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3.10 WATER RESOURCES

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 and trails 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 (Foltz 2006). Management decisions to eliminate cross-country motorized travel, add new routes to the National Forest Transportation System (NFTS), and make changes to the existing NFTS must consider effects on watershed functions.

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

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

Clean Water Act of 1948 (as amended in 1972 and 1987): establishes as federal policy for the control of point and non-point pollution, and assigns the states the primary responsibility for control of water pollution. Compliance with the Clean Water Act by National Forests in California is achieved under state law (see below).

Non-point source pollution on National Forests is managed through the Regional Water Quality Management Plan (USDA, Pacific Southwest Region, 2000), which relies on implementation of prescribed best management practices (BMPs). The Water Quality Management Plan includes one BMP for off-highway vehicle (OHV) use (4-7) and 28 BMPs related to road construction and maintenance (2-1 to 2-28) (See Appendix G). All NFTS roads and trails open to OHV use are required to comply with these BMPs.

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

The California Water Code consists of a comprehensive body of law that incorporates all state laws related to water, including water rights, water developments, and water quality. The laws related to water quality (sections 13000 to 13485) apply to waters on the National Forests and are directed at protecting the beneficial uses of water. Of particular relevance for the Proposed Action is section 13369, which deals with non-point-source pollution and best management practices.

The Porter-Cologne Water-Quality Act, as amended in 2006, is included in the California Water Code. This act provides for the protection of water quality by the state Water Resources Control Board and the regional water quality control boards, which are authorized by the U.S. Environmental Protection Agency to enforce the Clean Water Act in California.

The Sierra Nevada Forest Plan Amendment (SNFPA): The Record of Decision (ROD) for the 2004 SNFPA includes standards and guidelines that apply to the 11 Sierra Nevada Forests for construction and relocation of roads, and for management of riparian conservation areas (RCAs). These standards and guidelines require the Forest Service to avoid road construction, reconstruction, and relocation in meadows and wetlands (SNFPA S&G 70). Reconstructing unauthorized routes to bring them to NFTS standards in meadows or wetlands should therefore be avoided. Only routes that already meet NFTS standards in meadows and wetlands should be proposed for addition to the NFTS. SNFPA S&G 92 requires that the Forest Service evaluate new management activities within RCAs and

critical aquatic refuges (CARS) during environmental analysis to determine consistency with riparian conservation objectives (RCOs) at the project level and the Aquatic Management Strategy (AMS) goals for the landscape. Adding an unauthorized route to the NFTS is a new management activity and must comply with S&G 92. SNFPA S&G 100 requires the Forest Service to maintain and restore the hydrologic connectivity of streams, meadows, and wetlands by identifying roads and trails that intercept, divert, or disrupt flows paths and implementing corrective actions. SNFPA S&G 102 requires that the Forest Service determine if stream characteristics are within the range of natural variability prior to taking actions that could adversely affect streams.

Effects Analysis Methodology

Proposed additions to the NFTS as well as cross country travel prohibition and change in vehicle class were reviewed in all applicable watersheds within the Forest boundary to determine effects on water resources. This consisted of GIS analysis as well as a review of the Forest trail condition surveys (project record) to determine which routes were in hydrologically sensitive areas (HSA). Hydrologically sensitive areas are synonymous with Riparian Conservation Areas (RCA) in the Forest Plan Direction (USDA 2005a). The focus of these sensitive areas, which includes streams and wetlands such as meadows, springs and seeps, and attendant near-surface ground water resources, was to determine which segments of routes with erosional features could adversely affect water quality. These areas, known as hydrologically connected segments (HCS), are locations near water within hydrologically sensitive areas where drainage off a route is likely to enter a watercourse. The GIS analysis showed that 25 HUC Level 7 watersheds with routes proposed for addition to the NFTS had routes that were in hydrologically sensitive areas as shown in Table 3.10-6. Once the GIS analysis was complete, all HSA routes in the 25 watersheds were field surveyed to determine the level of concern regarding the water resource. Field evaluation was conducted following the hydrologically connected segment inventory protocol used on the Stanislaus National Forest (Frazier 2006a). Data were collected on all routes identified as hydrologically connected (results are shown in Table 3.10-6). The field evaluations were analyzed to determine hydrologically connected segments of routes that would be acceptable with routine maintenance or mitigation, or routes that should not be recommended for addition to the NFTS because of a watershed resource concern that was not practical to mitigate (see tables 3.10-9 and 3.10-10). Data from all the hydrologically connected segments was analyzed by watershed to inform the effects analysis.

Beneficial uses of water and water quality objectives in the California Water Quality Control Plan (Basin Plan) of the Central Valley Regional Water Quality Control Board (CVRWQCB 1998) were utilized as a regulatory benchmark regarding the existing condition and to assess the effects of the proposed action and its alternatives. The principal water quality parameter considered in the water resources analysis was sediment, since this is the primary pollutant from motorized travel. Petrochemical residue (e.g., oil and grease) was also considered since motor vehicles can deposit such pollutants. Water temperature was also evaluated since motorized travel routes can create openings along streams that may be a factor in elevating stream temperature.

Many of the watersheds with water resource concerns in this analysis have had recent stream condition surveys using the Stanislaus National Forest StreamScape Inventory protocol (Frazier 2006b). This information was used to evaluate existing water quality and stream condition to determine the effects of the three actions. In addition, other available recent stream and water quality information was used, including data from Pacific Gas and Electric Company (Pacific Gas and Electric Company 2002) and the Clavey River Watershed Assessment (CREP 2008). Other information sources included sampling condition of some streams and wet areas (e.g., springs) during field evaluation of routes with watershed resource concerns and/or watershed staff observations in these areas in recent years, both to fill data gaps. The time frame for analysis of direct and indirect effects is from one to 20 years.

Assumptions Specific to Water Resources

Four assumptions are specific to the water resources analysis:

1. Route Proliferation: Routes will continue to increase without prohibition of cross country motorized travel. This applies only to Alternative 2 (No Action) since cross country travel would continue. The rate of proliferation is estimated to be 2.25 miles per year across the Forest based on utilizing the same proliferation rate that has occurred during the past 20 years (see project record). For purposes of the water resources analysis the route proliferation in Alternative 2 was assumed to occur in the concentrated use watersheds (Table 3.10-2) since these are expected to continue to be the locations of demand for off-highway motorized travel.
2. New Construction: While no new route construction occurs in the proposed action or alternatives, about five miles are expected to be built in the next 10 years. These are primarily segments that would connect existing routes to enhance motorized travel opportunities. These routes exist in, and the effects are accounted for, in the CWE analysis of concentrated use watersheds.
3. Passive Recovery: Existing routes not added to the NFTS are assumed to passively recover; that is, heal over in time as forest litter (e.g., pine needles, twigs, branches) and vegetation re-occupies the route surface. The rate of recovery will vary by location, type of route (i.e., motorcycle or ATV trail, road), and by soil type and route gradient. The range of time is expected to be from about two to ten years; trails in forested areas that were closed were observed to accumulate an acceptable amount of ground cover within two years while trail segments in forest openings may take up to a decade to recover.
4. Wheeled Over Snow (WOS) use does not affect water resources since the use is on existing NFTS routes that are open to public motorized use during the normal summer driving season.

Data Sources

Refer to the introduction to the Effects Analysis Methodology section above.

Water Resources Indicators

Three water resource indicators were used to analyze effects of the alternatives considered:

1. Unauthorized routes in hydrologically sensitive areas, with miles as the measure
2. Unauthorized routes with documented erosional features affecting water quality (hydrologically connected segments), with miles as the measure
3. Equivalent Roaded Acres (ERA), with % ERA per HUC Level 7 watershed as the measure

Indicators 1 and 2 were most applicable to analyzing direct and indirect effects of the proposed action and alternatives. Indicator 3 was used in the analysis of cumulative watershed effects.

Water Resources Methodology by Action

1. Direct and indirect effects of the prohibition of cross country motorized vehicle travel

This action affects the amount of hydrologically sensitive area disturbed and potential stream sedimentation or impact to other wet areas. That is, the more miles of unauthorized routes currently existing in the Forest that are prohibited from being used, the less impact on the water resource. The effects vary by alternative since the number of miles of routes proposed for addition in each alternative is different and they all vary from the existing condition. The analysis of the intensity of effects includes mitigation measures with been prescribed to lessen impacts.

2. Direct and indirect effects of adding facilities to the NFTS including identifying seasons of use and vehicle class

This action also affects the amount of hydrologically sensitive area disturbed, in the reciprocal from prohibition of cross country travel. The more unauthorized routes that are added to the NFTS in hydrologically sensitive areas, the more retention of potential stream sedimentation and disturbance to other wet areas. The effects vary by alternative since the number of miles of routes proposed for addition to the NFTS in each alternative is different and they all vary from the existing condition. The analysis of the intensity of effects includes mitigation measures that were prescribed to lessen impacts (Appendix I shows protections for streams, meadows, springs, etc.)

3. Direct and indirect effects of changes to the existing NFTS including identifying seasons of use and vehicle class

This action may affect hydrologically sensitive areas by changing the status of currently open and closed routes and changing the vehicle use type. Opening closed NFTS routes which have hydrologically sensitive segments to motorized travel may increase stream sedimentation while closing open routes may reduce the effect. Changing the type of vehicle use on routes with hydrologically sensitive segments may have an effect that could increase or decrease impacts. The effects vary by alternative as with the previous two actions. In both cases the proposed changes occur on a small percentage of the NFTS routes presently available for motorized travel.

4. Cumulative Effects

Cumulative watershed effects (CWE) were evaluated using the USDA Forest Service Region 5 methodology (USDA 1988) and the Stanislaus National Forest CWE model (USDA 2003a). Details are available in the project record. The data source for consideration of past, present and reasonably foreseeable future action is the list of activities in the Cumulative Watershed Effects Analysis (Appendix B).

CWE were considered for all alternatives for HUC Level 7 watersheds that had routes proposed for addition to the NFTS as well as prohibition of cross-country travel. These watersheds were categorized as either concentrated or dispersed use. Concentrated use watersheds refer to those that encompass the three concentration areas of off-highway motorized travel on the Forest. Detailed CWE analysis was conducted on these watersheds. The dispersed use watersheds usually have a lesser amount of mileage of routes per watershed and/or less management activity disturbance, and thus a lower risk of cumulative effects. The time frame for analysis of cumulative watershed effects used in the CWE model is 20 years.

