coxey Creek is currently closed to public use and would be decommissioned under Alternatives 1, 3, and 4. Originally closed to protect the armored three-spine stickleback fish, the closure also enhances riparian and stream processes by protecting the channel bed and banks from motorized use.

Illustrated in Table 2 is a comparison between alternatives and the number of stream crossings that would remain open or be closed to public use. The numbers for Alternative 2 represent no action to decommission NFTS routes or change use to administrative or permit holder use only.

**Table 2. Stream Crossings**

| | **ROUTES TO BE DESIGNATED FOR MOTORIZED PUBLIC USE** | | **ROUTES TO BE CLOSED TO MOTORIZED PUBLIC USE** | |
|---|---|---|---|---|
| | Perennial Stream Crossings | Intermittent Stream Crossings | Perennial Stream Crossings | Intermittent Stream Crossings |
| Alternative 1 | 0 | 50 | 14 | 98 |
| Alternative 2 | 14 | 99 | 0 | 49 |
| Alternative 3 | 0 | 40 | 14 | 87 |
| Alternative 4 | 0 | 50 | 14 | 98 |

Data Source: Watershed Project File WAT-4: GIS Crossings

Illustrated in Table 3 is a comparison between alternatives and the miles of perennial or intermittent channels within 150 feet of included routes. The numbers for Alternative 2 represent no action to decommission NFTS routes or change use to administrative or permit holder use only.

**Table 3. Miles within 150 feet of Streams**

| | ROUTES TO BE DESIGNATED FOR MOTORIZED PUBLIC USE | | ROUTES TO BE CLOSED TO MOTORIZED PUBLIC USE | |
|---|---|---|---|---|
| | Routes within 150 feet of Perennial Streams | Routes within 150 feet of Intermittent Streams | Routes within 150 feet of Perennial Streams | Routes within 150 feet of Intermittent Streams |
| Alternative 1 | 0.3 | 6.1 | 2.7 | 11.4 |
| Alternative 2 | 2.9 | 11.1 | 0.1 | 6.4 |
| Alternative 3 | 0.4 | 6.2 | 2.7 | 10.4 |
| Alternative 4 | 0.3 | 6.1 | 2.7 | 11.4 |

Data Source: Watershed Project File WAT-4: GIS Stream Buffers

The miles of motorized public use routes within 150 feet of intermittent channels are the same in Alternatives 1 and 4 (Table 3). The mileage within 150 feet of perennial or intermittent streams to be closed is slightly less under Alternative 3 and significantly less for Alternative 2. Routes open to public use within 150 feet of perennial or intermittent channels increase the risk of channel bed or bank damage if off-route travel occurs.

In addition to sediment and erosion, NFTS routes can affect water quality through the operation of 2-stroke engines, spills, and emissions (Ouren *et al.* 2007). Spill and emission contaminants include petroleum products such as benzene, xylenes, and toluenes. Researchers tested routes adjacent to snowmobile trails in Yellowstone NP and found elevated levels of these chemicals but the levels were within limits set by the EPA.

## *Beneficial Uses and Listed Waterbodies*

Table 4 describes the effects of the alternatives on beneficial uses and listed waterbodies. Actions that change use to administrative use only would have a positive effect on adjacent listed waterbodies since use of the route and the potential sediment generated from that use would be restricted. Through the restriction process, seasonal closures, type of vehicles, and number of vehicles can be controlled. In addition, these routes would be maintained to BMP standards further reducing the risk of sedimentation.

Where routes are proposed to be added to provide motorized access routes to designated YP campsites positive effects would be realized. Positive effects would include having the access routes delineated and visitor use controlled as well as having the routes carefully planned, considered, and maintenance performed to meet BMPs. The YP

campsites would continue to be used rather the access routes are added to the NFTS or not.

Where routes are to be decommissioned or restored, positive effects would be realized through the reduction of user created sedimentation within the road prism and at any stream crossing.

Change of use to include both non-highway and highway legal vehicles would have a slight negative to neutral effect. Non-highway legal vehicles may be operated in a manner that increases route erosion; research has found the combination of vehicle and skill result in faster and more aggressive moves on slopes and curves (USDA Forest Service Draft 2007; Foltz and Meadows 2007). However, the routes proposed for vehicle use changes exist on the landscape and are currently being used by highway legal vehicles. Thus the routes have the wide to accommodate non-highway legal vehicles so no additional resources would be designated as roads or trails.

**Table 4. California State 303(d) Listed Waterbodies adjacent to EA Routes, Numeric Action Analysis by Alternative**

| LISTED SUBWATERSHED | NON-HIGHWAY LEGAL ROUTE BEING CONSIDERED IN THIS EA | ACTION AND EFFECT |
|---|---|---|
| Big Bear Lake and Tributaries (including Grout and Knickerbocker Creeks)<br><br>Rathburn Creek (Trib to Big Bear Lake) | 2N77, 2N48Y, 2N07, unauthorized routes on the south and north sides of the lake – change to administrative use or decommission/restore<br><br>2N46Y, unauthorized routes in the headwaters of Rathburn Creek - change to administrative use or decommission/restore | **Alternative 1**<br>Change to Administrative = 3.2 mi<br>Decommission = 0.9 mi<br>Restore = 2.8 mi<br>**Alternative 2**<br>No change from current designation<br>**Alternative 3**<br>Change to Administrative = 3.2 mi<br>Decommission = 0.9 mi<br>Restore = 2.8 mi<br>Add Unauthorized Routes = 0.2 mi<br>**Alternative 4**<br>Change to Administrative = 3.2 mi<br>Decommission = 0.9 mi<br>Restore = 2.8 mi |

| LISTED SUBWATERSHED | NON-HIGHWAY LEGAL ROUTE BEING CONSIDERED IN THIS EA | ACTION AND EFFECT |
|---|---|---|
| Santa Ana River, Alder Creek, Deer Creek, subwatersheds | 1N04A, 1N03 – change to administrative use<br>add unauthorized routes that access YP campsites along Coon Creek<br>1N39A, 1N05A - decommission routes | **Alternative 1**<br>Change to Administrative = 2.1 mi<br>**Alternative 2**<br>No change from current designation<br>**Alternative 3**<br>Change to Administrative = 2.1 mi<br>Add Unauthorized Routes to YP sites = 0.7 mi<br>**Alternative 4**<br>Change to Administrative = 2. mi<br>Decommission = 2.3 mi |
| San Jacinto River, NF San Jacinto River, Poppet Creek, Strawberry Creek subwatersheds | 4S06 | **Alternative 1**<br>Change vehicle class = 8.2 mi<br>**Alternative 2**<br>No change from current designation<br>**Alternative 3**<br>Change vehicle class = 8.2 mi<br>Add Unauthorized Routes to YP sites = 0.5 mi<br>**Alternative 4**<br>Change vehicle class = 5.6 mi |

Data Source: Alternative Maps; State of California 303(d) List 2005

## Adding Unauthorized Routes to the San Bernardino NF NFTS

Unauthorized routes are closed to travel by motorized vehicles under the SBNF LRMP (Part 3, S35:8-9) and Forest Order 5 (pursuant to 36 CFR 261.56 (July 22, 1996)). The effects of unauthorized routes on the landscape have already occurred and are similar to those discussed above for route effects. The effects include physical soil displacement, loss of soil productivity from the trail tread, erosion, and loss of hydrologic function. The effects of unauthorized routes on the landscape are generally greater than those from designed and constructed routes (NFTS routes) because NFTS routes are built to include BMPs and trail design standards. A positive effect occurs if unauthorized routes are designated in that these unauthorized routes would have a maintenance plan and BMP upgrades, reducing effects to soil and water resources (Mitigations 9, 11, and 12).

Review of the unauthorized routes proposed to be added to the NFTS (Alternatives 1 and 4) show that only 0.01 miles are within 150 feet of, or cross, intermittent channels (Watershed Project File WAT-4:GIS stream buffer and crossings). No routes (Alternatives 1 and 4) are within 150 feet of, or cross perennial streams. Alternative 3 proposes to open 0.7 miles of unauthorized routes within 150 feet of intermittent streams and 0.1 miles within 150 feet of perennial streams. The unauthorized route mileage close to stream corridors associated with Alternative 3 relates to adding YP campsite access routes into the NFTS. Under Alternative 2, all unauthorized routes would remain closed under the existing Forest Order.

Unauthorized routes proposed for inclusion into the NFTS are found in Table 5. All the routes, except Routes U2938 and U2000, have a severe erosion hazard (Watershed Project File WAT-4: Soil Erosion Risk). The high sensitivity associated with Routes 2938 and U2000 come from the desert landscape through which they pass, rather than the slope or soil type.

Sections of the unauthorized routes that parallel the Pilot Rock (2W33X) and Cleghorn (2W47X) routes have gully erosion within the road prism. These sections have been identified and are scheduled to be closed and stabilized. Other sections of these routes, if added to the NFTS, would have maintenance and BMPs applied.

Designating unauthorized route U6905 would have a positive effect to soil and water resources since it would replace the currently designated route 2N26 which encroaches on Willow Creek. Route 2N46 is heavily used and affects the function of Willow Creek and its riparian area. Unauthorized route U6905 is away from the riparian area and located on flat ground in relatively stable soils with moderate erosion risk.

Currently, the vehicle access routes to Yellow Post campsites are considered unauthorized routes. These routes and their effects are discussed under Alternative 3. Only Alternative 3 considers designating Yellow Post campsite access routes.

