Project Management Indicator Species Report

Rim Fire Restoration Project

Supervisor's Office

Stanislaus National Forest

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2016/04/21

1. Introduction

The purpose of this report is to evaluate and disclose the impacts of the Rim Fire Recover Project on the habitat of the two (2) Aquatic Management Indicator Species (MIS) identified in the Forest (NF) Land and Resource Management Plan (LRMP) (USDA 1991) as amended by the Sierra Nevada Forests Management Indicator Species Amendment (SNF MIS Amendment) Record of Decision (USDA Forest Service 2007a). This report documents the effects of the proposed action and alternatives on the habitat of selected project-level MIS. Detailed descriptions of the Rim Fire Reforestation Project alternatives are found in the Rim Fire Reforestation Project Draft Environmental Impact Statement (DEIS) (USDA Forest Service 2014, Chapter 2 pages 2-27).

MIS are animal species identified in the SNF MIS Amendment Record of Decision (ROD) signed December 14, 2007, which was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS set forth in the Stanislaus NF LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the Stanislaus NF LRMP as amended.

1.a. Direction Regarding the Analysis of Project-Level Effects on MIS Habitat

Project-level effects on MIS habitat are analyzed and disclosed as part of environmental analysis under the National Environmental Policy Act (NEPA). This involves examining the impacts of the proposed project alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects will change the habitat in the analysis area.

These project-level impacts to habitat are then related to broader scale (bioregional) population and/or habitat trends. The appropriate approach for relating project-level impacts to broader scale trends depends on the type of monitoring identified for MIS in the LRMP as amended by the SNF MIS Amendment ROD. Hence, where the Stanislaus NF LRMP as amended by the SNF MIS Amendment ROD identifies distribution population monitoring for an MIS, the project-level habitat effects analysis for that MIS is informed by available distribution population monitoring data, which are gathered at the bioregional scale. The bioregional scale monitoring identified in the Stanislaus NF LRMP, as amended, for MIS analyzed for the Rim Fire Reforestation Project is summarized in Section 3 of this report.

Adequately analyzing project effects to MIS generally involves the following steps:

- Identifying which habitat and associated MIS would be either directly or indirectly affected by the project alternatives; these MIS are potentially affected by the project.
- Summarizing the bioregional-level monitoring identified in the LRMP, as amended, for this subset of MIS.
- Analyzing project-level effects on MIS habitat for this subset of MIS.

- Discussing bioregional scale habitat and/or population trends for this subset of MIS.
- Relating project-level impacts on MIS habitat to habitat and/or population trends at the bioregional scale for this subset of MIS.

These steps are described in detail in the Pacific Southwest Region's draft document "MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination" (May 25, 2006) (USDA Forest Service 2006a). This Management Indicator Species (MIS) Report documents application of the above steps to select project-level MIS and analyze project effects on MIS habitat for the Rim Fire Reforestation Project.

1.b. Direction Regarding Monitoring of MIS Population and Habitat Trends at the Bioregional Scale.

The bioregional scale monitoring strategy for the Stanislaus NF's MIS is found in the Sierra Nevada Forests Management Indicator Species Amendment (SNF MIS Amendment) Record of Decision (ROD) of 2007 (USDA Forest Service 2007a). Bioregional scale habitat monitoring is identified for all twelve of the terrestrial MIS. In addition, bioregional scale population monitoring, in the form of distribution population monitoring, is identified for all of the terrestrial MIS except for the greater sage-grouse. For aquatic macroinvertebrates, the bioregional scale monitoring identified is Index of Biological Integrity and Habitat. The current bioregional status and trend of populations and/or habitat for each of the MIS is discussed in the 2010 Sierra Nevada Forests Bioregional Management Indicator Species (SNF Bioregional MIS) Report (USDA Forest Service 2010a).

- **MIS Habitat Status and Trend.**

All habitat monitoring data are collected and/or compiled at the bioregional scale, consistent with the LRMP as amended by the 2007 SNF MIS Amendment ROD (USDA Forest Service 2007a).