Affected Environment

Watershed Setting

The three actions described above (cross-country travel prohibition, additions to the NFTS and changes to the existing NFTS) are applicable to roaded watersheds throughout the Forest, with some exceptions. Watersheds in Wilderness and certain other areas are excluded. Additions to the NFTS are proposed on the Calaveras, Groveland and Mi-Wok Ranger Districts. Changes to the existing NFTS are proposed on the Summit Ranger District and the others.

Watersheds on the Stanislaus National Forest are delineated into a series of subdivisions based on a national hierarchical classification system (FGDC 2004). These watersheds cover the entire Forest – roaded, unroaded and wilderness areas. They are nested in five of the eight tiers in the classification system; these five range from very large (greater than 250,000 acres each) to very small (less than 2,000 acres each).

The watershed classification system uses the title Hydrologic Unit Code (HUC) for all tiers (see Table 3.10-1). The tiers are numbered in order from one to eight in descending size classes. Each HUC level

code is a two digit number that ties to a watershed size and name. For example, HUC Level 1 is a two digit code whereas as HUC Level 5 is a 10 digit code. Table 3.10-1 also shows an example of how the nesting system applies to the Stanislaus National Forest.

Table 3.10-1 Hydrologic Unit Code System (HUC)

HUC Level	Name	Size (acres)	Examples Related to Stanislaus NF
1	Region	100,000,000 (average)	NA
2	Sub-region	10,000,000 (average)	NA
3	Basin	7,000,000 (average)	San Joaquin River
4	Sub-basin	450,000 (average)	Stanislaus River
5	Watershed	~40,000-250,000	South Fork Stanislaus River
6	Sub-watershed	~10,000-40-000	Lower South Fork Stanislaus River
7	Drainage	~2,000-10,000	Deer Creek
8	Sub-drainage	~Less than 2,000	Upper Deer Creek

Note: Names and sizes for HUC 7 and 8 watersheds are draft but are used for reference in this report.

The Stanislaus National Forest consists of HUC level watersheds four through eight. (The term watershed is used generically even though each HUC level has a unique name). The HUC Level 4 watersheds on the Forest are the headwaters of large rivers that continue downstream of the Forest (e.g., Stanislaus River). Some of the HUC Level 5 watersheds extend somewhat downstream from the Forest and some are entirely within the Forest boundary. With rare exceptions, boundaries of HUC Levels 6 through 8 are entirely on the Forest.

Scope of the Water Resources Analysis

The Water resources analysis primarily focused on HUC Level 7 watersheds, though context to HUC Level 5 watersheds is provided as needed. These two tiers are often termed “classic” watersheds where the naming convention provides a relatively clear understanding of size and location. (The intermediate class, HUC 6, sometimes provides less spatial and naming clarity, and is not used in this report). The rationale for the focus on HUC 7’s was that they provide the best size class for estimating direct, indirect and cumulative effects of management activity relative to the water resource. Potential effects are often underestimated if only larger watersheds are considered and can be overestimated in smaller watersheds.

The principal scope for the analysis of watershed effects in this project was all HUC Level 7 watersheds with additions to the NFTS on National Forest land within the Forest boundary. This action is expected to have the highest risk of effects since it determines permanent additions to the NFTS and allows passive recovery of existing unauthorized routes. Watersheds without additions to the NFTS but changes to the NFTS were considered as well and are discussed as needed in the analysis.

The analysis was initiated at the largest scale of the HUC Level 7 watersheds on the Forest and focused down to the principal watersheds, in the following sequence:

- 188 HUC Level 7 watersheds exist on the Stanislaus National Forest,
- Of these 188, 97 have one or more unauthorized routes available for motorized travel,
- Of these 97, 88 have one or more unauthorized routes proposed for addition to the NFTS,
- Of these 88, 25 have one or more unauthorized routes proposed for addition to the NFTS within hydrologically sensitive areas. (Many proposed routes in the 88 watersheds run along ridges, on upper slopes or are dead-end segments off NFTS routes that are not near water). These 25 watersheds are the principal focus for analysis of direct and indirect effects,
- Of these 25, 10 watersheds encompass three areas of concentrated motorized travel on the Forest. These 10 watersheds are the principal focus of the CWE analysis.

The three concentrated use areas are the Deer Creek, Hull Creek and Moore Creek areas as shown in Table 3.10-2. The four watersheds in the Deer Creek area are contiguous as are the five watersheds in the Hull Creek areaThese 10 concentrated use watersheds account for 75% of the routes in hydrologically sensitive areas with the other 15 watersheds accounting for the remainder (see Figure 3.10-1).

Table 3.10-2 Principal Areas of Concentrated Vehicle Use on Unauthorized Routes

Area Name	Ranger District and General Location	Watershed Name	
		HUC 5	HUC 7
Deer Creek	Mi-Wok – 5 miles north of Twain Harte	South Fork Stanislaus River	Deer Creek
			Lyons Reservoir-South Fork Stanislaus River
			Fraser Flat-South Fork Stanislaus River
		Lower Middle Fork Stanislaus River	Upper Rose Creek
Hull Creek	Mi-Wok – 8 miles east of Twain Harte	Clavey River	Hull Creek
			Main Stem West Clavey River
			Trout Creek
			Two Mile Creek
		North Fork Tuolumne River	Wrights Creek
Moore Creek	Groveland – 8 miles east of Groveland	North Fork Merced River	Moore Creek

Motorized Routes within Watersheds

HUC Level 4 and HUC Level 5 Watersheds

Approximately 180 miles, out of 252 miles of unauthorized routes, are proposed for addition to the NFTS. These 252 miles comprise the existing condition of unauthorized motorized travel on the Forest. This is about 11% of the 2,260 miles of NFTS routes presently available for motorized travel forestwide.

These 252 miles lie within all four HUC Level 4 watersheds on the Forest and are distributed among 11 of the Forest's 22 HUC Level 5 watersheds. No routes are proposed for addition on the Summit Ranger District.

At present, cross country motorized travel is not prohibited and only limited seasonal use restrictions exist (see Table 2.02-7). The period of motorized travel usually occurs in relation to weather conditions. Lower elevation sites, such as the Deer and Moore Creek concentrated use areas, are used mostly in fall, winter and spring since summers are generally too hot and dusty. Mid elevation sites, such as the Hull Creek concentrated use area, are often used spring through fall since summer temperatures are not too hot. Higher elevation areas are usually not accessible in winter due to snow.

Of the 2,260 miles of NFTS routes open for motorized travel, changes are proposed on about 620 miles. These changes consist mostly of altering the vehicle class that may use an existing route. A lesser amount of this route mileage is a mix of opening closed routes and closing open routes. These changes occur in most all HUC Level 5 watersheds since they include routes on the Summit Ranger District.

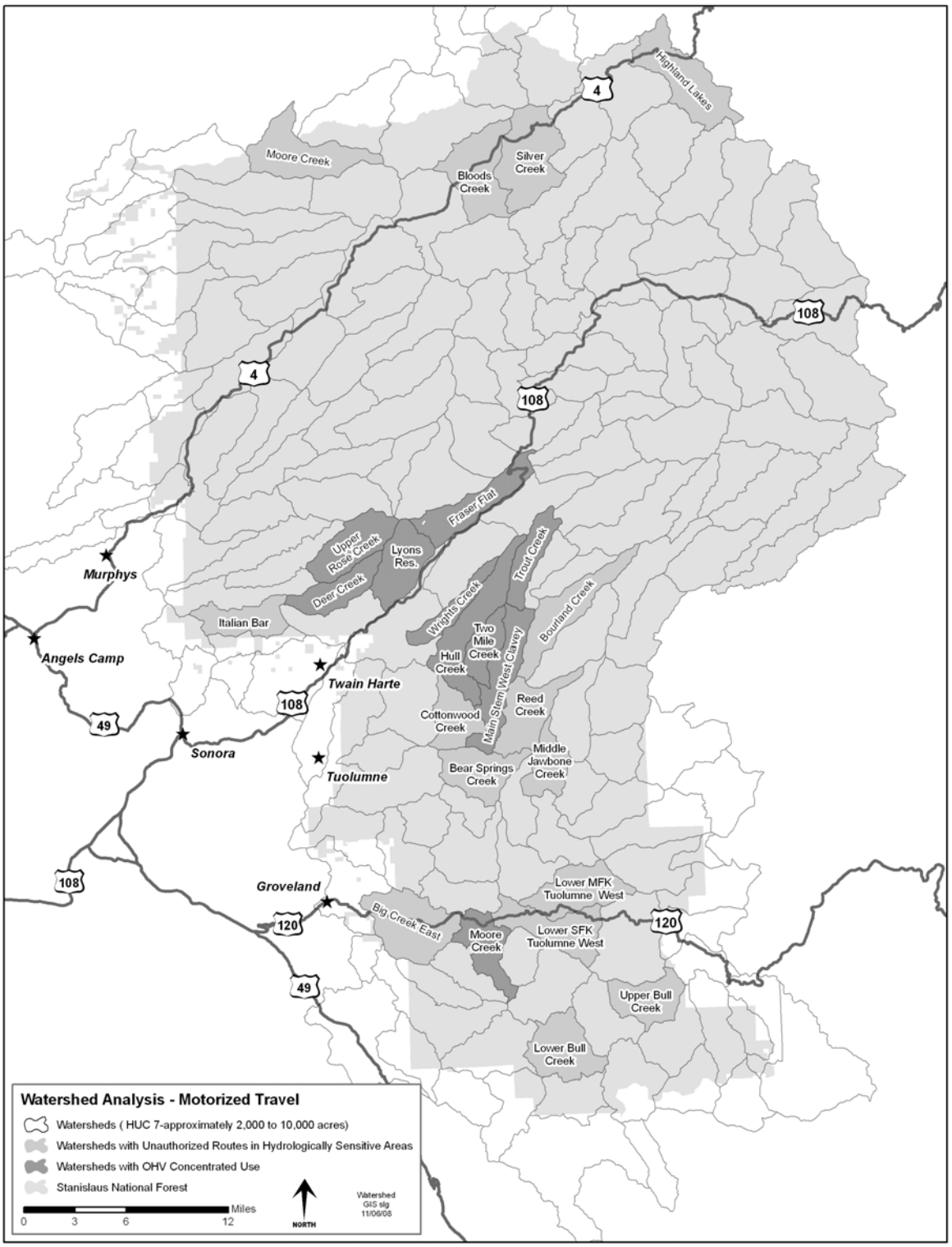

Figure 3.10-1 Distribution of Off-Highway Motorized Travel in HUC Level 7 Watersheds