**Table 5. Unauthorized Routes to be Added to the NFTS**

| UNAUTHORIZED ROUTE | STREAM CROSSINGS | SENSITIVITY |
|---|---|---|
| U2000 | 0 | Desert soils, high sensitivity to erosion and loss of groundcover (pavement, cryptobiotic and chemical crusts) |
| 2W33X | 0 | High on-site erosion hazard because of soil texture and lack of internal cohesion, no drainage structures, and the presence of gullies in trail tread.<br>Low off-site erosion hazard because the route is located on a ridgetop with limited connection to ephemeral drainages<br>Sections of high off-site erosion hazard have been identified and would be closed and stabilized/rehabilitated. |
| U2938 | 1 – intermittent drainage, unnamed | Desert soils, high sensitivity to erosion and loss of groundcover (pavement, cryptobiotic and |

| | | |
|---|---|---|
| | | chemical crusts) |
| U6905 | 0 | Low sensitivity (Slope <10%, soils moderate erosion hazard), replaces an existing route (3W13) within the Willow Creek Riparian zone. |
| 2W47X | 0 | High on-site erosion hazard because of soil texture and lack of internal cohesion, no drainage structures, and the presence of gullies in trail tread.<br>Low off-site erosion hazard because the route is located on a ridgetop with limited connection to ephemeral drainages<br>Sections of high off-site erosion hazard have been identified and would be closed and stabilized/rehabilitated. |

## New Route Construction

Alternatives 1 and 4 propose 0.5 miles of new construction; Alternative 3 proposes 0.2 miles. No new construction would occur in Alternative 2 (Appendix B Table). New trails would be constructed to Forest Service standards and include BMPs and mitigations. Construction related erosion is reduced through the application of BMPs and mitigations. Once the route has "weathered" and construction related erosion stabilized, erosion rates would drop to those described for vehicle use (Sheridan *et al.* 2006; Megan *et al.* 2001).

No connection to ephemeral or intermittent channels is found along the three proposed routes. Approximately 0.2 miles of new route would be designated for administrative use only; this route is adjacent to the Lake Arrowhead Work Center and connects the work center to the Lake Arrowhead non-highway legal trails.

Another section of new route is also found in the Lake Arrowhead area along Route 3W14. This new route is approximately 0.1 miles in length. The third section of new route is a connector route between 3W12 and 3W13. This route is approximately 0.2 mile long.

The new construction is located on soils with a severe erosion classification. Two-thirds of the new construction would be on landscape slopes less than 20 percent; about seven acres on slope greater than 20 percent. Mitigations 1-19 would apply to all new construction.

## Restoration of Unauthorized Motorized Vehicle Routes

Unauthorized routes not identified in this analysis would remain closed. Passive restoration is proposed unless a route is identified for active restoration. Since closure of the cross-country motorized travel routes, passive restoration has begun the healing process although disturbed areas have not change much because removal of vegetation, compaction of soils, and alteration of drainage patterns require time to heal without active restoration. Elimination of traffic on unauthorized routes and areas has reduced erosion caused by wheel abrasion, but the routes still intercept and concentrate surface flows and produce sediment. In the long term, some or all unauthorized routes and areas would probably revegetate and regain some of their hydrologic and geomorphic functions, although use of these routes by

nonmotorized traffic could delay or prevent recovery (Ouren *et al.* 2007; Madej 2001; Switalski *et al.* 2004; and Luce 1997).

Passive restoration for soil and water resources depends on vegetation re-establishment to provide the building blocks to rebuild soil processes that in turn reduce erosion and provide for on-site capture and storage of water. Given the sandy and shallow soils with an effective rooting depth of 10-20 inches, passive recovery potential of revegetation would be limited and long-term, greater than 20-30 years (Watershed Project File WAT-6). Recovery of soil and hydrologic processes will take longer as soil will need to rebuild and decompact or erosion will need to decrease to geologic levels.

Narrow tracks are likely to close quickly from vegetation growth along the edges while wide trails will take longer to vegetate naturally. Trail aspect and the kinds of vegetation growing nearby would also direct how quickly or slowly the route naturally revegates. If any use continues on the route, *e.g.*, hiking, horseback riding, bike use, vegetation restoration will be retarded.

Active restoration is proposed on identified unauthorized routes. Identified routes are those tied to a legal settlement agreement through the Southern California Conservation Strategy and portions of 2W47X (Cleghorn Ridge Fuelbreak).

Active restoration would accelerate the development of vegetation and soil stabilization, slightly, but would require forest resources from the forest. Continued use of the route, even by hikers, would retard restoration efforts. The long-term goal of any restoration or restoration project would be to have self-sustaining, effective groundcover and vegetation.

Active restoration may include ground disturbance and the use of machinery to decompact soil, remove road bed contours, spread berm or organic material in the area, install waterbars and gully control structures, and reestablish stream drainages by removing culverts or re-shaping fords. Depending on the location of these activities, this work could also be done by hand. Passive and active restoration techniques and references are described in detail in Watershed Project File PF-WAT-6:Decommissioning and Restoration References. Site-specific active restoration plans have not been prepared for the unauthorized routes included in active restoration.

Techniques identified for maintenance, decommissioning, or restoration would depend on the slope, aspect, soil texture, soil moisture conditions, and soil fertility at the particular site (Watershed Project File WAT-6). Typically, sandy soils are well drained, do not hold water, may have low fertility and are easily eroded. They are generally not subject to compaction. Silt soils absorb and hold water within the profile but do not get waterlogged. They are easily compacted especially when moist and erosive when dry. On the other hand, clay soils drain poorly, hold water and nutrients within the soil profile, and are not easily eroded. However, because of the small pore sizes and water holding capacity, clay soils are easily compacted when wet but do not compact when they are dry. Rock fragments within the soil profile reduce the risk of compaction and erosion.

Recovery potential within NFTS routes is low unless vegetation loss and erosion is caught early. Once erosion has removed the thin top soil or resulted in gully formation, site recovery is a slow process. Site stabilization can occur with adequate drainage, the

use of groundcover, mulches, or erosion control fabrics, and persistence in planting and establishment of vegetation (Watershed Project File WAT-6: Decommissioning and Restoration References). Because of changes to hydrologic function and soil productivity, these effects would persist for periods of years to decades following closure of any route or trail.

Vegetation establishment is difficult because the soils are well to excessively well drained with low to moderate water holding capacity. Combined with dry, hot summer days, successful plant establishment often requires additional water. In addition, loss of organic matter leads to ravel and sheet erosion that also reduces re-vegetation success.

Vegetation recovery is a lengthy endeavor and requires site monitoring and maintenance (Cole and Spildie 2007). Cole and Spildie (2007) suggest that vegetation planting combined with soil restoration may reduce site recovery to about 20 years. Though this research applies to high elevation wilderness sites, it presents the idea that site recovery is a long-term commitment of resources. The long-term goal of any restoration or restoration project would be to have self-sustaining, effective groundcover and vegetation (exceeding 60 percent or equal to a reference site).

The key for route decommissioning or restoration, as well as for maintenance, is to capture sediment and water on-site, store sediment and water on-site, and provide for safe release of the sediment and water off-site. Watershed Project File WAT-6 provides a list of references and techniques for route decommissioning and restoration. The references provide guidance for maintenance, decommissioning, and restoration activities.

By capturing sediment and water on-site, off-site effects of non-highway legal vehicle activities can be minimized. Captured sediment collected in depressions and behind landscape features create sites for vegetation. Water collected on site sinks into the soil profile reducing overland flow, erosion effects, and rill and gully formation. Techniques to capture sediment and water are those that provide roughness to the soil surface, for example establishing ground cover and vegetation, decompacting the soil, adding mulch or organic matter to the soil surface, creating depressions or landscape features that break up smooth hillslopes (rock, log, or soil erosion barriers), or building checkdams.

Luce (1997) found ripping to be effective at increasing hydraulic conductivity and reducing the risk of runoff but that these positive effects may be reduced over time due to soil subsidence (sandy textured soils) or surface sealing (finer textured soils). Similar results were published in Switalski *et al.* (2004). Mulching is reported to mitigate the effects of surface sealing. Quick establishment of vegetation is paramount for successful route restoration, both to reduce weed infestations and to provide for re-establishment of biological processes. Cole and Spildie (2007) found soil amendments had a pronounced effect on improving soil characteristics, including water and air exchange and available nutrients.

Storing sediment and water on the hillslope maintains aquatic systems and hillslope productivity. The soil, organic matter, and water are available to promote vegetation growth and health that in turn captures and stores additional sediment and water. Techniques to store sediment and water on site include providing roughness to the soil surface and sites for sediment and water to be deposited (Watershed Project File WAT-6: Decommission and Restoration References). Monitoring from the Clearwater National

Forest in Idaho (2003) suggest that techniques to convert ditch intercepted water back into subsurface flow are effective to reduce concentrated flows from ditches and cross-drains.

Finally, maintenance and restoration must consider the safe release of sediment and water downslope, in other words, "plan for flow". Landscapes and the climate are dynamic eroding uplands and building lowlands. Maintenance, decommissioning, and restoration techniques are designed to slow the effects of man's changes to landscape processes, provide the building blocks for physical, chemical, and biological processes, and are most effective during low intensity storm events, those that occur every two to five years. Episodic storm events initiate large watershed scale processes changing surface and subsurface hydrology, the ability of soil to accept and move water within the profile, and soil and hillslope stability. Techniques to allow for the safe release of sediment and water downslope during annual storm events include activities that stabilize but do not harden the lands surface, for example establishing vegetation and installing waterbars, drainage, and grade control structures on trail treads.

# Changes to the existing NFTS (Changing Vehicle Classification and Routes Proposed for Closure to Motorized Public Use *e.g.*, Change Designated Use to Administrative or Permit Holder only and Route Decommissioning)

## Changes to Vehicle Classification

The action alternatives propose to change the type (class) of vehicle for which use is permitted. For example, a route may now only be used for motorcycles, but the alternatives may allow four-wheeled vehicles as well. Changes to vehicle classification effect soil and water resources because of potential changes in road width and too a lesser degree the type of vehicle and rider skill required along the route. The routes proposed for vehicle classification change exist on the ground; soil and water direct and indirect effects occurred when the route was constructed.

The effects of changing vehicle classification on the San Bernardino NFTS would be minimal because the existing routes are wide enough to accommodate the change in use. No addition land would be dedicated to these existing routes to accommodate the change in vehicle type. Routes may see elevated erosion related to more aggressive drivers and machines but the erosion amounts are not anticipated to be measurable since vehicle use is currently occurring on the routes (Tuttle and Griggs 1987; Ouren *et al.* 2007; USDA-FS Draft 2007).