Habitats are the vegetation types (for example, early seral coniferous forest) or ecosystem components (for example, snags in green forest) required by an MIS for breeding, cover, and/or feeding. Aquatic MIS for the Sierra Nevada National Forests represent 3 major habitats (USDA Forest Service 2007a), as listed in Table 1. These habitats are defined using the California Wildlife Habitat Relationship (CWHR) System (CDFG 2005). The CWHR System provides the most widely used habitat relationship models for California's terrestrial vertebrate species (ibid). It is described in detail in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Habitat status is the current amount of habitat on the Sierra Nevada Forests. Habitat trend is the direction of change in the amount or quality of habitat over time. The methodology for assessing habitat status and trend is described in detail in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

- **MIS Population Status and Trend.**

All population monitoring data are collected and/or compiled at the bioregional scale, consistent with the LRMP as amended by the 2007 SNF MIS Amendment ROD (USDA Forest Service 2007a). The information is presented in detail in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Population monitoring strategies for MIS of the Stanislaus NF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment ROD (USDA Forest Service 2007a). Population status is the current condition of the MIS related to the population monitoring data required in the 2007 SNF MIS Amendment ROD for that MIS. Population trend is the direction of change in that population measure over time.

There are a myriad of approaches for monitoring populations of MIS, from simply detecting presence to detailed tracking of population structure (USDA Forest Service 2001, Appendix E, page E-19). A distribution population monitoring approach is identified for all of the terrestrial MIS in the 2007 SNF MIS Amendment, except for the greater sage-grouse (USDA Forest Service 2007a). Distribution population monitoring consists of collecting presence data for the MIS across a number of sample locations over time. Presence data are collected using a number of direct and indirect methods, such as surveys (population surveys), bird point counts, tracking number of hunter kills, counts of species sign (such as deer pellets), and so forth. The specifics regarding how these presence data are assessed to track changes in distribution over time vary by species and the type of presence data collected, as described in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

- **Aquatic Macroinvertebrate Status and Trend.**

For aquatic macroinvertebrates, condition and trend is determined by analyzing macroinvertebrate data using the predictive, multivariate River Invertebrate Prediction And Classification System (RIVPACS) (Hawkins 2003) to determine whether the macroinvertebrate community has been impaired relative to reference condition within perennial water bodies. This monitoring consists of collecting aquatic macroinvertebrates and measuring stream habitat features according to the Stream Condition Inventory (SCI) manual (Frazier et al. 2005). Evaluation of the condition of the biological community is based upon the "observed to expected" (O/E) ratio, which is a reflection of the number of species observed at a site versus the number expected to occur there in the absence of impairment. Sites with a low O/E scores have lost many species predicted to occur there, which is an indication that the site has a lower than expected richness of sensitive species and is therefore impaired.

2. Selection of Project level MIS

Aquatic Management Indicator Species (MIS) for the Stanislaus NF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA Forest Service 2007a). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of aquatic MIS, as indicated in Table 1. In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column), the Table discloses whether or not the habitat of the MIS is potentially affected by the Rim Fire Reforestation Project (4th column).

Table 1. Selection of MIS for Project-Level Habitat Analysis for the Rim Fire Reforestation Project.

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species *Scientific Name*	Category for Project Analysis [2]
Riverine & Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	3
Wet Meadow	Wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree (chorus) frog *Pseudacris regilla*	3

[1] All CWHR size classes and canopy closures are included unless otherwise specified; **dbh** = diameter at breast height; **Canopy Closure classifications:** S=Sparse Cover (10-24% canopy closure); P= Open cover (25-39% canopy closure); M= Moderate cover (40-59% canopy closure); D= Dense cover (60-100% canopy closure); **Tree size classes:** 1 (Seedling)(<1" dbh); 2 (Sapling)(1"-5.9" dbh); 3 (Pole)(6"-10.9" dbh); 4 (Small tree)(11"-23.9" dbh); 5 (Medium/Large tree)(≥24" dbh); 6 (Multi-layered Tree) [In PPN and SMC] (Mayer and Laudenslayer 1988).