HUC Level 7 Watersheds

Routes are proposed for addition to the NFTS in 88 of the Forest's HUC Level 7 watersheds. Routes within hydrologically sensitive areas (HSA) occur in 25 of these watersheds. Many of the proposed

routes in the 88 watersheds run along ridges, on upper slopes without stream courses, or are away from water as "hill climbs" or dead-end segments off NFTS routes. Mid and lower slope routes most often cross or closely run along streams for short distances. These are considered hydrologically connected segments (HCS), a subset of routes in hydrologically sensitive areas. Hydrologically connected segments are those route portions that drain water and sediment directly to a watercourse rather than drain off onto the forest floor where sediment does not reach water. Some of these hydrologically connected segments occur on dispersed campsite access routes, usually going a short distance off NFTS routes. Hydrologically connected segments average about 11% of the length of routes in hydrologically sensitive areas. About 70% of the hydrologically connected segments occur on ephemeral and intermittent streams with the remainder on small perennial streams.

Across the 25 HUC Level 7 watersheds, 75 routes and 41.02 miles are proposed for addition to the NFTS in hydrologically sensitive areas, as shown in Table 3.10-3. The range is 1-15 routes per watershed which average about 6,000 acres, with an average of 3 per watershed. Route density is very low, an average of 0.18 miles per square mile with a range 0.01 to 0.96.

Table 3.10-3 Additions to the NFTS: Hydrologically Sensitive Areas (Watersheds)

HUC 4	HUC 5	HUC 7	Ranger District	Routes in Hydrologically Sensitive Areas	
				Number	Miles
Mokelumne River	Lower North Fork Mokelumne River	Moore Creek-North Fork Mokelumne River	Calaveras	1	0.31
	Upper North Fork Mokelumne River	Highland Lakes-Headwaters Upper NFK Mokelumne River	Calaveras	1	0.10
Stanislaus River	North Fork Stanislaus River	Bloods Creek-Upper North Fork Stanislaus River	Calaveras	2	2.13
		Silver Creek-Upper North Fork Stanislaus River	Calaveras	2	0.29
	Lower Middle Fork Stanislaus River	Upper Rose Creek	Mi-Wok	3	3.36
	South Fork Stanislaus River	Fraser Flat-Lower South Fork Stanislaus River	Mi-Wok	2	0.45
		Lyons Reservoir- Lower South Fork Stanislaus River	Mi-Wok	4	2.59
		Italian Bar-Lower South Fork Stanislaus River	Mi-Wok	3	0.29
		Deer Cr	Mi-Wok	15	8.24
Tuolumne River	North Fork Tuolumne River	Wrights Creek	Mi-Wok	5	1.04
	Clavey River	Hull Creek	Mi-Wok	6	2.26
		Trout Creek	Mi-Wok	5	3.25
		Two Mile Creek	Mi-Wok	3	3.72
		Cottonwood Creek	Mi-Wok	2	0.45
		Main Stem West Clavey River	Mi-Wok	1	3.65
		Bourland Creek	Mi-Wok	2	0.07
		Reed Creek	Groveland	2	0.42
		Bear Springs-Lower Clavey River	Groveland	1	0.13
	Middle Fork Tuolumne River	Lower Middle Fork Tuolumne River West	Groveland	1	0.31
	South Fork Tuolumne River	Lower South Fork Tuolumne River West	Groveland	1	0.94
	Tuolumne River- Big Creek	Big Creek East	Groveland	4	3.01
		Middle Jawbone Creek	Groveland	1	0.07
Merced River	North Fork Merced River	Moore Creek-Upper North Fork Merced River	Groveland	8	3.86
		Lower Bull Creek	Groveland	1	0.05
		Upper Bull Creek	Groveland	1	0.03
			total	**75**	**41.02**

No hydrologically sensitive area information exists for the 72 miles of existing unauthorized routes that are not proposed for addition since they will not be maintained. However, they are accounted for in the cumulative watershed effects analysis since they represent an existing watershed disturbance.

Of the 178 hydrologically connected route segments inventoried for this analysis, 93% (165) are less than 0.10 miles (about 500 feet) in length, and most are less than half that length. Route gradient of these segments is dominantly gentle to moderate – 128 segments are less than 10%, with 90 of those segments less than 5%Thirty four segments are between 10-15% with the remainder mostly 15-20%.

Most of the segments were found to be in acceptable condition (routine maintenance will minimize stream sedimentation) but 23 are proposed for site specific mitigation to minimize sedimentation. Mitigation typically includes installation of drain dips and/or trail hardening to prevent or minimize mechanical erosion caused by motorized vehicles. Mitigation also includes wet season closure zones intended to minimize trail damage and stream sedimentation that can occur from wet weather use. Nine routes are not recommended for addition to the NFTS because the water resource problem cannot be practicably mitigated.

Route gradients that are steepest usually occur outside hydrologically connected sites, and are typically greatest on “hill climb” sections of routes. Gradient is an important corollary with poorer condition of routes as noted in the Soil Resource Report.

While sedimentation does occur from the hydrologically connected segments of unauthorized routes in hydrologically sensitive areas, it should be considered in context with the existing NFTS. The 252 miles of unauthorized routes are generally much narrower than NFTS routes, and only about 10% of the NFTS mileage on the Forest. Motorcycle routes are about 3 feet wide, ATV routes are about 5 feet wide, and other unauthorized routes that accommodate high clearance vehicles are typically 10-12 feet wide. Most of the 2,260 miles of NFTS roads are 15-25 feet wide or wider, and though some are gravel or paved a very high percentage remain native surfaced like unauthorized routes. While unit-area erosion and sedimentation in hydrologically connected segments can be higher on OHV routes than on Forest roads (Welsh 2008), OHV routes are likely to be a smaller overall sediment producer in roaded watersheds since total surface area of roads is usually greater. This is the case in the Stanislaus National Forest motorized travel management analysis area where NFTS road density (miles per square mile) exceeds that of unauthorized routes, often substantially.

Water Resources Condition

Water Quality Management Framework

Water quality on the Forest is principally managed through the Water Quality Control Plan (Basin Plan) of the California Regional Water Quality Control Board, Central Valley Region (CVRWQCB 1998). This plan establishes Beneficial Uses of Water and describes Water Quality Objectives for meeting beneficial uses.

Beneficial Uses of Water

All four of the HUC Level 5 watersheds on the Forest (Mokelumne, Stanislaus, Tuolumne and Merced Rivers) have established beneficial uses of water applicable to the additions to the NFTS and changes in vehicle class in this analysis. These uses are municipal and domestic supply, contact and non-contact recreation, warm and cold water freshwater habitat, and wildlife habitat.

Of the municipal and domestic supply beneficial uses, one of the most important regarding effects of motorized travel management occurs in the South Fork of the Stanislaus River. Lyons Reservoir serves as the collection and distribution point that serves water to as much as 80% of the population of Tuolumne County. Water is diverted from Lyons Reservoir into a broad distribution system that has numerous water treatment plants downstream of the Forest prior to consumptive use. Other large

reservoirs downstream of the Forest (New Melones on the Stanislaus River and New Don Pedro on the Tuolumne River) store water for some municipal and domestic use in the San Joaquin Valley.

Beneficial uses relevant to humans and aquatic wildlife within the Forest are contact and non-contact recreation (e.g., swimming, angling), freshwater habitat (cold and warm water fisheries), and wildlife (amphibian and aquatic reptile species). All of the streams in the watersheds where routes are proposed for addition to the NFTS have these beneficial uses.

Water Quality Objectives

Water quality objectives are limits of constituents in water that are intended to provide reasonable protection of beneficial uses of water. The Basin Plan contains objectives for numerous water quality constituents, or parameters. The water quality parameter most likely to be affected by the proposed action is sediment, as a result of erosion that occurs on unauthorized routes near water. The measure of the water quality objective for this pollutant is that sediment "…shall not be altered so as to cause nuisance or adversely affect beneficial uses." The focus of sediment evaluation in this project is streambed sediment in pools – natural areas of deposition in streams. Pool tail surface fine sediment and pool bed sediment are relevant to erosion from roads and trails.

Water temperature is another parameter considered relevant to this project. It can be elevated by openings along streams, including those created by roads and trails. The measure of this water quality objective is that water temperature "…shall not be altered unless it…does not adversely affect beneficial uses, and…at no time or place be increased more than 5 degrees F above natural receiving water temperature."

Petrochemical products in water (e.g., oil or grease) are also considered relevant to this project since they have the potential to cause nuisance or adversely affect beneficial uses. These pollutants can be produced as a byproduct of motorized vehicle use.

Water Quality Condition

HUC Level 4 Watersheds

These are the four major rivers on the Stanislaus National Forest. The two principal rivers, the Stanislaus and the Tuolumne, occupy much more land on the Forest than the Mokelumne on the north and the Merced on the south. They also contain most of the routes proposed for addition to the NFTS as well as changes in vehicle use on the existing NFTS.

All four of these large watersheds are managed for beneficial water resources, primarily off the Forest. All have very large reservoirs in the Sierra foothills downstream of the Forest and infrastructure that produces hydroelectric power, supplies water for irrigation, domestic, municipal and other uses, and provides recreational opportunities.

Water quality meets beneficial uses of water at this large watershed scale. No impaired waters exist on the Forest. The Environmental Protection Agency lists such waters as a requirement of Section 303d of the Federal Clean Water Act. None of the four major rivers on the Stanislaus National Forest are listed.

HUC Level 5 Watersheds

The 11 principal HUC Level 5 watersheds in this analysis will be described in groups with similar geographic and/or motorized travel characteristics. HUC Level 7 watersheds within each HUC Level 5 group will be discussed as applicable.