## Change Designated Use to Administrative or Permit Holder Only

Designated use changes to administrative or permit holder use only is proposed in Alternatives 1, 3, and 4. No use changes are proposed in Alternative 2 (Appendix B Table). Closing routes to public access would reduce both use and erosion risk since routes would be used infrequently and the timing of use could be controlled to avoid traffic over wet road conditions.

Administrative use routes require approval from the local Forest Service office; this allows for controls related to vehicle type, the number of vehicles, and timing of use. Routes designated as permit holder use only are managed under a special-use permit. This permit includes an operating plan that specifies route maintenance, route location, timing of use, and type of vehicle.

Table 6 compares and contrasts administrative only routes with the existing condition, Alternative 2. The numbers for Alternative 2 represent no action to change use to administrative or permit holder use only. Alternatives 1 and 4 propose to change use to administrative only adjacent to the most stream miles (intermittent and perennial) and for the most intermittent stream crossings reducing erosion and in-channel sediment risk.

**Table 6. Miles of Routes, Number of Perennial and Intermittent Stream Crossings and Miles of Route within 150 feet of Perennial or Intermittent Streams Proposed for Administrative Use Only**

| | MILES OF ROUTE FOR ADMIN USE ONLY | PERENNIAL STREAM CROSSINGS | INTERMIT.STREAM CROSSINGS | ROUTES W/IN 150 FEET OF PERENNIAL STREAMS (MILES) | ROUTES W/IN 150 FEET OF INTERMIT. STREAMS (MILES) |
|---|---|---|---|---|---|
| Alternative 1 | 38.8 | 6 | 30 | 0.6 | 2.8 |
| Alternative 2 | 0 | 0 | 0 | 0 | 0 |
| Alternative 3 | 29.1 | 6 | 22 | 0.6 | 2.2 |
| Alternative 4 | 38.8 | 6 | 30 | 0.6 | 2.8 |

Data Source: Watershed Project File WAT-4: GIS Stream buffers, GIS Crossings

## Route Decommissioning

Decommissioning and restoration is a large part of Alternatives 1, 3, and 4 (Appendix B Table). No decommissioning or restoration is proposed with Alternative 2; routes would be decommissioned or restored on a site-specific basis.

Route decommissioning would include removing the route from the NFTS, blocking or closing the route to public use, and stabilizing the route. Decommissioning generally includes a mix of active and passive restoration. Active restoration and ground disturbance can occur with the physical closing of the road and the stabilization and reestablishment of stream channels where culverts or fords are removed. Passive restoration occurs when nature is left to heal the remaining road bed. Passive restoration may occur on a slow timeframe (greater than 20 years) in this dry, well drained soil environment. Elimination of vehicle traffic reduces erosion caused by wheel abrasion, but the routes still intercept and concentrate surface flows and produce sediment. The use of these routes by non-motorized traffic could delay or prevent recovery (Ouren *et al.* 2007; Madej 2001; Switalski *et al.* 2004; and Luce 1997).

Passive restoration for soil and water resources depends on vegetation re-establishment to provide the building blocks to rebuild soil processes that in turn reduce erosion and

provide for on-site capture and storage of water. Given the sandy and shallow soils with an effective rooting depth of 10-20 inches, passive recovery potential of revegetation would be limited and long-term, greater than 20-30 years (Watershed Project File WAT-6). Recovery of soil and hydrologic processes will take longer as soil will need to rebuild and decompact or erosion will need to decrease to geologic levels.

Narrow tracks are likely to close quickly from vegetation growth along the edges while wide trails will take longer to vegetate naturally. Trail aspect and the kinds of vegetation growing nearby would also direct how quickly or slowly the route naturally revegates. If any use continues on the route, *e.g.*, hiking, horseback riding, bike use, vegetation restoration will be retarded.

Decommissioning a route using active restoration would accelerate the development of vegetation and soil stabilization, slightly, but would require forest resources from the forest. Active restoration may include ground disturbance and the use of machinery to decompact soil, remove road bed contours, spread berm or organic material in the area, install waterbars and gully control structures, and reestablish stream drainages by removing culverts or re-shaping fords. Depending on the location of these activities, this work could also be done by hand. Passive and active restoration techniques and references are described in detail in Watershed Project File PF-WAT-6:Decommissioning and Restoration References. Site-specific decommissioning plans have not been prepared for the identified routes.

Techniques identified for maintenance, decommissioning, or restoration would depend on the slope, aspect, soil texture, soil moisture conditions, and soil fertility at the particular site (Watershed Project File WAT-6). Typically, sandy soils are well drained, do not hold water, may have low fertility and are easily eroded. They are generally not subject to compaction. Silt soils absorb and hold water within the profile but do not get waterlogged. They are easily compacted especially when moist and erosive when dry. On the other hand, clay soils drain poorly, hold water and nutrients within the soil profile, and are not easily eroded. However, because of the small pore sizes and water holding capacity, clay soils are easily compacted when wet but do not compact when they are dry. Rock fragments within the soil profile reduce the risk of compaction and erosion.

Recovery potential within NFTS routes is low unless vegetation loss and erosion is caught early. Once erosion has removed the thin top soil or resulted in gully formation, site recovery is a slow process. Site stabilization can occur with adequate drainage, the use of groundcover, mulches, or erosion control fabrics, and persistence in planting and establishment of vegetation (Watershed Project File WAT-6: Decommissioning and Restoration References). Because of changes to hydrologic function and soil productivity, these effects would persist for periods of years to decades following closure of any route or trail.

Vegetation establishment is difficult because the soils are well to excessively well drained with low to moderate water holding capacity. Combined with dry, hot summer days, successful plant establishment often requires additional water. In addition, loss of organic matter leads to ravel and sheet erosion that also reduces re-vegetation success.

Douglass *et al.* (1999) found that grass communities are more resistant than shrub communities are to non-highway legal vehicle disturbance, especially in the spring and

early summer. Forbs are most easily damaged in the early fall. Douglass *et al.* (1999) found that after eight passes with a cross-country vehicle, there is a significant loss of shrub cover and that vegetation was completely lost after approximately 32 passes. Locally, Hund (2003) reviewed non-highway legal vehicle use on the San Bernardino NF and found similar vegetation/non-highway legal vehicle interactions on open roads. This illustrates the need to control off-route use and limit the creation of user trails (accomplished through the Forest Order and Forest Plan prohibition on cross-country travel).

Vegetation recovery is a lengthy endeavor and requires site monitoring and maintenance (Cole and Spildie 2007). Cole and Spildie (2007) suggest that vegetation planting combined with soil restoration may reduce site recovery to about 20 years. Though this research applies to high elevation wilderness sites, it presents the idea that site recovery is a long-term commitment of resources. The long-term goal of any restoration or restoration project would be to have self-sustaining, effective groundcover and vegetation (exceeding 60 percent or equal to a reference site).

The key for route decommissioning or restoration, as well as for maintenance, is to capture sediment and water on-site, store sediment and water on-site, and provide for safe release of the sediment and water off-site. Watershed Project File WAT-6 provides a list of references and techniques for route decommissioning and restoration. The references provide guidance for maintenance, decommissioning, and restoration activities.

By capturing sediment and water on-site, off-site effects of non-highway legal vehicle activities can be minimized. Captured sediment collected in depressions and behind landscape features create sites for vegetation. Water collected on site sinks into the soil profile reducing overland flow, erosion effects, and rill and gully formation. Techniques to capture sediment and water are those that provide roughness to the soil surface, for example establishing ground cover and vegetation, decompacting the soil, adding mulch or organic matter to the soil surface, creating depressions or landscape features that break up smooth hillslopes (rock, log, or soil erosion barriers), or building checkdams.

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Storing sediment and water on the hillslope maintains aquatic systems and hillslope productivity. The soil, organic matter, and water are available to promote vegetation growth and health that in turn captures and stores additional sediment and water. Techniques to store sediment and water on site include providing roughness to the soil surface and sites for sediment and water to be deposited (Watershed Project File WAT-6: Decommission and Restoration References). Monitoring from the Clearwater National Forest in Idaho (2003) suggest that techniques to convert ditch intercepted water back

into subsurface flow are effective to reduce concentrated flows from ditches and cross-drains.

Finally, maintenance and restoration must consider the safe release of sediment and water downslope, in other words, “plan for flow”. Landscapes and the climate are dynamic eroding uplands and building lowlands. Maintenance, decommissioning, and restoration techniques are designed to slow the effects of man’s changes to landscape processes, provide the building blocks for physical, chemical, and biological processes, and are most effective during low intensity storm events, those that occur every two to five years. Episodic storm events initiate large watershed scale processes changing surface and subsurface hydrology, the ability of soil to accept and move water within the profile, and soil and hillslope stability. Techniques to allow for the safe release of sediment and water downslope during annual storm events include activities that stabilize but do not harden the lands surface, for example establishing vegetation and installing waterbars, drainage, and grade control structures on trail treads.

**Road Density**

Route decommissioning and unauthorized route restoration would have a slight positive effect on subwatershed scale open road densities in the subwatersheds of (the number in () indicate the mi/mi2 of road density reduction):

| | |
|---|---|
| Arrastre Creek (0.2 mi/mi2) | Holcomb Creek (0.1 mi/mi2) |
| Baldwin Lake (0.4 mi/mi2) | Lower Deep Creek (0.1 mi/mi2) |
| Crystal Creek (0.1 mi/mi2) | Lucerne Valley (0.1 mi/mi2) |
| Silverwood (0.2 mi/mi2) | |

Changing use to administrative or permit holder only would also reduce the open road density. The subwatersheds most affected by the proposal to change use to administrative or permit holder only are:

| | |
|---|---|
| Baldwin Lake | Holcomb Creek |
| Big Bear Lake | Lower Deep Creek |
| Crystal Creek | Mohave River Forks Res |
| Cucamonga Creek | Upper Cajon Wash |

Adding unauthorized routes would have a negligible effect on open road densities since the routes to be added are scattered throughout the forest and short in length. The addition of 8.55 miles of unauthorized routes over the forest area of about 1479.6 square miles would result in a 0.01 mi/square mile increase to total open road density. Decommissioning and changing use to administrative or permit holder only would reduce total road density by 0.8 miles/square mile.