[2] **Category 1:** MIS whose habitat is not in or adjacent to the project area and would not be affected by the project.
Category 2: MIS whose habitat is in or adjacent to project area, but would not be either directly or indirectly affected by the project.
Category 3: MIS whose habitat would be either directly or indirectly affected by the project.

The aquatic MIS whose habitat would be either directly or indirectly affected by the Rim Fire Reforestation Project, identified as Category 3 in Table 1, are carried forward in this analysis, which will evaluate the direct, indirect, and cumulative effects of the proposed action and alternatives on the habitat of these MIS. The aquatic MIS selected for project-level MIS analysis for the Rim Fire Reforestation Project are: aquatic macroinvertebrates and Pacific tree frog.

3. Bioregional Monitoring Requirements for MIS Selected for Project-Level Analysis

3.a. MIS Monitoring Requirements.

The Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA Forest Service 2007a) identifies bioregional scale habitat and/or population monitoring for the Management Indicator Species for ten National Forests, including the Stanislaus NF. The habitat and/or population monitoring requirements for Stanislaus NF's MIS are described in the 2010 Sierra Nevada Forests Bioregional Management Indicator Species (SNF Bioregional MIS) Report (USDA Forest Service 2010a) and are summarized below for the MIS being analyzed for the Rim Fire Reforestation Project. The applicable habitat and/or population monitoring results are also described in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a) and are summarized in Section 5 below for the MIS being analyzed for the Rim Fire Reforestation Project.

Bioregional Monitoring for aquatic macroinvertebrates: Index of Biological Integrity (IBI) and habitat condition and trend are measured by collecting aquatic macroinvertebrates, and analyzing

the resulting data using the River Invertebrate Prediction And Classification System (RIVPACS) (Hawkins 2003) to determine whether the macroinvertebrate community has been impaired relative to reference condition within perennial water bodies. In addition, stream habitat features are measured according to the Stream Condition Inventory (SCI) manual (Frasier et al. 2005).

3.b. How MIS Monitoring Requirements are Being Met.

Habitat and/or distribution population monitoring for all MIS is conducted at the Sierra Nevada scale. Refer to the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a) for details by habitat and MIS.

4. Description of Proposed Project.

The action alternatives (Alternatives 1, 3, 4and 5) and the no action alternative (Alternative 2) are considered in detail. The no action alternative, as required by the implementing regulations of NEPA, serves as a baseline for comparison among the alternatives. The alternatives contain a mix of one or more of the following activities: site preparation, planting, prescribed fire, mechanical and/or chemical release, noxious weed eradication (mechanical and/or chemical), and plantation thinning. Summaries of the alternatives are listed below; more comprehensive descriptions of the alternatives are located in Chapter 2 of the EIS.

Table 2 - Comparison of Alternatives

Proposed Treatments (acres)	**Alternative 1** (Proposed Action)	**Alternative 2** (No Action)	**Alternative 3**	**Alternative 4**	**Alternative 5**
Deer habitat enhancement	3,833	0	3,833	1,164	3,833
Natural regeneration	4,031	0	4,031	22,464	0
Noxious weed eradication	5,714	0	3,131	3,131	5,714
Reforestation	21,300	0	21,300	2,867	25,331
Thin existing plantations	12,769	0	12,769	12,769	12,769
Prescribed fire only	0	0	0	34,344	0

Table 3 - Comparison of alternatives: Reforestation Treatments outside of Deer Habitat Enhancement