South Fork Stanislaus River and Lower Middle Fork Stanislaus River

These contiguous watersheds both drain into the 2.4 million acre foot New Melones Reservoir immediately downstream of the Forest. The South Fork headwaters originate in the Emigrant Wilderness at about 9,600 feet. The Lower Middle Fork watershed begins at the confluence of the Clark and Upper Middle Forks of the Stanislaus River; its uppermost elevation is slightly above 9,000 feet. Both watersheds are dominated by mixed conifer forests although the upper portions reach into the true fir zone and the lowest elevations include a pine-oak mix. The South Fork is the principal recreation watershed on the Stanislaus National Forest. It includes Pinecrest Lake and the communities of Pinecrest and Strawberry, and access to the nearby Dodge Ridge Ski Area. It also includes Lyons Reservoir which, along with Pinecrest Lake, provides fishing and other recreational activities. These watersheds also have the most off-highway vehicle recreation on the Forest. Herring Creek, a South Fork tributary above Strawberry, has several authorized trails, and the Deer Creek concentrated use area has most of its unauthorized trails in the South Fork with some others in the Upper Rose Creek HUC Level 7 watershed within the Lower Middle Fork. The Deer Creek concentrated use area contains 24 of the 75 segments with routes in hydrologically sensitive areas considered in this analysis.

The South Fork water resource is regulated by the Spring Gap-Stanislaus hydroelectric project operated by Pacific Gas and Electric Company. It consists of dams on Pinecrest Lake and Lyons Reservoir and a diversion from the South Fork to the Middle Fork Stanislaus River for hydropower production near Spring Gap. Lyons Reservoir serves as the point of diversion for the Tuolumne Main Canal which distributes municipal and domestic water to about 80% of the population of Tuolumne County. Along the canal a small diversion provides water for hydro power at the Phoenix powerhouse.

The Lower Middle Fork water resource is also regulated for hydropower and other uses downstream of the Forest. This river holds Donnells and Beardsley Reservoirs as well as hydropower plants near each. These are both operated by the Oakdale and South San Joaquin Irrigation Districts. These facilities along with Tulloch Reservoir downstream of the Forest are known as the Tri-Dam Project.

Water Quality is very good in the South Fork of the Stanislaus River as documented in recent studies by PG&E (Pacific Gas and Electric Company 2002).

For the South Fork between Pinecrest Lake and Lyons Reservoir, PG&E conducted water sampling of numerous water quality parameters in 2000 and 2001 as required for relicensing of the Spring Gap-Stanislaus hydroelectric project (FERC No. 2130). This water quality information is applicable to the Fraser Flat and Lyons Reservoir HUC Level 7 watersheds that lie between Pinecrest Lake and Lyons Reservoir.

Overall water quality is consistent with the water quality objectives of the Basin Plan of the Central Valley Regional Water Quality Control Board (Pacific Gas and Electric, 2002). More specifically, suspended sediment levels were found to be very low as were total settleable solids, indicating little deposition of streambed sediment. Pinecrest Lake likely traps some of the settleable material that may otherwise move downstream. Forest watershed staff observations concur with this as minimal streambed sedimentation appears present. In addition, PG&E sampled benthic macroinvertebrate (BMI) communities as an indicator of water quality and habitat condition. The sampling from the project reaches indicates favorable water quality as demonstrated by a community of taxa that are intolerant to water degradation, including sedimentation.

Water temperature in the South Fork is not elevated above normal. It may be somewhat below normal at times during summer months since water released from Pinecrest Lake from near the bottom of the dam is cooler than surface water. No oil or grease was detected in the South Fork during PG&E's studies.

Two other HUC Level 7 watersheds have routes proposed for addition to the NFTS in the South Fork, both downstream of Lyons Reservoir. Deer Creek, the main watershed in the Deer Creek concentrated use area for off-highway motorized travel, is an unregulated tributary of the South Fork. It is a small perennial stream although a mid-watershed segment, running through a low gradient alluvial valley, often goes dry by late summer. Though no quantitative water quality data for Deer Creek exists, Forest watershed staff have observed the creek in 2007 and 2008 in relation to sediment deposition in stream pools. Deposition is relatively low even with the watershed being a principal off-highway vehicle riding area. It is estimated that pool sedimentation is less than 20%.

The other HUC Level 7 watershed in the South Fork with routes proposed is a segment of the main channel called Italian Bar. Little quantitative data are available for this watershed although data from a field survey in 2001 to conduct benthic macroinvertebrate sampling described some applicable conditions of the river. It noted that streambed sediment was minor. Also, data recorded during the streambed particle count showed no fine sediment (< 2 mm) at any of the 100 sample points, and the dominant particle size classes were boulder and cobble with lesser amounts of gravel.

The portion of the Lower Middle Fork of the Stanislaus applicable to this project is Upper Rose Creek. This small perennial tributary drains into New Melones Reservoir from headwaters near Crandall Peak at about 5,400 feet. Though no recent quantitative water quality data are available, staff observations and benthic macroinvertebrate data from 1996-1998 provide an indication of stream health. About two miles downstream of the 1992 Ruby fire, samples were taken for three years and showed metric ranking scores suitable for recommending it as a reference site, meaning conditions were suitable as a benchmark for comparison with other streams (Pacific Gas and Electric, 2002). Even only a few years after the upstream fire, the Rose Creek benthic community was in very good condition. Recent watershed staff observations indicate that portions of Upper Rose Creek in the Ruby fire area have more streambed sediment than desired but that the trout population appears to be stable indicating that it is not adversely affecting this beneficial use of water.

Clavey River and North Fork Tuolumne River

These contiguous watersheds are major tributaries of the main Tuolumne River, the largest watershed in the San Joaquin river system. The Clavey and North Fork are both free-flowing rivers. The Clavey and North Fork headwaters are slightly above 9,000 and 8,000 feet respectively. Both watersheds are heavily forested, with true fir at the higher elevations, mixed conifer in mid elevations and a pine-oak mix in the lowest portions of the watersheds. The North Fork contains developed recreation at the upper elevations (Dodge Ridge Ski Area and part of Pinecrest), and organization camps and off-highway vehicle use at mid elevations. In the low to mid-elevations of the North Fork thousands of acres of timber plantations occupy the landscape as a result of reforestation following the 150,000 acre Stanislaus Complex Fire of 1987.

The Clavey River is unique in the Sierra Nevada. It is one of the longest free flowing rivers remaining in the mountain range with 47 miles of undammed waters. It is a proposed Wild and Scenic River based on numerous outstandingly remarkable values including a unique native assemblage of fish (USDA 1991c). It is also designated as a Critical Aquatic Refuge (CAR) in the Forest Plan Direction (USDA 2005a). At 100,000 acres, the Clavey River is the largest CAR in the Pacific Southwest Region of the Forest Service. The river was designated California's first Wild Trout Stream in 1971 (USDA 1985). Recreational activity in the Clavey River watershed consists mostly of dispersed uses; other than the Dodge Ridge Ski Area only one developed campground is in the watershed. Dispersed camping, hiking in the upper part of the watershed in the Emigrant Wilderness and hunting in the fall are principal activities. The most widespread recreation activity is off-highway motorized travel in the mid elevation portion of the watershed. Four of the five HUC Level 7 watersheds comprising the Hull Creek concentrated use area are within the Clavey River. The Hull Creek concentrated use area

contains 20 of the 75 segments with routes in hydrologically sensitive areas considered in this analysis.

Water quality in the Clavey River and North Fork Tuolumne River is excellent based on recent detailed surveys as part of a watershed assessment conducted for the Clavey River (CREP 2008) and stream surveys in most of the North Fork Tuolumne River. This includes Wrights Creek, one of the HUC Level 7 watersheds in the North Fork that is part of and contiguous with the Hull Creek concentrated use area for off-highway motorized travel.

In the Clavey River, stream surveys were conducted on all HUC Level 7 watersheds using the Stanislaus National Forest StreamScape Inventory (SSI) protocol (Frazier et al 2006b). SSI consists of measuring 19 physical and biological attributes continuously along each stream surveyed. In addition, benthic macroinvertebrates were sampled at 14 sites in the Clavey River as an indicator of water quality and aquatic habitat condition. Results are summarized in Table 3.10-4 for the HUC Level 7 watersheds in which routes are proposed in the Clavey River watershed as well as Wrights Creek in the North Fork Tuolumne River.

In the Clavey Watershed Assessment (CREP 2008) the desired condition (DC) measures for the sediment attributes are 20 and 10% respectively. For benthic macroinvertebrates the DC measure is > 0.9. The Clavey WA does not contain water temperature or oil and grease desired conditions; however, these parameters can be related to their respective water quality objective in the Basin Plan.

Sediment attributes all exceed desired condition except for Cottonwood Creek, which is slightly higher but limiting to the trout fishery. Overall, very little streambed sediment exists in these HUC Level and watersheds. BMI data were evaluated using the River Invertebrate Prediction and Classification System (RIVPACS) (Hawkins et al 2000). All streams (including Cottonwood Creek) exceed the BMI desired condition measure in the Clavey River Watershed Assessment. Numeric values very close to 1 indicate reference condition. No impairment of water quality is evident.

Water temperature is within the range of variability for these watersheds. BMI data indicates this as does the presence of viable populations of fish and other aquatic species. Water temperature does not appear elevated above normal range in these streams.

No oil or grease or other petrochemical products were detected during stream surveys. The survey protocol includes making observations for such pollutants.

Table 3.10-4 Water Quality Summary for the Clavey and North Fork Tuolumne Rivers

HUC 7 Watershed	Pool Tail Surface Fine Sediment (%)	Pool Bed Surface Fine Sediment (% of pool length)	Benthic Macroinvertebrates (Observed v. Expected Taxa)	Water Temperature (Degrees C)	Oil and Grease
Wrights Creek	8	1	NA	12	Not Detected
Two Mile Creek	8	1	0.991	NA	Not Detected
Trout Creek	14	6	1.102	17	Not Detected
Hull Creek	15	5	1.106	16	Not Detected
Main Stem West Clavey River	NA	NA	0.927	NA	NA
Reed Creek	1	8	1.021	14	Not Detected
Bourland Creek	2	7	1.166	17	Not Detected
Cottonwood Creek	32	36	1.166	12	Not Detected
Bear Springs Creek-Lower Clavey River	NA	NA	0.932	NA	NA

Notes: NA means data not available. For the Main Stem and Bear Springs watersheds only BMI data were collected. Temperature data for Two Mile Creek is not available due to thermograph malfunction.