At a subwatershed scale, similar and slight decreases in open road density are noted. For example, in Silverwood Lake Subwatershed, the current road density is about 2.2 miles/square mile, route decommissioning and change to administrative use would reduce this route density by 0.2 miles/square mile (Watershed Project File WAT-4: Open Road Density and Watershed Analysis). Adding portions of unauthorized routes X2N47 (0.9 miles) and X2N33 (3.0 miles) would increase the route density by 0.1 miles/square miles for a net decrease in subwatershed open road density of 0.1 miles/square mile. Adding unauthorized route U2938 would affect the Upper South Fork San Jacinto River Subwatershed. Route U6905 is found in the Lower Deep Creek Subwatershed. Route U2000 is located in Arrastre Creek Subwatershed while Route X2N33 is found in both Silverwood (3.0 miles) and Mojave River Forks Reservoir (0.9 miles) subwatersheds. Route X2N47 is split between three subwatersheds, Silverwood (0.9 miles), Upper Cajon (0.4 miles) and Mojave River Forks Reservoir (2.5 miles).

# Other Common Direct and Indirect Effects

## Route Maintenance

Road maintenance would continue on all designated routes, regardless of the alternative implemented. Soil and Water BMPs and mitigations are applied. The San Bernardino National Forest would maintain responsibility to keep drainage systems clear and functional and ensure water is diverted off the route in a safe place and in a location that minimizes sediment input into stream channels or ephemeral draws. A high level of maintenance would occur on easy NFTS routes (those suited to a wide variety of vehicles and driver skill levels) with lesser amounts of maintenance primarily to remove obstacles on more difficult routes (routes requiring specialized equipment or highly skilled drivers). Water and sediment controls would be the primary maintenance item on all routes.

The San Bernardino National Forest currently writes an annual maintenance plan after field review identifies areas of concern. Volunteer groups, partners, and the Forest use these annual maintenance plans to prioritize annual route maintenance. Annually, all of the designated non-highway legal routes are reviewed for maintenance needs. Approximately 60 percent of routes receive some kind of road maintenance each year.

## Mitigation Effectiveness

All alternatives rely on mitigations and monitoring to reduce soil and water effects. Proposed mitigation is based in the research cited below and standard road maintenance principles.

Designated non-highway legal routes (Alternative 2) are currently monitored for soil loss and maintenance needs. For Alternatives 1, 3, and 4, expanded monitoring is proposed (Watershed Project File WAT-8). Monitoring allows for evaluation of mitigation effectiveness and adaptive management providing an early warning of potential problems.

Burroughs and King (1989) reviewed erosion mitigations from travelways, fillslopes, cutslopes, and roadside ditches. They found most road erosion was generated from fillslopes (especially for new construction), followed by travelways, cutslope, and ditches. In summary, the study found that fillslope mulches and treatments (*e.g.*, erosion nets) can be effective at reducing erosion if they are applied immediately as route

construction or re-construction is completed and are properly implemented and maintained. Slash windrows below the road may also reduce sediment transport distance by providing roughness and sediment capture and storage sites. Seeding alone was found to have little effectiveness until it germinated and roots became dense and strong enough to hold the slope in place (Megahan *et al.* 2001). This research was conducted on Forest Service system roads, similar soil and water processes occur on NFTS routes.

Road prism erosion can be reduced with the use of crushed rock aggregate. To be effective in reducing erosion, this gravel lift needs to be 6-8 inches. Burroughs and King (1998) report a 6-inch lift of 1.5 minus crushed rock reduced sediment production by 70 percent. When grass was established at the margins of the travelway, sediment was reduced by over 84 percent.

On cutslopes, where the dominant erosion process is dry ravel, use of geotextiles and geogrids show positive results unless the slope was too steep. Hydroseeding plus mulch is also effective. If mass wasting or bank slough due to groundwater seepage is the dominant erosion process managing soil water becomes paramount. Once vegetation is established with a ground cover of greater than 70 percent, sediment yield would be expected to drop by 85 percent or more. Hardening ditches and providing roughness elements reduces the amount of ditch-generated erosion (Burroughs and King 1989; Megahan *et al.* 2001).

Tuttle and Griggs (1987) suggest that for hillclimb areas, locating the trails on finer textured soils and keeping hillclimb length to a minimum would reduce erosion. Further, they recommended concentrating vehicle use in the “bowls” above drainages, and scheduling hillclimb areas for restoration before erosion to bedrock occurs. Catchment basins below hillclimb areas are successful but costly to clean and maintain.

Robichaud *et al.* (2000 and 2005) have done extensive research on the effectiveness of hillslope treatments to control erosion following wildfire. His research is applicable to non-highway legal routes as he evaluated the success of hillslope treatments to slow, capture, store, and safely release both flow and sediment. Hillslope treatment effectiveness and success depends on correct implementation and cooperative weather following ground-disturbing activities. Robichaud *et al.* (2000) found mulching and geotextiles to be effective in providing immediate ground cover, reducing raindrop impact, and holding the soil in place.

Managers identify personal contact as most effective at changing behavior but this technique needs follow-up with law enforcement, signs, and posters (Chavez and Knap 2006; Marion 1998). Personal contact, law enforcement, signs, and posters are proposed in Watershed Mitigations 11 and 22).

BMPs are effective in minimizing the amount of disturbance in conjunction with forest activities. The Pacific Southwest Region of the Forest Service, Region 5, has an active program to evaluate the implementation and effectiveness of Soil and Water BMPs (USDA-FS November 2004). Results from monitoring, 1992-2002, “… indicate that while some improvements are necessary, the program performed reasonable well during that period of time. BMP implementation and effectiveness were relatively high for most activities and elevated effects on water quality and beneficial uses were relatively infrequent, particularly in recent years.” (USDA-FS November 2004: Executive

Summary). For all activities, BMPs were implemented at 85 percent of the observation sites and were 92 percent effective. For recreation and engineering projects, BMPs were implemented at 68 percent and 85 percent of observation sites, respectively, with a 89 percent effectiveness rate for both recreation and engineering (USDA-FS November 2004: Executive Summary). Road stream crossings appear to be most problematic. Monitoring for Recreation BMPs found one major departure occurred caused by a failure to provide adequate runoff control from impervious surfaces (USDA-FS November 2004:31). Sediment delivery to streams was found at 21 percent of the sites monitored.

The Forest Service BMP monitoring and evaluation program fulfills monitoring commitments to the State Water Resources Control Board (USDA-FS November 2004: Executive Summary). Soil and Water BMPs, when implemented and effective, would assist the Forest Service in meeting its obligation in the various forest TMDL processes. A similar issue was addressed in a recent court case with the result that "application of BMPs is by definition compliance with water quality laws" (Center for Native Ecosystems, *et al.* v. Cables *et al.* Dec 17, 2007; Chris Everett, personal communication Jan 2008). This case was litigated in Wyoming.

Monitoring for BMP implementation and effectiveness is included in the monitoring plan for Alternatives 1, 3, and 4 (Watershed Project File WAT-9).

### Duration of Direct and Indirect Effects

Use of designated non-highway legal routes would continue under all alternatives. Any open, administrative, or special use (permittee) non-highway legal route is a dedicated land use. NFTS routes have already resulted in irreversible changes to soil and water resources within the route prism (Marion 1998).

# Alternative Specific Direct and Indirect Effects

Discussed under the alternative specific effects is the magnitude of the effects (the number of acres or miles proposed for action). Refer to Effects Common to All Alternatives for a discussion of the type of effect.

For analysis, proposed actions have been grouped:

> Addition of Motorized Facilities (*e.g.,* New Construction and Add Unauthorized Routes)
>
> Changes to the existing NFTS (Changing Vehicle Classification and Routes Proposed for Closure to Motorized Public Use *e.g.,* Change Designated Use to Administrative or Permit Holder only and Route Decommissioning)

## Alternative 1 Proposed Action

## Water Direct and Indirect Effects

### Addition of Motorized Facilities

#### *Beneficial Uses and Listed Waterbodies*

> Improvement in water quality may be realized in 303(d) listed waterbodies within the Big Bear Lake and Santa Ana River subwatersheds with the implementation of

Alternative 1 (Tables 4 and 5). Alternative 1 proposes to decommission or restore routes within these subwatersheds or change use to administrative only. Improvement would be noted with reduced vehicle use of the road bed resulting in less road bed erosion and sediment generation. When the route is decommissioned or restored hydrologic function would be improved over time.

In the Big Bear Lake subwatershed improvements would be similar for Alternatives 1, 3, and 4 and greater than Alternative 2. Under Alternative 3, inclusion of 0.7 miles of unauthorized routes to access Yellow Post campsites would occur along Coon Creek, a tributary to the Santa Ana River. Inclusion of these routes in the NFTS would be a positive effect since the application of BMPs and maintenance of the routes would occur.

For the upper subwatersheds of the Santa Ana River, alternative 1 provides greater improvement than either alternatives 2 or 3 but not as great as alternative 4 which proposed to decommission an additional 2.3 miles.

In the San Jacinto River headwaters, Alternative 1 has a neutral effect since the proposal is to change vehicle class. The route, 4S06, is already designated for 4x4 vehicles and is wide enough to accommodate non-highway legal vehicles. Alternative 1 proposes to change use on more miles than Alternative 4. Comparing Alternative 1 to Alternative 3 presents a neutral effect; while Alternative 3 designates unauthorized routes to YP sites as part of the NFTS, these sites and routes are currently on the ground and being used. Alternative 3 reduces resource effects by stabilizing the access routes and sites.

### *Stream Flow and Channel Morphology*

No change to stream flow is expected. Change to stream flow regimes occurred when the routes were first constructed and/or created through use. Maintenance plans would be developed and implemented for designated routes.

About 0.5 miles of new route construction is proposed under Alternative 1; similar to Alternative 4 and more miles than either Alternatives 2 or 3. The new routes have no connection to ephemeral, intermittent, or perennial channels. Maintenance plans would be developed and implemented for these routes (Mitigation WAT 12). Unauthorized routes proposed to be designated would have maintenance plans prepared and implemented (Mitigation WAT 12).