Proposed Treatments (acres)	**Alternative 1** (Proposed Action)	**Alternative 2** (No Action)	**Alternative 3**	**Alternative 4**	**Alternative 5**
Feller buncher	3,139	**0**	3,139	140	3,318
Feller buncher and mastication	351	**0**	351	0	423
Hand cut, hand pile and burn	74	**0**	74	0	271
Hand cut, prescribed fire (understory and jackpot)	237	**0**	237	51	237
Machine pile and burn	912	**0**	912	76	925
Mastication	1,493	**0**	1,493	32	1,528
Total Initial Site Preparation	**6,206**	**0**	**6,206**	**299**	**6,704**
Deep till and forest cultivate	5,085	0	8,893	0	5,085
Manually apply herbicides (Glyphosate)	16,215[1]	0	0	2,867	20,246
Total Site Preparation	**21,300**	**0**	**8,893**	**2,867**	**25,331**
Total Plant	**21,300**	**0**	**21,300**	**2,867**	**25,331**
Release with grubbing	0	0	21,300[2]	0	0
Release with glyphosate	21,300	0	0	4,012[3]	25,331
Total Release	**21,300**		**42,600**	**4,012**	**25,331**
Total Prescribed Fire at Year 10	**21,300**	**0**	**21,300**	**0**	**0**

Proposed Treatments (acres)	**Alternative 1** (Proposed Action)	**Alternative 2** (No Action)	**Alternative 3**	**Alternative 4**	**Alternative 5**
Total Thin New Plantations	**0**	**0**	**0**	**0**	**25,331**[4]
Additional Prescribed Fire in First Decade				**17,172**	

[1] Does not include proposed 4,031 acres of natural regeneration units that may have herbicide treatment.
[2] Hand release would be required twice annually on the same acres for most competing species.
[3] Release with glyphosate acreage includes treatment of the buffer adjacent to the planted areas.
[4] Thin plantations where needed to create desired ICO structure and to meet fire and fuels structure goals.

5. Effects of Proposed Project on the Habitat for the Selected Project-Level MIS.

The following section documents the analysis for the following 'Category 3' species: aquatic macroinvertebrates and Pacific chorus frog. The analysis of the effects of the Rim Fire Reforestation Project on the MIS habitat for the selected project-level MIS is conducted at the project scale. The analysis used the following habitat data: Geographic Information Systems (GIS) NHD (National Hydrography Data) layer showing perennial and intermittent streams and lakes; Forest wet meadow GIS data, Stanislaus Streamscape Inventory program. Detailed information on the MIS is documented in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a), which is hereby incorporated by reference.

Cumulative effects at the bioregional scale are tracked via the SNF MIS Bioregional monitoring, and detailed in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Lacustrine/Riverine Habitat (Aquatic Macroinvertebrates)

Habitat/Species Relationship.
Aquatic or Benthic Macroinvertebrates (BMI) were selected as the MIS for riverine and lacustrine habitat in the Sierra Nevada. They have been demonstrated to be very useful as indicators of water quality and aquatic habitat condition (Resh and Price 1984; Karr et al. 1986; Hughes and Larsen 1987; Resh and Rosenberg 1989). They are sensitive to changes in water chemistry, temperature, and physical habitat; aquatic factors of particular importance are: flow, sedimentation, and water surface shade.

Project-level Effects Analysis – Lacustrine/Riverine Habitat

Habitat Factor(s) for the Analysis: Flow; Sedimentation; and Water surface shade.

Current Condition of the Habitat Factor(s) in the Project Area: The Rim Fire Reforestation Watershed Report thoroughly discusses the existing conditions in the project area. That information is summarized here. There have been multiple large scale fires in the project area, as well as vegetation and road management actions, recreation and grazing. The Rim Fire was a mixed severity fire that burned upland areas at higher severity than near the streams in the 18 HUC 6 watersheds that encompass the fire perimeter.

In the first year after a fire, water flow typically increases due to a reduction in soil water storage, interception and evapotranspiration when vegetation is killed. As vegetation recovers, the water yield will decrease (Watershed Report).