North Fork Merced River

The North Fork is a free flowing tributary of the Merced River that runs along the southern boundary of the Forest. The North Fork headwaters is at about 6,000 feet on Pilot Ridge and drops rapidly to elevations of 3,000 feet or lower before running off the Forest and into the main Merced River. Vegetation consists of mixed conifer, pine-oak and chaparral. Much of the area is in timber plantations following reforestation after the Stanislaus Complex Fire in 1987. The North Fork consists of five HUC Level 7 tributaries that all join just above Forest road 2S05, at which point they begin to carve into the landscape and form a deep canyon as it heads south toward the Merced River.

The five tributaries are mapped as perennial streams. However, upper portions are often dry by fall, and in very dry years most sections of these streams may be nearly dry. At this relatively low elevation fully perennial streams are not common.

The North Fork has limited recreation activity. Camping and off-highway motorized travel, the main activities, occur from fall through spring as this area is accessible year round. Hot summers at the 3,000 foot elevation limit use. Most of the OHV use is in the Moore Creek HUC Level 7 watershed, the center of the Moore Creek concentrated use area previously described. Several contiguous HUC Level 5 watersheds have similar activity but to a lesser degree. The Moore Creek concentrated use area contains 8 of the 75 segments with routes in hydrologically sensitive areas considered in this analysis.

Water Quality in the North Fork appears good based on staff observations and some stream surveys in the area. Estimates of pool tail and pool bed sediment percentages in 2008 at several sample sites in Moore Creek plus Deer Lick Creek, Jordan Creek and the Headwaters of the North Fork were all less than 10 %. While the latter three HUC Level 7 watersheds have no routes proposed for addition they still provide an insight regarding water quality in the Moore Creek area. No stream temperature or oil and grease data are available.

Two short hydrologically connected routes proposed for addition to the NFTS occur in Bull Creek, one in lower and one in upper Bull Creek. Staff observations were made in Bull Creek reaches near these routes and stream condition appears acceptable to support beneficial uses.

Middle and South Fork Tuolumne River and Tuolumne River-Big Creek

These three contiguous watersheds represent a southern group of dispersed off-highway motorized travel activity. The Middle and South Fork are free flowing tributaries of the main Tuolumne River, and both originate in Yosemite National Park east of the Forest. The Tuolumne River-Big Creek watershed incorporates the entire main channel of the Tuolumne River on the Forest as well as its Big Creek tributary that begins near Buck Meadows and enters the river downstream of Pine Mountain Lake near the town of Groveland. Most of the land in these watersheds is below 5,000 feet. Mixed conifer forests are common with pine-oak and some chaparral in the lower portions. Oak grasslands occupy some of the lowest elevations in the Tuolumne River Canyon.

Recreational activity in these watersheds is mostly dispersed camping and off-highway motorized travel. Use is more scattered and less intense than in the nearby Moore Creek area.

Water Quality in these watersheds is very good based on recent stream surveys in the Middle and South Forks of the Tuolumne River and staff observations at several sites in Big Creek. The streams shown in Table 3.10-5 were surveyed in 2006, 2007 and 2008 respectively. One hydrologically connected route is proposed in each of the Middle and South Fork West HUC Level 7 watersheds, and four routes proposed for the Big Creek East HUC Level 7. One hydrologically connected route is proposed for addition to the NFTS in Middle Jawbone Creek HUC Level 7 watershed. Staff observations indicate suitable stream condition on the Jawbone Creek tributary where this very short route exists.

Table 3.10-5 Water Quality Summary for the Middle and South Fork Tuolumne Rivers

HUC 7 Watershed	Pool Tail Surface Fine Sediment (%)	Pool Bed Surface Fine Sediment (% of pool length)	Benthic Macroinvertebrates (Observed v. Expected Taxa)	Water Temperature (Degrees C)	Oil and Grease
Lower Middle Fork Tuolumne River West	8	9	NA	8	Not Detected
Lower South Fork Tuolumne River West	1	3	NA	18	Not Detected
Big Creek East	<10 (est.)	<10 (est.)	NA	NA	Not Detected

Notes: BMI data were not collected. Water temperature for the Lower Middle Fork is low because SSI was conducted in the fall. Pool sediment was estimated at sample points along Big Creek.

Streambed sediment is very low in these streams. Water temperature is within the range of variability and does not appear to be elevated above normal.

No oil or grease or other petrochemical products were detected during stream surveys. The survey protocol includes making observations for such pollutants.

Lower and Upper North Fork Mokelumne River and North Fork Stanislaus River

These three HUC Level 5 watersheds are along the state highway 4 corridor near the northern edge of the Forest. All range from mid to high elevation on the Forest with mixed conifer and true fir vegetation types. Portions of the Mokelumne River watersheds extend north to the Eldorado National Forest.

Recreational use in these watersheds includes developed and dispersed camping in summer and winter sports activities since the higher elevations have downhill and cross country ski areas. Lake Alpine in the Silver Creek HUC Level 7 watershed is the hub of summer developed recreation use along upper Highway 4. Motorized off-highway travel is mostly a summer activity in these three HUC Level 5 watersheds and is relatively low intensity and well dispersed. These HUC Level 5 watersheds contain only 5 routes proposed for addition to the NFTS in hydrologically sensitive areas.

Observations by Forest watershed staff over the past several years indicate water quality is very good. Minimal instream sediment exists, water temperature is suitable for beneficial uses and no apparent petrochemical issues are present. Only five routes are scattered among the four HUC Level 7 watersheds here, and little intensive forest management that would potentially contribute to water quality problems. Riparian vegetation along Moore, Silver and Bloods creeks as well as the headwaters of the North Fork Mokelumne River is abundant and the streams are stable at the HUC Level 7 scale.

Environmental Consequences

Direct and Indirect Effects of All Alternatives

The following two tables display data that will be used to describe direct and indirect effects of all alternatives.

Table 3.10-6 shows proposed additions to the NFTS in hydrologically sensitive areas (HSA) as well as the hydrologically connected segments (HCS) for the action alternatives.

Table 3.10-6 Additions to the NFTS: Hydrologically Sensitive Areas (action alternatives)

Watershed Name		Additions in HSA and length of HCS within HSA (miles)						
HUC 5	**HUC 7** (Ranger District)	**# of routes**	**Alternatives**					
			1		**4**		**5**	
			HSA	**HCS**	**HSA**	**HCS**	**HSA**	**HCS**
Upper North Fork Mokelumne River	Moore Creek-North Fork Mokelumne River (Calaveras)	1	0.31	0.30	0.31	0.30	0	0
Upper North Fork Mokelumne River	Highland Lakes-Headwaters Upper North Fork Mokelumne River (Calaveras)	1	0.10	0.01	0.10	0.01	0.10	0.01
North Fork Stanislaus River	Bloods Creek-Upper North Fork Stanislaus River (Calaveras)	1	2.13	0.31	2.13	0.31	0	0
	Silver Creek-Upper North Fork Stanislaus River (Calaveras)	2	0.29	0.09	0.29	0.09	0.29	0.09
Lower Middle Fork Stanislaus River	Upper Rose Creek (Mi-Wok)	3	3.36	0.21	3.36	0.21	2.05	0.01
South Fork Stanislaus River	Fraser Flat-Lower South Fork Stanislaus River (Mi-Wok)	2	0.45	0.45	0.45	0.45	0	0
	Lyons Reservoir- Lower South Fork Stanislaus River (Mi-Wok)	4	.21	0.24	2.59	0.45	2.06	0.04
	Deer Creek (Mi-Wok)	15	7.87	0.38	8.24	0.43	1.47	0.04
	Italian Bar-Lower South Fork Stanislaus River (Mi-Wok)	3	0.29	0.16	0.29	0.16	0	0
North Fork Tuolumne River	Wrights Creek Mi-Wok)	5	1.04	0.25	1.04	0.25	0.87	0.22
Clavey River	Hull Creek Mi-Wok)	6	1.77	0.17	2.26	0.59	0.08	0.01
	Trout Creek (Mi-Wok)	5	2.72	0.25	3.25	0.29	0	0
	Two Mile Creek (Mi-Wok)	3	2.93	0.11	3.72	0.46	0	0
	Main Stem West Clavey River (Mi-Wok)	1	2.82	0.13	3.65	0.13	0	0
	Cottonwood Creek (Mi-Wok)	2	0.45	0.26	0.45	0.26	0	0
	Bourland Creek Mi-Wok)	2	0.07	0.07	0.07	0.07	0	0
	Reed Creek (Groveland)	2	0.42	0.36	0.42	0.36	0	0
	Bear Springs-Lower Clavey River (Groveland)	1	0.13	0.12	0.13	0.12	0	0
Middle Fork Tuolumne River	Lower Middle Fork Tuolumne River West (Groveland)	1	0	0	0.31	0.10	0	0
South Fork Tuolumne River	Lower South Fork Tuolumne River West (Groveland)	1	0.94	0.02	0.94	0.02	0	0
Tuolumne River- Big Creek	Big Creek East (Groveland)	4	3.01	0.27	3.01	0.27	0	0
	Middle Jawbone Creek (Groveland)	1	0.07	0.04	0.07	0.04	0	0
North Fork Merced River	Moore Creek-Upper North Fork Merced River (Groveland)	8	3.86	0.41	3.86	0.41	1.00	0.12
	Lower Bull Creek (Groveland)	1	0.05	0.02	0.05	0.02	0	0
	Upper Bull Creek (Groveland)	1	0.03	0.02	0.03	0.02	0	0
total		**75**	**37.32**	**4.65**	**41.02**	**5.82**	**7.93**	**0.55**

Table 3.10-7 shows that the routes proposed in hydrologically sensitive areas (HSA) are a small percentage of the total additions to the NFTS proposed at the Forest scale. For example, Alternative 1 adds about 157 miles to the NFTS, of which about 37 miles, or 24%, are in HSA. Hydrologically connected segments are a much smaller percentage of forestwide additions to the NFTS in Alternative 1 – about 3%. Alternatives 2 and 3 do not include additions to the NFTS.