Stream channel condition at perennial stream crossings would be improved under Alternative 1; 14 existing perennial stream crossings would be closed to motorized public use (Table 2). Eight crossings would be on decommissioned routes while six crossings proposed for routes that would become administrative use. This effect is similar to Alternatives 3 and 4. Alternative 2 does not change motorized public use of perennial stream crossings.

Stream channel condition at intermittent stream crossings would be improved along 98 crossings (similar to Alternative 4, greater than Alternatives 2 or 3) (Table 2). Of these crossings, 62 would be decommissioned or rehabilitated; 36 would have restricted use through administrative or permit holder use only.

### *Groundwater*

No defined groundwater recharge areas have been identified with the route corridors. Route designation would not change groundwater recharge since the routes are already present on the landscape.

### *Water Quality*

Erosion, stream sediment, and water quality are linked and discussed under Soil Effects – Erosion Potential.

### *Riparian Areas, Wetlands, Floodplains*

Route 2N25Y is currently designated adjacent to a moist meadow system, Rouse Meadow. This route is proposed to be decommissioned under Alternative 1. Removing use from the area would allow meadow hydrologic and landscape process to continue undisturbed.

## Changes to the Existing NFTS

In the San Jacinto River headwaters, Alternative 1 has a neutral effect since the proposal is to change vehicle class. The route, 4S06, is already designated for 4x4 vehicles and is wide enough to accommodate non-highway legal vehicles. Alternative 1 proposes to change use on more miles than Alternative 4. Comparing Alternative 1 to Alternative 3 presents a neutral effect; while Alternative 3 designates unauthorized routes to YP sites as part of the NFTS, these sites and routes are currently on the ground and being used. Alternative 3 reduces resource effects by stabilizing the access routes and sites.

Routes decommissioned or rehabilitated provide positive effects for both soil and water resources, in the long-term, as vegetation becomes established and soils stabilize and rebuild. This effect is especially positive for restoration of unauthorized routes since many are not in desired locations nor were they constructed to Forest Service trail standards. Monitoring and maintenance would assure that drainage problems are corrected and that use is not occurring.

Use on routes limited to administrative or permit holder only would provide positive effects to soil and water resources because of vehicle use controls. Monitoring and maintenance of the routes would assure that drainage problems are corrected. Table 7 shows a comparison of the alternatives relative to administrative use only. More routes would be designated as administrative use only under Alternatives 1 and 4 than for Alternative 3. No routes would be changed to administrative use only under Alternative 2.

# Soil Direct and Indirect Effects

## Addition of Motorized Facilities

### *Erosion Potential*

Erosion potential increases along routes maintained for motorized public access commiserate with route maintenance, grade, width, and level of use. Maintenance and monitoring offsets this erosion potential.

Alternative 1 results in slightly more route acres of severe erosion risk soils maintained for motorized public access than Alternative 4 (Table 1 erosion on routes open to public use adjusted by the total miles of routes considered for each alternative in the EA (Appendix B table)). Alternative 1 results in fewer route acres on severe erosion risk soils maintained for motorized public access than Alternative 3 and significantly less than Alternative 2 (Table 1). Alternatives 1 and 4 propose to designate the same miles of unauthorized route on moderate and severe erosion risk landscapes; Alternative 3 would designate an additional 154 acres on moderate and 249 acres on severe erosion risk landscapes. The extra acres in Alternative 3 are associated with access routes to YP campsites.

Stream crossings on native surface routes are a source of chronic sediment into a stream channel. The crossings associated with routes maintained for motorized public access are currently on the ground and receive use; each use has the potential to dislodge and transport erosional material. This is especially evident where the stream crossing approaches are eroded, gullied, or composed of coarse sand. Routes with stream crossings have been identified (Appendix A Tables 2 and 3), the crossings field reviewed, and needed mitigations proposed (Appendix A Table 3).

An eroding crossing may contribute between 17.5 – 35 pounds of road prism erosion and 11 – 23 pounds of sediment leaving the buffer, depending on route width (Appendix A Table 5). Different approach slopes, approach soil type and surface rock size and amount, time of year, and amount and type of vehicle use would result in a unique contribution. Alternatives 1, 3, and 4 close 14 crossings on perennial streams (Table 2). Alternative 1 and 4 close more crossings on intermittent channels than either Alternatives 2 or 3.

### *Mass Movement or Geologic Hazard*

Other than the small slumps associated with the Cleghorn Route 2N47, (which is a designated non-highway legal route and not part of this analysis) and road cut slumps, no areas of mass movement were observed.

Slumps and rill/gully formation associated with road cuts or Mac drains would continue. Maintenance and stabilization of the toe of the road cut would reduce the amount of material that could be eroded and transported through the ditch and drainage system. Initiating energy dissipation structures within and downstream of Mac drains would reduce erosion energy generated by route ditches. These areas are identified on the annual maintenance reviews that are conducted by the Forest Motorized Trail Ranger and volunteer groups.

## Changes to the existing NFTS

Routes decommissioned or restored provide positive effects for both soil and water resources, in the long-term, as vegetation becomes established and soils stabilize and rebuild. This effect is especially positive for unauthorized routes

since many are not in desired locations nor were they constructed to Forest Service trail standards. Monitoring and maintenance would assure that drainage problems are corrected and that use is not occurring.

Use on routes limited to administrative or permit holder only would provide positive effects to soil and water resources because of vehicle use controls. Monitoring and maintenance of the routes would assure that drainage problems are corrected. Table 7 shows a comparison of the alternatives relative to administrative use only. More routes would be designated as administrative use only under Alternatives 1 and 4 than for Alternative 3. No routes would be changed to administrative use only under Alternative 2.

# Alternative 2 No Action

# Water Direct and Indirect Effects

## Addition of Motorized Facilities

### *Beneficial Uses and Listed Waterbodies*

No change from conditions described in the Affected Environment section would be realized (Water and Soil Resource Report). All NFTS routes are currently on the landscape and receive vehicle use. No positive effects would be realized from active restoration of unauthorized routes or the addition of unauthorized routes with corresponding BMP implementation. Passive restoration of all unauthorized routes would continue and over the long-term would provide positive benefits in the reduction of vehicle generated sediment and hydrologic recovery; vehicle use would not occur on the road surface.

Maintenance, BMP implementation, monitoring, and adaptive management techniques would be employed as part of Forest Plan implementation (SBNF LMP 2006).

### *Stream Flow and Channel Morphology*

No change to stream flow is expected. Designated routes are currently part of the Forest NFTS and receive vehicle use. No new construction is proposed. Change to stream flow regimes occurred when the routes were first constructed and used. Maintenance plans are developed and implemented for these routes.

### *Groundwater*

No defined groundwater recharge areas have been identified with the route corridors. No change in groundwater is expected with implementation of Alternative 2.

### *Water Quality*

Erosion, stream sediment, and water quality are linked and discussed under Soil Effects – Erosion Potential.

### *Riparian Areas, Wetlands, Floodplains*

Route 2N25Y is currently a designated non-highway legal vehicle route adjacent to a moist meadow system, Rouse Meadow. No change to this designation is proposed, however the original roadbed is overgrown and difficult to find.

## Changes to the Existing NFTS

No routes would be decommissioned, rehabilitated, or changed to administrative or permit holder use only under Alternative 2. Soil and water benefits providing by closing or restricting public access would not be realized.

Implementation of Alternative 2 would continue the Forest Order that restricts vehicle use on unauthorized routes. This effect would be beneficial since most unauthorized routes are not in desired locations nor constructed to Forest Service trail standards; passive recovery would occur over the long-term (greater than 20 years).

# Soil Direct and Indirect Effects

## Addition of Motorized Facilities

### *Erosion Potential*

Currently designated routes would be maintained for motorized public access; Alternative 2 proposed no change to existing designations. This includes routes with stream crossings or within the 150 foot buffer of perennial or intermittent streams.

Erosion potential increases along routes maintained for motorized public access commiserate with the route maintenance, grade, width, and level of use. Erosion potential is higher than would be realized under Alternatives 1, 3, and 4 because no designated routes would be decommission, rehabilitated, or use changed to administrative or permit holder only.

### *Mass Movement or Geologic Hazard*

Mass movement and geologic hazard is similar to and discussed in Alternative 1.

## Changes to the existing NFTS

No routes would be decommissioned, rehabilitated, or changed to administrative or permit holder use only under Alternative 2. Soil and water benefits providing by closing or restricting public access would not be realized.

Implementation of Alternative 2 would continue the Forest Order that restricts vehicle use on unauthorized routes. This effect would be beneficial since most unauthorized routes are not in desired locations nor constructed to Forest Service trail standards; passive recovery would occur over the long-term (greater than 20 years).

# Alternative 3

Alternative 3 considers maintaining more miles of NFTS routes for a variety of motorized users and fewer miles of route decommissioning or changing the route designation to administrative or permit holder use only. This alternative also evaluates access to Yellow Post campsites, designated dispersed campsites.

# Water Direct and Indirect Effects

## Addition of Motorized Facilities

### *Beneficial Uses and Listed Waterbodies*

Improvement in water quality may be realized in listed waterbodies within the Big Bear Lake and Santa Ana River Subwatersheds with the implementation of Alternative 3; however, these improvements would be less than with Alternatives 1 or 4 because additional unauthorized routes would be designated for access to Yellow Post dispersed campsites.

In the San Jacinto River headwaters, Alternative 3, improvement to water quality would be limited since the proposal is to change vehicle type as well as open

unauthorized routes for access to Yellow Post campsites. Route 4S06 is already designated for 4x4 vehicles and is wide enough to accommodate non-highway legal use. The YP campsite access routes and sites in this subwatershed are located along Coon Creek and contribute to erosion and sediment production because of their proximity to the perennial stream (campsite use is discussed in the Cumulative Effects section).

### *Stream Flow and Channel Morphology*

No change to stream flow is expected. Both NFTS and unauthorized routes are currently on the landscape and receive vehicle use. Only 0.1 miles of new route construction is proposed under Alternative 3. This new route is not connected to ephemeral, intermittent, or perennial channels. Maintenance plans are developed and implemented for all new routes (Mitigation WAT 12).