The Rim Fire contains a mosaic of high, moderate and low soil burn severity plus unburned areas within its perimeter. Table 4 displays estimates for burn severity within Riparian Conservation Areas (RCA). Many past fires occurring within the Rim Fire perimeter have half or more of their total acreage in the low and unburned categories that resulted in minimal to negligible watershed impact. Most watershed damage occurs from high soil burn severity, and lesser from moderate soil burn severity. The actual amount of erosion from the hillslopes and the amount entering streams as sediment depends on several factors, including soil type, soil texture, hillslope steepness, ground cover quantity, and rainfall intensity. When substantial sediment enters a stream, habitat complexity is reduced (e.g., pool filling) and substrate composition change, such as abundant fine sediment, may reduce spawning suitability for many species. Observations in the Rim Fire area indicate hillslope erosion has increased post-fire. Post-fire erosion rates can return to pre-fire rates within five to ten years." Observations made by the author during 2015 field visits indicated that many streams are already showing initial signs of recovery/stabilization due to rapid vegetation growth, though substantial aggradation is evident and will likely persist through a normal recovery period (5-10 years). In an undisturbed watershed erosion rates average 0.5 tons per acre. The HUC 6 watersheds encompassing the Rim Fire are modeled to have from 0.7 to 3.6 tons per acre. The actual magnitude is dependent upon the timing and severity of winter weather events and to date the fire area has received below average precipitation. Observations after the 1987 Stanislaus Complex Fire that occurred in some of the same watersheds as the Rim Fire (Watershed Report) indicated that increased sediments were essentially gone from streams within 3 to 5 years. The beginning of implementation for this multi-year project could occur at the 3-year mark (2016).

Water surface shade was reduced by the Rim Fire, particularly in areas where the vegetation burn severity was higher. The Watershed Report displays the soil and vegetation burn severity by watershed within the Riparian Conservation Areas (RCAs) along intermittent and perennial streams in the project area. There is a notable loss of stream shade from conifers and riparian obligate trees and shrubs in many watersheds. Riparian trees and shrubs will recover and provide shade within 5 years, while conifers trees will recover in a longer time frame.

Table 4 – Burn severity in Riparian Conservation Areas

HUC Level and Name	Riparian Conservation Area (RCA) (100-foot stream buffer)					Watershed (total acres)
	Soil Burn Severity % acres in RCA				Vegetation Burn Severity % acres with 75-100% Canopy Mortality	Soil Burn Severity % acres in Watershed
	High	Mod	Low	H+M		High+Mod
5 – Big Creek-Tuolumne River						
6 – Big Creek	0	0	100	0	0	0
6 – Grapevine Creek-Tuolumne River	0	11	89	11	15	27

6 – Jawbone Creek-Tuolumne River	11	38	51	49	50	70
7 – Corral Creek	41	51	9	92	88	89
7 – Lower Jawbone Creek	3	42	55	45	49	85
5 – North Fork Tuolumne River						
6 – Lower North Fork Tuolumne River	1	8	91	9	6	7
5 – Clavey River						
6 – Lower Clavey River	1	19	80	20	19	49
7 – Bear Springs Creek-Lower Clavey River	2	17	81	19	14	50
6 – Middle Clavey River	1	7	92	8	7	13
6 – Reed Creek	3	10	87	13	11	23
7 –Lower Reed Creek	12	31	56	43	41	62
5 – Cherry Creek						
6 – Lower Cherry Creek	13	34	53	47	45	53
7 – Granite Creek	35	59	6	94	91	92
6 – Upper Cherry Creek	0	0	100	0	0	1
6 – West Fork Cherry Creek	0	0	100	0	0	0
5 – Eleanor Creek[1]						
6 – Miguel Creek-Eleanor Creek	4	34	62	38	41	35
5 – Falls Creek-Tuolumne River[1]						
6 – Poopenaut Valley-Tuolumne River	5	27	68	32	32	39
5 – Middle Fork Tuolumne River[1]						
6 – Lower Middle Fork Tuolumne River	5	50	45	55	50	63
6 – Upper Middle Fork Tuolumne River	3	22	75	25	17	29
5 – South Fork Tuolumne River[1]						
6 – Lower South Fork Tuolumne River	2	23	75	25	18	46
6 – Upper South Fork Tuolumne River	4	19	77	22	17	25
5 – North Fork Merced River						
6 – Bull Creek	0	2	98	2	2	2
6 – Bean Creek-North Fork Merced River	0	2	98	2	2	4

[1] Substantial portion of the fire extends east into Yosemite National Park

Alternatives 1, 3, 4 and 5

Direct and Indirect Effects to Habitat. The Rim Fire Reforestation Project alternatives propose a mix of one or more of the following activities: site preparation, planting, prescribed fire, mechanical and/or chemical release, noxious weed eradication (mechanical and/or chemical), and plantation thinning.