Table 3.10-7 Additions to the NFTS and Existing Condition

Existing Condition	Alternatives (miles)				
	1	2	3	4	5
251.80	157.39	0.00	0.00	181.72	31.51

Finally, for context among the alternatives, 24 of the 25 HUC Level 7 watersheds with routes in hydrologically sensitive areas occur in Alternative 1, all 25 are in Alternative 4 and eight are in Alternative 5.

Cumulative Effects of All Alternatives

The CWE analysis considered the 88 HUC 7 watersheds on the Forest that contain one or more proposed additions to the NFTS. Of these, the largest concentration of use occurs in the 10 watersheds that coincide with the three principal off-highway vehicle activity areas on the Forest. These concentrated use watersheds are the locations in which detailed CWE analysis was conducted. The summary of cumulative watershed effects is shown in Table 3.10-8, and more detailed information is in the project record. The table shows the equivalent roaded acres (ERA) for each watershed, the portion of the ERA contributed by the additions to the NFTS and the threshold of concern (TOC) for each watershed.

The 78 remaining "dispersed area" watersheds have a low amount of existing ERA and a very low route contribution to ERA. Detailed CWE calculations were not performed on these watersheds based on professional knowledge of cumulative disturbances in each and correlated with recent CWE analysis conducted in some of them for other projects. The ERA in 68 of these watersheds is estimated to be less than 50% of the TOC, some as low as 25%. Ten of these watersheds are estimated to be between 50-75% of the TOC. None of the dispersed area watersheds would approach the TOC even if all routes proposed for addition to the NFTS were selected. The proposed addition route mileage is low enough in each watershed that the disturbed acreage would increase no more than about 10 acres, or 0.15% ERA, in watersheds that average approximately 6,000 acres in size.

Table 3.10-8 Summary of Cumulative Watershed Effects

Watershed Name		ERA Category	ERA (%)					
			Alternative					TOC (%)
HUC 5	HUC 7		1	2	3	4	5	
South Fork Stanislaus River	Deer Creek	HUC 7 Watershed	3.30	3.87	2.80	3.35	2.86	12-14
		Route Additions	0.12	0.56	0	0.14	0.01	
	Fraser Flat-Lower South Fork Stanislaus	HUC 7 Watershed	5.50	5.70	5.34	5.57	5.45	12-14
		Route Additions	0.06	0.18	0	0.10	0.03	
	Lyons Reservoir-Lower South Fork Stanislaus	HUC 7 Watershed	8.10	8.40	7.93	8.13	8.01	12-14
		Route Additions	0.05	0.25	0	0.06	0.02	
Lower Middle Fork Stanislaus River	Upper Rose Creek	HUC 7 Watershed	3.72	3.99	3.30	3.73	3.46	12-14
		Route Additions	0.11	0.37	0	0.10	0.04	
North Fork Tuolumne River	Wrights Creek	HUC 7 Watershed	3.78	3.98	3.36	3.78	3.41	12-14
		Route Additions	0.14	0.35	0	0.14	0.02	
Clavey River	Hull Creek	HUC 7 Watershed	6.11	6.35	5.80	6.17	5.83	12-14
		Route Additions	0.14	0.29	0	0.16	0.02	
	Main Stem West Clavey River	HUC 7 Watershed	2.75	2.91	2.59	2.77	2.59	12-14
		Route Additions	0.05	0.18	0	0.06	0	
	Trout Creek	HUC 7 Watershed	5.27	5.46	4.90	5.30	4.91	12-14
		Route Additions	0.16	0.31	0	0.17	0	
	Two Mile Creek	HUC 7 Watershed	4.42	4.92	3.96	4.68	3.97	12-14
		Route Additions	0.20	0.51	0	0.31	0	
North Fork Merced River	Moore Creek	HUC 7 Watershed	3.67	3.80	3.45	3.68	3.45	14-16
		Route Additions	0.09	0.20	0	0.10	0	

Notes: (1) HUC 7 ERA is for the maximum CWE year from 2010-2019; year varies by watershed: (2) no route additions occur in Alternative 2; however, for comparison with the other alternatives, values are shown that represent the existing condition of unauthorized routes combined with all other activities occurring or expected to occur in the watershed in the reasonably foreseeable future; and (3) route additions means the portion of the HUC 7 watershed ERA contributed by proposed route additions to the NFTS.

The two items are of most importance in this CWE analysis are (1) the total ERA which considers the effects of past, present and reasonably foreseeable future activities in the watershed and (2) the portion of the total ERA contributed by the proposed additions to the NFTS. The total ERA represents the cumulative disturbances in the watershed for comparison with the threshold of concern (TOC) to determine the risk of CWE. The ERA contributed by the additions to the NFTS is important because it shows its context with the total ERA for the watershed. These values can then be compared between alternatives and with the overall ERA values for the watershed.

Summary findings common to all alternatives in the 10 concentrated use watersheds are (1) the total ERA is well below the TOC, including the additions to the NFTS, (2) additions to the NFTS are a very small fraction of the total ERA, and (3) the ERA created by additions to the NFTS is less in the action alternatives (1, 4 and 5) than the existing watershed footprint (Alternative 2), thus reducing disturbance and the risk of cumulative effects.

Alternative 1 (Proposed Action)

DIRECT AND INDIRECT EFFECTS

The proposed action reduces direct and indirect effects compared with both the existing condition and Alternative 4, the alternative with the most mileage proposed for addition to the NFTS. Existing condition consists of unauthorized routes proposed for addition to the NFTS as well as unauthorized routes that exist but are not proposed for addition.

The length of routes that occur in hydrologically sensitive areas (e.g., Riparian Conservation Areas) decreases from 41.02 to 37.32 miles, or 10% as shown in Table 3.10-6. The erosional features that affect water quality along those routes – hydrologically connected segments – are reduced by 20%, from 5.82 to 4.65 miles. As a result, the route footprint, or disturbed watershed area, becomes less over time as the existing route mileage in hydrologically sensitive areas passively recovers (e.g., ground cover re-occupies the route – plant growth, pine needles, etc.). Existing stream sedimentation from the HCS sites is thus reduced as well.

Most watersheds have very little route mileage in hydrologically sensitive areas, and based on field surveys a very small portion of that is hydrologically connected; that is, 11.3% of the length of routes in the hydrologically sensitive areas are hydrologically connected. While the overall amount of hydrologically connected segments in the alternative is several miles, it is small in each of the HUC 7 watersheds.

Water quality effects from existing stream sedimentation will decrease over time since the routes not added to the NFTS will passively recover. The magnitude of this effect is expected to be minor since at present very little stream sedimentation exist. Based on detailed stream surveys and/or staff observations of the streams in these watersheds, pool sedimentation is very low, and where data exist from benthic macroinvertebrate sampling stream health is excellent.

Water temperature and petrochemical effects of vehicle use are negligible. Existing water temperature data in numerous streams in the project area indicate this parameter is suitable for all instream beneficial uses. No petrochemical effects were noted during recent stream surveys or observations. No oil or grease has been detected in any stream.

1. Cross Country Travel

This action will result in a minor reduction in stream sedimentation. Fewer miles of routes mean less potential stream sedimentation. Route reduction may, however, increase traffic on the routes added to the NFTS. However, this is expected to be a neutral effect since sedimentation will be reduced on trails not added as they heal over, and mitigation measures described below will reduce sedimentation from routes added to the NFTS.

2. Additions to the NFTS

Stream sedimentation will continue to be produced from the hydrologically connected segments of routes. However, the existing amount of sedimentation will be reduced on routes added to the NFTS by implementation of site-specific and area-wide maintenance and mitigation measures, as shown in Table 3.10-9. For maintenance, upkeep of existing features to minimize sedimentation (e.g., water bars, hardened crossings) will be performed as needed. For mitigation, drainage control features and trail hardening will be installed where needed to minimize stream sedimentation, and hardening or boardwalks will be installed in other wet areas (i.e., seeps and springs) to protect them from damage. In addition, seasonal closures will be implemented which will further reduce sedimentation presently caused by wet season use. The combination of mitigation and reduced sedimentation from elimination of a portion of existing unauthorized trails is expected to result in decreased water quality effects from motorized travel.

Table 3.10-9 Maintenance and Mitigation in Hydrologically Connected Segments

Activity	Number of routes		
	Alt. 1	Alt. 4	Alt. 5
Routine maintenance	46	52	10
Mitigation measures	20	23	5
Total number of routes	66	75	15

Some proposed routes are not recommended for addition to the NFTS (Table 3.10-10) since water quality effects cannot practicably be mitigated and inclusion would likely not be in compliance with water quality best management practices. These routes, if selected for addition to the NFTS, would result in continued sedimentation at present rates. While sedimentation from these routes is believed to be individually unacceptable, the effect at the stream reach scale would not be expected to impair water quality.

Table 3.10-10 Routes Not Recommended for Addition to the NFTS

Route	RD	MI	SYS	Alternative				
				1	2	3	4	5
16EV191	CAL	0.13	UNT	ATV			ATV	ATV
17EV192	GR	0.63	UNT	ALL			ALL	
1S1728	GR	0.47	UNT	SLO			SLO	
1S17M	GR	1.13	UNT	ATV			ATV	
1S1822C	GR	0.31	UNT				ALL	
2N1820	GR	0.34	UNT	ALL			ALL	
2S1804	GR	0.94	UNT	ATV			ATV	
16E182A	MW	0.19	UNT	ALL			ALL	
17EV297	MW	0.49	UNT				ATV	
18EV100	MW	0.08	UNT	ALL			ALL	
FR98704	MW	0.15	UNT	SLO			ALL	
		total (miles)		**4.06**	**0.00**	**0.00**	**4.86**	**0.13**

3. Changes to the Existing NFTS

Route closure or opening may have a minor effect on stream sedimentation but will be less in relation to additions to NFTS. Closed NFTS routes that are proposed to be opened are roads that were engineered to control drainage and erosion and are thus designed to minimize stream sedimentation. They are expected to receive maintenance when opened and will be subject to seasonal closure. Closure of NFTS roads will result in no maintenance but are expected to be “put to bed” before closure, meaning that erosion control measures would be taken to keep them from long term damage with the expectation they may be re-opened in the future. Changing the type of vehicle use is not expected to result in a noticeable impact on water quality since any impacts related to a vehicle type would be mitigated by drainage features and wet season closure.