Review of the unauthorized routes proposed to be added to the designated system (Alternative 3) show that 0.7 miles of unauthorized routes are within 150 feet of intermittent channels and 0.1 miles within 150 feet of perennial streams. Most of these routes are associated with designated yellow post campsites. Though motorized routes and trails within 150 feet of stream channels may result in increased sedimentation and bank damage adding the yellow post campsite access routes to the NFTS would provide a benefit since BMPs, maintenance, and visitor controls (mitigations Watershed 11 and 22) would be applied to these routes.

Stream channel condition at perennial stream crossings would be improved under Alternative 3, 14 existing perennial stream crossings are proposed to be closed to motorized public use (Table 2). Eleven intermittent stream crossings would be decommissioned, 22 would be restricted to administrative use only. This is three fewer crossings than either Alternatives 1 or 4 for decommissioning and eight fewer for change of use to administrative only.

### *Groundwater*

No defined groundwater recharge areas have been identified with the route corridors. The forest is considered a dispersed groundwater recharge area. Alternative 3 route designation would not change groundwater recharge.

### *Water Quality*

Erosion, stream sediment, and water quality are linked and discussed under Soil Effects – Erosion Potential.

### *Riparian Areas, Wetlands, Floodplains*

Route 2N25Y is currently designated adjacent to a moist meadow system, Rouse Meadow. This route is proposed to be decommissioned under Alternative 3. Removing use from the area would allow meadow hydrologic and landscape process to continue undisturbed.

### Changes to the Existing NFTS

Alternative 3 proposes to decommission fewer miles of existing NTFS routes than Alternatives 1 or 4 but more than Alternative 2. Positive effects would be realized for both soil and water resources (long-term) as vegetation becomes established and soils stabilize and rebuild.

Use on routes limited to administrative or permit holder only would provide positive effects to soil and water resources because of vehicle use controls. Monitoring and maintenance of the routes would assure that drainage problems are corrected. Table 7 shows a comparison of the alternatives relative to administrative use only. Fewer routes would be designated as administrative use only under Alternative 3 than either Alternatives 1 or 4. No routes would be changed to administrative use only under Alternative 2.

## Soil Direct and Indirect Effects

### Addition of Motorized Facilities

#### *Erosion Potential*

Erosion potential increases along routes maintained for motorized public access, similar to Alternatives 1, 2, and 4. Approximately 0.1 miles of new route construction would have a negligible effect on erosion; route construction would include mitigations and the implementation of BMPs. In addition, the route is not adjacent to or connected to intermittent or perennial streams.

Alternative 3 proposes to add 14.7 miles of unauthorized routes to the NFTS, more than either Alternatives 1 or 4. Approximately 5.6 miles are associated with access to YP dispersed campsites. The unauthorized routes to be designated occur on 154 acres of moderate and 249 acres of severe erosion risk landscapes. Positive benefits would be associated with these additions because of the application of BMPs and mitigations to these routes. The access routes would provide vehicles to park at the designated campsites providing enhanced recreation opportunities. On the other hand, positive benefits would also be realized with the continued prohibition of use that allows for passive restoration to occur in the long-term.

#### *Mass Movement or Geologic Hazard*

Mass movement and geologic hazard is similar to and discussed in Alternative 1.

### Changes to the existing NFTS

Alternative 3 proposes to decommission fewer miles of existing NTFS routes than Alternatives 1 or 4 but more than Alternative 2. Positive effects would be realized for both soil and water resources (long-term) as vegetation becomes established and soils stabilize and rebuild.

Use on routes limited to administrative or permit holder only would provide positive effects to soil and water resources because of vehicle use controls. Monitoring and maintenance of the routes would assure that drainage problems are corrected. Table 7 shows a comparison of the alternatives relative to

administrative use only. Fewer routes would be designated as administrative use only under Alternative 3 than either Alternatives 1 or 4. No routes would be changed to administrative use only under Alternative 2.

### Yellow Post Campsite Access Routes

Yellow Post (YP) campsite access routes (approximately 5.6 miles) are being considered for designation in Alternative 3. The selected Yellow Post campsite access routes are short, unauthorized road segments that access designated dispersed camping sites (Yellow Post campsites). Many of these campsites have been in place for decades and are off highway legal roads. Currently users walk into the site or defy the forest order prohibiting the use of vehicles off designated routes and drive to the campsite. The YP campsite access routes are physically on the ground with a variety of roadbed conditions. The effects of Yellow Post campsites are discussed in the Cumulative Effects section below.

Alternative 3 would provide motorized access to the designated dispersed campsites and provide for the implementation of BMPs and mitigations along the access routes. Under Alternatives 1, 2, and 4 these access routes would remain closed under Forest Order 5, pursuant to 36 CFR 261.56 (July 22, 1996) and SBNF LMP, Part 3, S35:8-9.

# Alternative 4

# Water Direct and Indirect Effects

## Addition of Motorized Facilities

### *Beneficial Uses and Listed Waterbodies*

In the Big Bear Lake subwatershed improvements would be similar to Alternatives 3 and 1 and greater than Alternative 2. For the upper subwatersheds of the Santa Ana River, alternative 4 provides the highest potential for improvement through the decommissioning of an additional 2.3 miles of route crossing the Santa Ana River and Fish Creek and paralleling Fish Creek. In the San Jacinto River headwaters, Alternative 4, no change in subwatershed condition would be expected.

### *Stream Flow and Channel Morphology*

No change to stream flow is expected. About 0.5 miles of new route construction is proposed under Alternative 4; similar to Alternative 1 and more miles than either Alternatives 2 or 3. The new routes have no connection to ephemeral, intermittent, or perennial channels. Maintenance plans would be developed and implemented for these routes (Mitigation WAT 12).

Review of the unauthorized routes proposed to be added to the NFTS (Alternatives 4 and 1) show that 0.01 miles are within 150 feet of or cross intermittent channels. No routes (Alternatives 4 or 1) are within 150 feet of or cross perennial streams. Alternative 3 proposes to open 0.7 miles of unauthorized routes within 150 feet of intermittent streams and 0.1 miles within 150 feet of

perennial streams. Under Alternative 2, all unauthorized routes would remain closed under Forest order.

The effects of adding unauthorized routes to the NFTS where the routes are within 150 feet of stream channels may be increased sedimentation and bank damage. These potential effects are off-set by the application of BMPs, maintenance standards, and visitor controls (mitigations Watershed 11 and 22).

Stream channel condition at perennial stream crossings would be improved under Alternative 4, 14 existing perennial stream crossings are proposed to be closed to motorized public use (Table 2). Eight crossings would be on decommissioned routes while six crossings would be on routes proposed for administrative use only allowing for greater control of vehicle use. This effect is similar to Alternatives 3 and 1. Alternative 2 does not change motorized public use of the crossings.

Stream channel condition at intermittent stream crossings would be improved along 98 crossings (similar to Alternative 1, greater than Alternatives 2 or 3). Of these crossings, 62 would be decommissioned or restored; 36 would have restricted use through administrative or permit holder use only.

### *Groundwater*

No defined groundwater recharge areas have been identified with the route corridors. Implementation of Alternative 4 for route designation would not change groundwater recharge since the routes are already present on the landscape.

### *Water Quality*

Erosion, stream sediment, and water quality are linked and discussed under Soil Effects – Erosion Potential.

### *Riparian Areas, Wetlands, Floodplains*

Route 2N25Y is currently designated adjacent to a moist meadow system, Rouse Meadow. This route is proposed to be decommissioned under Alternative 4. Removing use from the area would allow meadow hydrologic and landscape process to continue undisturbed.

## Changes to the Existing NFTS

Alternative 4 proposes to decommission more miles of existing NTFS routes than Alternative 1, 2, or 3. Positive effects would be realized for both soil and water resources (long-term) as vegetation becomes established and soils stabilize and rebuild.

Use on routes limited to administrative or permit holder only would provide positive effects to soil and water resources because of vehicle use controls. Monitoring and maintenance of the routes would assure that drainage problems are corrected. Table 7 shows a comparison of the alternatives relative to administrative use only. Alternative 4 is similar in effects to Alternative 1.

# Soil Direct and Indirect Effects

## Addition of Motorized Facilities

### *Erosion Potential*

Erosion potential increases along routes maintained for motorized public access. Alternative 4 has the fewest route acres on severe erosion risk soils maintained for motorized public access, adjusted for the differences in total miles between Alternatives 4 and 3 (Table 1).

Alternatives 4 and 1 propose to designate the same miles of currently unauthorized route on moderate and severe erosion risk landscapes; Alternative 3 would designate an additional 154 acres on moderate and 249 acres on severe erosion risk landscapes.

The 0.5 miles of new route construction would increase erosion slightly. Route construction would include mitigations and the implementation of BMPs. In addition, the routes are not adjacent to or connected to intermittent or perennial streams.

Alternatives 4, 1, and 3 close 14 crossing on perennial streams (Table 2). Alternatives 4 and 1 close more crossings on intermittent channels than either Alternatives 2 or 3.

### *Mass Movement or Geologic Hazard*

Mass movement and geologic hazard is similar to and discussed inAlternative 1.

## Changes to the existing NFTS

Alternative 4 proposes to decommission more miles of existing NTFS routes than Alternative 1, 2, or 3. Positive effects would be realized for both soil and water resources (long-term) as vegetation becomes established and soils stabilize and rebuild.

Use on routes limited to administrative or permit holder only would provide positive effects to soil and water resources because of vehicle use controls. Monitoring and maintenance of the routes would assure that drainage problems are corrected. Table 7 shows a comparison of the alternatives relative to administrative use only. Alternative 4 is similar in effects to Alternative 1.

# Cumulative Effects

Cumulative Effects includes a discussion of combined, incremental effects of human activities. For activities to be considered cumulative, their effects need to overlap in both time and space with those of the proposed actions.