CUMULATIVE WATERSHED EFFECTS

For this alternative, ERA values in the 10 concentrated use watersheds shown in Table 3.10-8 are based on consideration of the past, present and reasonably foreseeable future activities in the Cumulative Watershed Effects Analysis (project record). The activities that usually contribute most to ERA values are vegetation management and the NFTS. In addition, approximately 5 miles of motorized routes are expected to be constructed in the future to complete the motorized route system on the Forest. These routes are expected be constructed in six of the concentrated use watersheds within the next 10 years. Although they are not part of the proposed action, they were accounted for in the CWE analysis as a future activity. Another item accounted for is passive recovery of routes not added to the NFTS in the alternative. Passive recovery represents a slight reduction in the risk of cumulative effects over time since the route footprint decreases as the abandoned routes heal over.

The total ERA in the 10 concentrated use watersheds ranges from 2.75% to 8.10% of the total watershed area in these watersheds, which is 20% to 58 % of the TOC and thus represents a low risk of CWE. The additions to the NFTS account for less than 0.20% ERA in all of the watersheds, a very small fraction of the total ERA value. Alternative 1 results in a reduction of the watershed footprint, or disturbed area, thus reducing the risk of cumulative effects compared to the existing condition.

For each of the dispersed use watersheds, the total ERA in this alternative is estimated to be well below the TOC. The past, present and expected future management activity level is not anticipated to exceed, and is likely to be less than, that in the concentrated use watersheds based upon review of the list of activities in the Cumulative Effects Analysis list. The additions to the NFTS in these watersheds would account for even smaller fraction of the total ERA than in the concentrated use watersheds since the length of routes added is much less. The watershed footprint will be reduced compared with the existing condition, though to a smaller degree than in the concentrated use watersheds because the route addition mileage is much less.

Changes to the existing NFTS represent a neutral cumulative effect at the watershed scale since no change exist in the watershed disturbance acreage of these routes. In addition, the prohibition of cross country motorized travel on routes inventoried but not added to the NFTS in this alternative will reduce route proliferation.

Alternative 2 (No Action)

DIRECT AND INDIRECT EFFECTS

This alternative represents the existing condition of watershed disturbance. This footprint on the watersheds consists of all the inventoried unauthorized routes, approximately 252 miles. This alternative would result in perpetuation of the existing footprint.

1. Cross Country Travel

Without prohibition of cross country travel it is expected that route proliferation would occur over time, at a forestwide rate of 2.25 miles per year. For purposes of this analysis, it is expected that most if not all of the proliferation would occur in the concentrated use watersheds since these are the most popular areas for off highway motorized travel.

Unauthorized routes would continue to be used and increase as a result of this alternative. Thus, no reduction of stream sedimentation occurs as in the other alternatives. It would be expected to increase slightly over time as the unauthorized route system expands and likely includes additional hydrologically sensitive areas.

Even at the existing condition, based on stream inventories and observations, it appears that stream sedimentation from these routes is not degrading water quality at the HUC 7 level, and minimally if at all at the reach scale (i.e., downstream a certain distance from route crossings). The alternative is, however, likely not in compliance with water quality best management practices insofar as the routes

are not preventing or minimizing stream sedimentation to the extent practicable. Perpetuating cross country motorized travel does not meet the intent of the BMPs.

2. Additions to the NFTS

This alternative does not make any additions to the NFTS and thus no direct and indirect effects on the water resource.

3. Changes to the Existing NFTS

This alternative does not change the existing NFTS and thus no direct and indirect effects on the water resource.

CUMULATIVE WATERSHED EFFECTS

For Alternative 2, ERA values in the 10 concentrated use watersheds shown in Table 3.10-8 are based on the past, present and reasonably foreseeable future activities in the Cumulative Watershed Effects Analysis (project record). The activities that usually contribute most to ERA values are vegetation management and the NFTS. Although no routes will be added to the NFTS in Alternative 2, for purposes of evaluating CWE this alternative serves as the baseline, or existing condition, of the footprint of unauthorized routes. Footprint is the watershed disturbance acreage these routes represent. Forestwide, the footprint includes approximately 252 miles of unauthorized routes and trails that were inventoried for this project. This is approximately 72 miles greater than Alternative 4, the alternative with the most mileage of routes proposed for addition to the NFTS among the action alternatives. Alternative 2 also includes about 2.25 miles per year of expected route proliferation since this alternative would not prohibit motorized cross country travel. For purposes of the CWE analysis it is assumed that route proliferation will occur within the concentrated use watersheds and the mileage will occur evenly distributed among these watersheds. This alternative does not include new future route construction.

The total ERA in Alternative 2 ranges from 2.91% to 8.40% in the 10 concentrated use watersheds. This is 21% to 60 % of the TOC and thus represents a low risk of CWE. Alternative 2 does not reduce the watershed footprint, and given that route proliferation is anticipated, this alternative will slightly increase the risk of cumulative effects. The increase, however, will not cause the watershed ERAs to approach the threshold of concern since route proliferation raises the ERA in the alternatives less than 0.10%.

For each of the dispersed use watersheds, the total ERA in this alternative is estimated to be well below the TOC. The past, present and expected future management activity level is not anticipated to exceed, and is likely to be less than, that in the concentrated use watersheds based upon review of the list of activities in the Cumulative Effects Analysis list.

Alternative 3 (Cross Country Prohibited)

DIRECT AND INDIRECT EFFECTS

This alternative would allow all unauthorized routes described in Alternative 2 to immediately begin the passive recovery process. The short term watershed effect would be that no mitigation would occur on existing routes. Stream sedimentation at rates similar to present could be expected to occur for two to three years as routes naturally revegetate and become covered with forest floor litter (e.g., leaves, pine needles). Sedimentation would likely decrease at an accelerated rate after three years and not be noticeable after about 10 years. Observations of unauthorized motorized trails on the Forest that were closed to use indicate that passive recovery occurs rapidly where trails occur in forested areas; tree leaves and needles provide 50% or greater cover on trails within two to three years. Routes that traverse open areas such as lava caps with shallow soils and herbaceous cover take longer to passively recover, and some may need active restoration since some of the growing medium may were reduced by motorized vehicle use. While this effect may be severe at the site scale, these areas

represent a very small percentage of route miles and are often on ridges or upper slopes and thus not in hydrologically sensitive areas. Another small fraction of the unauthorized route footprint, even less than the lava caps, lie in wet areas such as meadows, springs and seeps. These spots have the capability to revegetate quickly after disturbance ceases since they have productive soil and a good source of subsurface moisture.

This alternative represents the greatest reduction in stream sedimentation of all the alternatives since use on all existing routes – those proposed for addition to the NFTS as well as routes not proposed for addition - is prohibited. Overall, positive effects of this alternative on the water resource are anticipated to be relatively the highest – slightly more than alternative 5, comparatively much more than alternatives 1 and 4 and especially more than Alternative 2. However, as existing sedimentation does not appear to be adversely affecting water quality and stream condition, the reduction over time resulting from this alternative is not significantly greater than the other alternatives.

1. Cross Country Travel

Same as Alternative 1.

2. Additions to the NFTS

This alternative does not make any additions to the NFTS and thus no direct and indirect effects on the water resource.

3. Changes to the Existing NFTS

This alternative does not change the existing NFTS and thus no direct and indirect effects on the water resource.

CUMULATIVE WATERSHED EFFECTS

For Alternative 3, ERA values in the 10 concentrated use watersheds shown in Table 3.10-8 are based on consideration of the past, present and reasonably foreseeable future activities in the Cumulative Watershed Effects Analysis (project record). The activities that usually contribute most to ERA values are vegetation management and the NFTS. None of the 5 miles of future motorized routes that are expected to be constructed to complete the motorized route system occur in this alternative. Route proliferation is not expected to occur since no motorized travel will be permitted off existing NFTS routes. Passive recovery of all 252 miles of unauthorized routes is accounted for in this alternative since none are added to the NFTS. This represents a reduction in the risk of cumulative effects over time since the route footprint decreases as the abandoned routes heal over.

The total ERA in the 10 concentrated use watersheds ranges from 2.59% to 7.93% in these watersheds, which is 18% to 56% of the TOC and thus represents a low risk of CWE. Since no additions to the NFTS are in Alternative 3 the only contribution to ERA are existing NFTS routes and other management activities in the watersheds. Alternative 3 prohibits cross country travel and thus eliminates the entire watershed footprint of unauthorized routes over time due to passive recovery. Thus, Alternative 3 reduces the risk of cumulative watershed effects relatively high compared to the existing condition and the other alternatives. However, the reduction is not a significant factor in the overall ERA.

For each of the dispersed use watersheds, the total ERA in this alternative is estimated to be well below the TOC. The past, present and expected future management activity level is not anticipated to exceed, and is likely to be less than, that in the concentrated use watersheds based upon review of the list of activities in the Cumulative Effects Analysis list. The watershed footprint will be reduced compared with the existing condition to a greater extent than any of the other alternatives.

Alternative 4 (Recreation)

DIRECT AND INDIRECT EFFECTS

The types of effects are the same as the proposed action (Alternative 1) – a reduction in routes, hydrologically connected segments, disturbed area and sedimentation compared with the existing condition in the watersheds; changes to existing NFTS routes; and prohibition of cross country travel. However, the magnitude of effects is slightly different since more routes are proposed for addition to the NFTS in Alternative 4. This alternative represents the greatest mileage of routes added to the NFTS among the alternatives, and conversely the least mileage of routes on which cross country travel would be prohibited and would thus be allowed to passively recover.

1. Cross Country Travel

Same as Alternative 1.