Routes included in this EA are scattered throughout the forest. For soil and water resources, the area of consideration is the travel route and a 300-foot buffer adjacent to the route. This limited area was selected since most soil effects are site-specific. Soil erosion is an exception. Soil erosion includes material that can potentially move off-site, thus may have a cumulative off-site effect. Soil erosion integrates with water resources and off-site effects will be discussed.

Section organization includes: 1) Existing condition, including past activities, 2) Additional effects from implementation of the alternatives, and 3) Effects of on-going and reasonable foreseeable actions.

## Existing Conditions and Past Activities

Legacy soil and channel disturbance, disturbance that occurred as a result of past activities, forms the foundation of the soil and channel conditions on the landscape today. The current soil and water resource conditions are discussed in the Affected Environment.

## Effects from Project Implementation

The effects of project implementation are discussed above in the Environmental Consequences – Comparison of Alternatives section. Except for the 0.5 miles of new construction proposed in Alternatives 1 and 4, the routes exist on the ground and receive vehicle use. Most of the soil and water impacts occurred when the route was first constructed or initially used. The effect of having routes on the ground would continue into the reasonably foreseeable future.

Project effects are based on the assumption that route maintenance, implementation of BMPs, and monitoring would occur. It is also assumed that law enforcement and visitor controls are adequate to prohibit cross-country travel and no new unauthorized routes are established. Alternatives 1, 4, and to a lesser extent 3 would decommission or restore routes. In addition, these alternatives also change use on selected routes to administrative or permit holder only. These actions would reduce the open (to public use) road density in six subwatersheds (Effects Common to All Alternatives).

## Effects of On-going and Reasonably Foreseeable Actions

On-going or reasonably foreseeable future actions that would overlap in time or space with the designation of non-highway legal routes in this EA include private land development, non-highway legal trailering sites and staging areas, hazard tree removal and fuel projects and other designated non-highway legal routes not considered in this EA. A complete project list can be found in Appendix B of the draft EA.

### *Yellow Post Campsites and Access Routes*

Yellow Post (YP) campsite access routes (approximately 5.6 miles) are being considered for designation in Alternative 3. The selected Yellow Post campsite access routes are short, unauthorized road segments that access designated dispersed camping sites (Yellow Post campsites). Many of these campsites have been in place for decades and are off highway legal roads. Currently users walk into the site or defy the forest order prohibiting the use of vehicles off designated routes and drive to the campsite. The YP campsite access routes are physically on the ground with a variety of roadbed conditions.

There is concern that the access routes and campsites are expanding as limited visitor controls are in place to restrict vehicle parking either along the access route or within the campsite (*e.g.*, parking barriers, route delineators). Increased ground disturbance, loss of vegetation, and changes to soil infiltration and percolation are a result of the access route and campsite trampling. These concerns would be reduced, but not eliminated, with visitor controls and maintenance of both the access route and campsites (Mitigation WAT

11 and 12) as proposed under Alternative 3. Alternatives 1, 2, and 4 do not address the use of campsite access routes.

Yellow Post campsite access routes of most concern access campsites close to perennial or intermittent channels and upland springs. The lack of visitor controls at the campsites has lead to streambank damage, erosion, and loss of streamside vegetation (Greg Hoffman, personal communication). Yellow Post campsites of soil and water concern are:

| | |
|---|---|
| #1-3, 10, 15, 16 (along Coon Creek) | 5S09 1 and 2 (along Stone Creek) |
| Fawnskin 6 (unnamed drainage) | Tool Box Spring 3 and 5 (spring) |
| Apple Canyon 3 (unnamed drainage) | Thomas Hunting Ground 1 (unnamed drainage) |

These dispersed campsites represent about 13 percent of the available dispersed YP campsites.

Under Alternatives 1, 2, and 4 the YP access routes would remain closed under Forest Order 5, pursuant to 36 CFR 261.56 (July 22, 1996) and SBNF LMP, Part 3, S35:8-9. The Forest closure would be enforced to keep vehicles from leaving designated routes, even to access a dispersed campsite. In addition, The SBNF Forest Plan provides guidance for Recreation Use and Riparian Management (Watershed Project File WAT-10 and 11, respectively) to prevent enlargement of the campsites.

### *Staging Areas and Trailering Sites*

Any proposed or future actions related to Staging Areas and Trailering Sites would require site-specific analysis and a decision document.

Most trailering sites and staging areas are large, 3-8 acres. They are 90-100 percent bare soil but may have scattered large trees. Both developed and dispersed staging areas have a common set of impacts that include soil compaction, soil displacement, and loss of vegetation.

Developed non-highway legal staging areas concentrate use and provide a trailhead for riders. The parking areas are generally flat, have defined areas, provide sanitation facilities and allow for loading and off-loading machines and parking. Visitor controls are in place to limit site expansion and reduce impacts away from the designated loading area (Watershed Project File WAT-7: Photo 3, 3a-Pinnacles). Warm-up and play hills may be designated as part of the staging area. Popular staging areas that serve routes identified in this EA include Pinnacles, Big Pine Flat (user-created), Crab Flat, Summit, Trestles, and Cactus Flat.

Big Pine Flat is a user-created staging area across from the existing Big Pine Campground. Crab Flat CG is a proposed staging area to replace Green Valley Trailering Site (Watershed Project File WAT-7: Photo 4, 4a-Green Valley). This existing campground is approximately ¼ mile from Crab Creek. Access to the campground and proposed Staging Area would include crossing Crab Creek with a ford. The existing Crab Creek ford (used to access the campground and designated non-highway legal routes north of Green Valley trailering site) has widened over time and is in need of visitor controls. Summit and Trestle staging areas are large, established sites. Summit Staging area could use visitor controls to limit site expansion as well as toilet and trash facilities.

Dispersed non-highway legal Trailering sites (*e.g.*, Miller Canyon Trailering Area) are generally user-created, do not have defined areas as evidenced by people parking among trees and boulders, and do not have sanitation facilities. Often users park and off-load in wide spots along Forest Service system or County roads. Trailering sites have evolved over time and today are very popular, especially on weekends. During weekends, site capacity is exceeded and visitors push farther into undeveloped areas to find a place to park. User-created trails often develop to access designated trails. Popular trailering sites include Green Valley, Cleghorn, and Miller Canyon.

At Miller Canyon Trailering Site, users park among trees within the riparian area of the EFWF Mojave River (Watershed Project File WAT-7: Photos 5, 5a-Miller Canyon). Visitor controls are needed to move vehicles away from the streambanks and large trees. Green Valley and Cleghorn trailering sites have become established in wide spots along main roads. The Green Valley trailering site is eroded and sediment is moving off-site and into intermittent channels that are tributary to Crab Creek.

### *Other Designated Non-Highway Legal Vehicle Routes*

There are no proposed changes to other designated non-highway legal routes on the SBNF. Use on these routes would continue with mitigations and monitoring implemented per the existing SBNF non-highway legal maintenance and monitoring program or the site-specific plan for the NFTS. Effects to soil and water resources would be similar to those described for this project.

There is a dual sports event (Honda Ride for Kids) staged on private land that comes onto the SBNF. Up to 200 motorcycles per day may use routes on the Front Country and Mountaintop Ranger Districts during the one day sports event. The event is managed under a special-use permit. This event does not use the routes identified in this EA.

Non-highway legal vehicle use would continue on adjacent Federal Land (managed by the FS or BLM) and the Soboba Indian Reservation. The BLM recently completed analysis on 40 miles of motorcycle trail in Juniper Flats, north of the Forest. This area is connected to trails within the San Bernardino NF, including the routes identified in this EA.

The Forest Service, San Bernardino NF is currently completing a proposal to manage motorized trails in the Baldy Mesa area. These trails are not connected to the non-highway legal routes identified within this EA. The actions identified in Baldy Mesa project are similar to those described in this document; soil and water effects would be similar.

### *Development within the San Bernardino NF*

Urbanization and suburbanization has and would continue to occur on private land within the San Bernardino NF. With development come roading and building footprints that increase the amount of impervious surfaces (Douglass *et al.* 1999).

When combined, ditches along State, County, private, and Forest Service system roads may extend the stream network by as much as 40 percent. Streamflow may double where road density is 1.6 mi/mi2 (Baldwin Lake, Big Bear Lake, Upper Deep Creek, and Silverwood Lake subwatersheds (Watershed Project File WAT-4: Total Road Density)

(Douglass *et al.* 1999). Private land within these subwatersheds is extensively developed. Actions that would decommission or rehabilitate unauthorized routes within these subwatersheds would reduce road densities. As discussed above, native surface roads also contribute road prism erosion to stream channels where the route and channel are connected.

Researchers in Illinois found that small floods have increased by about 200 percent with large floods increasing about 100 percent due to urban growth (Konrad 2003). The largest changes are seen in small stream basins where the majority of precipitation prior to development was subsurface flow (similar to the basins within the forest). In addition, the effects of development are most pronounced for moderate storms following a dry period. During large storm events and during wet periods, subwatersheds become saturated regardless of development. Thus, the increase in peak discharge is greater for small, frequent floods than for large infrequent floods.

In addition, development tends to reduce channel response time to precipitation since surface runoff is quickly shed off the landscape and into a drainage (Konrad 2003). Booth *et al.* (2002) found that limiting forest clearing and conversion to suburban vegetation (lawns) was a significant factor in determining peak discharge increases, more so than increases in impervious area.

This project would not add impervious surfaces to the forest, except for the new construction. The routes being considered exist on the landscape and the effects occurred at the time the routes were constructed or initially used. However, private development may encourage the creation of user-created trails as homeowners attempt to access the NFTS from their property.

### *Actions that Propose New Motorized Road Construction – Marble Canyon Limestone Quarry and Communication Sites*

The Marble Canyon Limestone Quarry and various communication sites propose construction of new access routes. These routes would be constructed to include Region 5 and Forest BMPs and be under special-use permits for operation. Public use would be restricted.

### *Recreation Residence Tracks, Range Allotments*

These projects may overlap in space with designated NFTS; NFTS routes may be used for access into a range allotment or recreation residence owners may develop user-created trails to access the NFTS from their residences. Law enforcement and monitoring would help limit unauthorized route development.