2. Additions to the NFTS

As shown in Table 3.10-6, route mileage in hydrologically sensitive areas in Alternative 4 is 3.70 more than Alternative 1, or an increase of about 10%. The increase in hydrologically connected segments is about 25% compared with Alternative 1. As a result, sedimentation would be expected to be somewhat more than in Alternative 1 though still less in the short term than the existing condition. Thus, stream sedimentation would likely be somewhat more than Alternative 1 but less than present. This again represents a reduction of effects compared to the existing situation. Effects of this alternative on the water resource are anticipated to be negligible since existing sedimentation does not appear to be adversely affecting water quality and stream condition.

Some proposed routes are not recommended for addition to the NFTS (Table 3.10-9) since water quality effects cannot practicably be mitigated and inclusion would likely not be in compliance with water quality best management practices. These routes, if selected for addition to the NFTS, would result in continued sedimentation at present rates. While sedimentation from these routes is believed to be individually unacceptable, the effect at the stream reach scale would not be expected to impair water quality.

3. Changes to the Existing NFTS

Same as Alternative 1.

CUMULATIVE WATERSHED EFFECTS

For Alternative 4, ERA values in the 10 concentrated use watersheds shown in Table 3.10-8 are based on the past, present and reasonably foreseeable future activities in the Cumulative Watershed Effects Analysis (project record). The activities that usually contribute most to ERA values are vegetation management and the NFTS. In addition, approximately 5 miles of motorized routes are expected to be constructed in the future to complete the motorized route system on the Forest. These routes are expected be constructed in six of the concentrated use watersheds within the next 10 years. They were accounted for in the CWE analysis as a future activity; they are not part of this project. Another item accounted for is passive recovery of existing routes not added to the NFTS in this alternative. This represents a slight reduction in the risk of cumulative effects over time since the route footprint decreases as the abandoned routes heal over.

The total ERA in the 10 concentrated use watersheds ranges from 2.77% to 8.13% in these watersheds, which is 20% to 58% of the TOC and thus represents a low risk of CWE. The additions to the NFTS account for less than 0.31% ERA in these watersheds, a very small fraction of the total ERA value. Overall, Alternative 4 results in a reduction of the watershed footprint, or disturbed area, thus reducing the risk of cumulative effects compared to the existing condition.

For each of the dispersed use watersheds, the total ERA in this alternative is estimated to be well below the TOC. The past, present and expected future management activity level is not anticipated to exceed, and is likely to be less than, that in the concentrated use watersheds based upon review of the list of activities in the Cumulative Effects Analysis list. The additions to the NFTS in these watersheds would account for even smaller fraction of the total ERA since the length of routes added is much less than in the concentrated use watersheds. The watershed footprint will be reduced compared with the existing condition, though to a smaller degree than in the concentrated use watersheds because the route addition mileage is much less.

Changes to the NFTS represent a neutral cumulative effect at the watershed scale since no change occurs in the watershed disturbance acreage of these routes. In addition, the prohibition of cross country motorized travel on routes inventoried but not added to the NFTS in this alternative will prevent route proliferation.

Alternative 5 (Resources)

DIRECT AND INDIRECT EFFECTS

The types of effects are the same as Alternative 1(Proposed Action): a reduction in routes, hydrologically connected segments, disturbed area and sedimentation compared with the existing condition in the watersheds; changes to existing NFTS routes; and prohibition of cross country travel. However, the magnitude of effects is noticeably different since substantially less route mileage is proposed in this alternative. This alternative represents the least mileage of routes added to the NFTS among the alternatives, and conversely the most mileage of routes on which cross country travel would be prohibited and would thus be allowed to passively recover. This alternative has noticeably fewer changes to the NFTS than alternatives 1 and 4.

1. Cross Country Travel

Same as Alternative 1.

2. Additions to the NFTS

As shown in Table 3.10-6, route mileage in hydrologically sensitive areas in Alternative 5 is 29.39 less than Alternative 1, or a decrease of about 78%. The decrease in hydrologically connected segments is about 88% compared with Alternative 1. As a result, sedimentation would be expected to be less than in Alternative 1 though still slightly more in the short term than the existing condition since some rather than no miles will be added to the NFTS. Thus, stream sedimentation would be proportionally highly reduced compared to Alternatives 1 and 4 but slightly more than present. This represents the greatest reduction in sedimentation among the action alternatives. However, the amount of reduction in this alternative must be considered in context with the sediment reduction effects of the mitigation measures in Alternatives 1 and 4; those would notably reduce sediment even though more length of hydrologically connected segments would remain. Overall, effects of this alternative on the water resource are anticipated to be negligible insofar as existing sedimentation does not appear to be adversely affecting water quality and stream condition.

One proposed route is not recommended for addition to the NFTS (Table 3.10-9) since water quality effects cannot practicably be mitigated and inclusion would likely not be in compliance with water quality best management practices. This route, if selected for addition to the NFTS, would result in continued sedimentation at present rates. While sedimentation from this route is believed to be individually unacceptable, the effect at the stream reach scale would not be expected to impair water quality.

3. Changes to the Existing NFTS

Same as Alternative 1.

CUMULATIVE WATERSHED EFFECTS

For Alternative 5, ERA values in the 10 concentrated use watersheds shown in Table 3.10-8 are based on the past, present and reasonably foreseeable future activities in the Cumulative Watershed Effects Analysis (project record). The activities that usually contribute most to ERA values are vegetation management and the NFTS. None of the 5 miles of future motorized routes that are expected to be constructed to complete the motorized route system occur in this alternative. In addition, the CWE analysis has accounted for passive recovery of routes not added to the NFTS. This represents a slight reduction in the risk of cumulative effects over time since the route footprint decreases as the abandoned routes heal over.

The total ERA in the 10 concentrated use watersheds ranges from 2.59% to 8.01% in these watersheds, which is 18% to 57 % of the TOC and thus represents a low risk of CWE. The additions to the NFTS account for 0.04% of the ERA in these watersheds, a very small fraction of the total ERA value. Many of the watersheds with routes in hydrologically sensitive areas have no additions to the NFTS in this alternative. Among the action alternatives this one results in the most reduction of the watershed footprint, thus providing the largest relative reduction in the risk of cumulative effects compared to the existing condition. However, since the route footprint is a small fraction of overall ERA the absolute change is minor.

For each of the dispersed use watersheds, the total ERA in this alternative is estimated to be well below the TOC. The past, present and expected future management activity level is not anticipated to exceed, and is likely to be less than, that in the concentrated use watersheds based upon review of the list of activities in the Cumulative Effects Analysis list. The additions to the NFTS in these watersheds would account for an even smaller fraction of the total ERA since the length of routes added is much less than in the concentrated use watersheds. The watershed footprint will be reduced compared to the existing condition, though to a smaller degree than in the concentrated use watersheds because the route addition mileage is much less.

Changes to the NFTS represent a neutral cumulative effect at the watershed scale since no change occurs in the watershed disturbance acreage of these routes. In addition, the prohibition of cross country motorized travel on routes inventoried but not added to the NFTS in this alternative will prevent route proliferation.

Summary of Effects Analysis across All Alternatives

Compared with the existing condition, represented by Alternative 2 (No Action), all other alternatives result in a reduction of direct, indirect and cumulative watershed effects. The existing condition consists of the footprint of the unauthorized routes proposed for addition to the NFTS as well as unauthorized routes that exist but are not proposed for addition.

The rank of decreasing watershed effects from the existing condition, from most to least, is Alternative 3, Alternative 5, Alternative 1 and Alternative 4 (see Table 3.10-11). While the range in reduction of effects among these four alternatives is relatively large based on the mileage measures in the water resource indicators, the decrease in the effect on water quality is minor. Water quality is good to excellent at present, and the difference in the expected reduced stream sedimentation is not likely to be of a magnitude that is measurable. Other watershed disturbances, such as vegetation management, wildfires and NFTS roads have a much greater influence on water quality than the present unauthorized route network.

All alternatives meet beneficial uses of water. Sediment, water temperature and oil and grease are consistent with water quality objectives. Alternative 2, assuming the amount of future route proliferation, would likely slightly increase sedimentation but not adversely affect beneficial uses. Cumulative watershed effects analysis shows that proliferation is a negligible part of equivalent roaded acreage in the watersheds analyzed. Stream survey information shows that stream sediment is

very low at present and the expected proliferation is small enough to expect that sedimentation would remain similar to the present condition.

Table 3.10-11 Summary of Effects on Water Resources

Indicators – Water Resources	Rankings of Alternatives for Each Indicator[1]				
	1	2	3	4	5
Miles of unauthorized routes in hydrologically sensitive areas	3	1	5	2	4
Miles of unauthorized routes with documented erosional features affecting water quality (hydrologically connected segments)	3	1	5	2	2
Equivalent roaded acres	3	1	5	2	4
Average for water resources	**3**	**1**	**5**	**2**	**4**

[1] A score of 5 indicates the alternative has the least impact on this resource; a score of 1 indicates the alternative has the most.

Compliance with the Forest Plan and Other Direction

Forest Plan

All alternatives comply with applicable standards and guidelines (S&Gs) as displayed in the RCO Analysis in the project record (USDA 2005a). No new routes are proposed in RCAs, and existing routes in RCAs that are proposed for addition to the NFTS have maintenance or mitigation requirements where applicable to insure consistency with S&Gs.

Beneficial Uses of Water

All alternatives are expected to result in maintenance of the applicable beneficial uses of water in the Water Quality Control Plan (Basin Plan) for the California Central Valley Water Quality Control Board (CVRWQCB 1998). Sediment, water temperature and petrochemical products are not expected to be adversely altered. Domestic and municipal water supplies are not adversely affected by the proposed action or alternatives. Recreational contact and non-contact waters are suitable for human use. Freshwater habitat (cold and warm water fisheries) and wildlife habitat (amphibian and aquatic reptile species) are not adversely affected by the proposed action or alternatives.

Water Quality Best Management Practices (BMPs)

Alternatives 1, 4 and 5 comply with the intent and procedural requirements of BMPs (USDA 2000a). If any of those alternatives is implemented, or a combination thereof, applicable BMPs would be followed. Alternative 2 (No Action) would not comply with the intent of BMPs because unregulated cross country motorized travel would continue to occur. Applicable BMPs such as OHV planning and monitoring (4-7), Watershed Restoration (7-1), Wetland Protection (7-3) and Wet Season Closure (7-7) would not be implemented.