### *Fuel Treatment Projects*

Fuel treatment projects may overlap in space with designated NFTS; NFTS routes may be used for access into the fuel treatment project site. This action may increase use on designated routes, increasing the risk of erosion and in-channel sedimentation. In addition, any fuel treatment action that creates a fuel break accessible to non-highway legal vehicles from designated routes may become an unauthorized route. Upon completion of the fuel treatment project, internal access points would need review and

restoration. Law enforcement, monitoring, and proper closure of any fuelbreak at designated route junctions would help limit unauthorized route development.

# Hydrologic and Soil Effects Summary

Related to route designation, benefits to the soil and water resource come from designated route maintenance, maintenance of administrative and special-use permit routes, implementing BMPs, upgrading drainage structures, and controlling erosion. Furthermore, monitoring and visitor controls ensure unauthorized routes are not created or used and that any decommissioning and restoration is successful. Tables 7 and 8 summarize watershed effects by the chosen indicators while the following paragraphs provide a narrative of project effects.

Alternative 1 has the potential to provide a diverse motorized recreation experience on over 89 miles of designated routes while at the same time providing monitoring, mitigations, and visitor controls to protect soil and water resources. The routes identified in Alternative 1 are located on moderate and severe erosion hazard landscapes. User controls, monitoring, and maintenance would be crucial for minimizing the effects of motorized traffic on water and soil resources. Alternative 1 also provides for decommissioning of existing roads and routes, restoration of unauthorized routes, and the reclassifying of routes to administrative or special use permit use only. Over time (greater than 20-years), these actions would reduce erosion as vegetation becomes established and soil stabilization occurs.

Alternative 2 appears to have the least advantage to soil and water resources. This alternative does not result in a well-planned or comprehensive non-highway legal trail system. It does not provide controls on sensitive landscapes except through the existing set of mitigations and monitoring established in the Forest Plan. Restoration of unauthorized routes and decommissioning of unneeded trails would occur on a case-by-case basis.

Alternative 3 appears to have few advantages for soil and water resources. This alternative provides more designated routes open to motorized public use and fewer miles of route decommissioning. However, visitor controls, monitoring, and mitigations are proposed, similar to Alternatives 1 and 4. These adaptive measures would allow the forest to protect soil and water resources as problems arise on the ground. This alternative also recognizes the existence and use of Yellow Post access routes and campsites. Unfortunately, some Yellow Post campsites are affecting stream channel function due to proximity to the channel. If use of these campsites is to continue into the future, Alternative 3 recognizes the need for soil and water stabilization of both YP access routes and campsites.

Alternative 4 provides the best protection of the soil and water resource, although only slightly better than Alternative 1. Alternative 4 has the largest amount of decommissioning proposed. Alternative 4 decommissions routes 1N39A and 1N05A, both of which effect water quality in Fish Creek and the Santa Ana River (Table 4). Visitor controls, monitoring, and mitigations are proposed, similar to Alternatives 1 and 3. These adaptive measures would allow the Forest to protect soil and water resources as problems arise on the ground.

**Table 7. Soil and Water Effects and Measurements**

| ISSUE | MEASURE | ALTERNATIVE 1<br>PROPOSED ACTION | ALTERNATIVE 2<br>NO ACTION | ALTERNATIVE 3 | ALTERNATIVE 4 |
|---|---|---|---|---|---|
| Surface Water Quality | Surface Water Quality: Miles of routes added to NFS system (net change) (EA Chapter 2) | 8.7 | 0<br>There are no changes to the existing NFS system | 14.7 | 8.7 |
| | Miles designated for motorized public use within 150 feet of perennial streams (Table 3) | 0.3 | 2.9 | 0.4 | 0.3 |
| | Miles designated for motorized public use within 150 feet of intermittent streams (Table 3) | 6.1 | 11.1 | 6.2 | 6.1 |
| | Miles proposed for decommissioning (Chapter 2) | 18.5 | 0<br>No decommissioning | 13.6 | 20.8 |
| | Miles proposed for restoration of unauthorized routes (EA Chapter 2) | 74.2 | 0<br>No restoration | 73.6 | 74.2 |
| Erosion Rates | Acres to be closed to motorized public use on severe erosion risk soils (Table 1) | 4955 | 2995 | 4447 | 5028 |
| Wetland and Meadow Hydrology | Miles designated for public use within Rouse Meadows, Route 2N25Y (EA Chapter 2) | 0 | 0.6 | 0 | 0 |
| Stream Channel Stability | Number of intermittent stream crossings to be closed to motorized public | 98 | 49 | 87 | 98 |

| ISSUE | MEASURE | ALTERNATIVE 1<br>PROPOSED ACTION | ALTERNATIVE 2<br>NO ACTION | ALTERNATIVE 3 | ALTERNATIVE 4 |
|---|---|---|---|---|---|
| | use (Table 2) | | | | |

1. The Alternatives differ in the total number of miles considered within this EA. The numbers presented need to be viewed in context of the total numbers of miles considered.

Table 8 provides a synthesis of effects by raking each alternative and soil and water resource indicator. The rankings are scored: 1 is the worst for the resource with 4 being the best.

**Table 8. Soil and Water Effects Summary**

| INDICATORS – WATERSHED RESOURCES | RANKINGS OF ALTERNATIVES FOR EACH INDICATOR[1] | | | |
|---|---|---|---|---|
| | Alt. 1 | Alt. 2 | Alt. 3 | Alt. 4 |
| Miles of routes added to NFS system (net change) (EA Chapter 2) | 3 | 1 | 2 | 3 |
| Miles designated for motorized public use within 150 feet of perennial streams (Table 2) | 3 | 1 | 2 | 3 |
| Miles designated for motorized public use within 150 feet of intermittent streams (Table 2) | 3 | 1 | 2 | 3 |
| Miles proposed for decommissioning (EA Chapter 2) | 3 | 1 | 2 | 4 |
| Miles proposed for restoration of unauthorized routes (EA Chapter 2) | 3 | 1 | 2 | 4 |
| Acres to be closed to motorized public use on severe erosion risk soils (Table 1) | 3 | 1 | 2 | 4 |
| Miles designated for public use within Rouse Meadows, Route 2N25Y (EA Chapter 2) | 2 | 1 | 2 | 2 |
| Number of intermittent stream crossings to be closed to motorized public use (Table 2) | 3 | 1 | 2 | 3 |
| Summary (the larger the number the greater the benefit to the soil and water resource) | **23** | **8** | **16** | **26** |

# Compliance with the Forest Plan and Other Direction.

## San Bernardino National Forest Plan (2005)

Forest Wide Standards and Guidelines, Strategies and Tactics (SBNF LMP, Part 2, Appendix B:134-136). All alternatives are consistent with the Forest Plan if BMPs, a Pollution Prevention Plan, Monitoring, Route Maintenance, and Visitor Controls are implemented.

Watershed Project File WAT-10 contains the Recreation Adaptive Management Review for soil and water resources. Watershed Project File WAT-11 contains the Riparian 5-Step analysis for soil and water resources. Mitigations and design criteria were developed in conjunction with these analyses.

## Forest Service Manual 2500 Watershed and Air Management

### 1. Region 5 Supplement 2500-92-4 to FSM 2540 gives guidance on water uses and developments

This supplement is not applicable, no withdrawal of surface or groundwater

### 2. Region 5 Supplement 2500-92-2 to FSM 2526 discusses riparian area management and is further defined by The San Bernardino Supplement to 2509.22 – Soil and Water Conservation Practices Handbook, FSH 2509.22-2005-1

All alternatives are consistent with FSH 2509.22-2005-1 (Watershed Project File WAT-9)

### 3. Region 5 Supplement 2500-93-1 to FSM 2530

This supplement is applicable and has been applied through the implementation and use of best management practices (BMP) and mitigations. Erosion control and in-channel sediment reductions are a concern and have been addressed through use of BMPs and route design features

### 4. FSM 2543 and 2880 are both draft direction for the management of groundwater resources. Manual direction has been applied

All alternatives are consistent because there would be no withdrawal of surface and/or groundwater

Alternative effects to surface and groundwater resources are disclosed

### 5. Forest Service Manual 2550 Soil Management

FSM 2550 provides guidance for soil resources along with Region 5, Soil Management Handbook Supplement (2509.18-95-1 Effective June 11, 1995). Designated non-highway legal routes would be considered a dedicated trail and recreation route system; thus, the soil productivity guidelines related to percent of ground cover would not apply in the route corridors or staging areas. Forest Service direction states that “areas with dedicated uses, such as specified roads and developed campsites, are not expected to meet the soil quality analysis standards (S52 – USDA-Forest Service April 2005)

Erosion control and in-channel sediment reductions are a concern and have been addressed through use of BMPs and route design features

## Clean Water Act

It is understood that the Forest Service will ensure all proposed activities result in protection or improvement of beneficial uses in adjacent streams (Tables WAT 4, 10, and 11) (compulsory under California State law (Porter Cologne Act)). All alternatives are designed to meet these requirements. This would be accomplished through application of BMPs (Watershed Project File WAT-9) and mitigations.

### BMP

Watershed Project File WAT-9 contains a BMP checklist for the project. All items marked Y would be implemented with the selected alternative. Additional items may be implemented at the discretion of the Forest Hydrologist or Forest Soil Scientist.

### EO 11988 and 11990

Floodplain and wetland delineation occurred as part of this analysis. Protection measures and monitoring for the adjacent wet meadow and spring areas are integrated into alternative design and monitoring.

### EO 11644 and 11989, Use of off-road vehicles on the public lands

The effects of non-highway legal vehicle use on public lands were reviewed as part of this analysis. Effects of such use were noted with the development of mitigation, monitoring, and restoration practices to reduce adverse effects on the soil and water resources.

### California Environmental Quality Act and Porter Cologne Act (California Water Quality Act)

All alternatives are compliant the California Environmental Quality Act (CEQA), including provisions in the Porter Cologne Act. The combination of mitigations, implementation of BMPs, and project monitoring constitute a Pollution Prevention Plan for the non-highway legal routes identified in this document (Watershed Project Files WAT-8 and WAT-9).

# References

See Appendix C: Soil and Water References and Literature Citations