All action alternatives have the potential to increase stream sediment input. Ground disturbing treatment, such as deep tilling, is most likely to mobilize sediment. Herbicide treatment poses the lowest risk due to the lack of soil disturbance. Prescribed fire generally poses an intermediate risk, as fire intensity is kept low to prevent substantial soil exposure. Alternative 3 would likely produce an increased chance of sediment mobilization as compared to the other alternatives due to the increase in deep tilling acreage. Alternative 4 would likely produce the least chance of sediment increase due to reduced acreage of ground disturbance. Alternatives 1 and 5 would produce intermediate values, with Alternative 5 exhibiting slightly higher values due to increased acreage of active reforestation (e.g., deep tilling) versus natural regeneration. The potential for additional sediment delivery to streams is minimized by implementation of management

requirements. In addition, all Alternative would protect existing native riparian vegetation, which should maintain bank stability and provide a filter for any sediment mobilized from treatment.

Under the action alternatives large woody debris (LWD), no measurable change to this habitat component is expected.

Little if any shade-providing vegetation is expected to be removed under any alternative; therefore, no measurable change in stream temperature is expected. The treatments are expected to speed the recovery and growth of shade-producing trees as compared to natural regeneration, so a long-term benefit to this habitat component is expected.

There is a small chance of low-concentration herbicide contamination in a few sections of stream. There is a chance of short-term impacts to aquatic plants and algae, which could theoretically affect food organisms for aquatic macroinvertebrates. This risk is deemed very low due to project management requirements that restrict herbicide use near water, such as retention of all native riparian vegetation. Therefore, the already low estimated concentrations are likely an overestimate of those that will actually occur. If indirect effects to food sources were to occur, they would be short-term and spatially isolated. Herbicide application would not occur under Alternative 3, and would be limited to glyphosate only under Alternative 4.

Cumulative Effects to Habitat in the Analysis Area. The watershed report discusses Cumulative Watershed Effects using the Equivalent Roaded Area (ERA) model used by the Pacific Southwest Region. Grazing was not included in ERA calculations as grazing effects are more of a site issue than a watershed issue.

Under this project two HUC 6 and four HUC 7 watersheds exceeded the Threshold of Concern (TOC) based on ERA percentage, almost entirely due to the contribution from previous non-project actions. These watersheds are the same watersheds that exceeded the TOC under the Rim Fire Recovery Project with the exception of the Lower Jawbone Creek HUC7 watershed that remained under TOC under this project. All of the rest of the analysis watersheds under this project were below the TOC (watershed report). In nearly all watersheds, the project alternatives would contribute less than 1% to the ERA total. The main differences between the action alternatives are the percentage of ERA calculated and the length of time the TOC is exceeded; exceedance of TOC is only possible in a small minority of project area watersheds, and these few watersheds are expected to fall below TOC within a maximum of 6 years. Although there are small differences in ERA values between the action alternatives, measurable cumulative impacts on fish are expected to differ very little.

Management Requirements and Best Management Practices are expected to minimize the effects of the action alternatives on the streams. The action alternatives are not expected to result in adverse off-site cumulative effects to sediment-related water quality

parameters or to watershed condition or to water temperatures. Although grazing has the potential to result in streambank disturbance and to slow recovery of riparian vegetation, effects will be localized and existing Standards and Guidelines should allow for riparian vegetation recovery to progress naturally.

Cumulative Effects Conclusion: Changes in flow and water surface shade will be too small to be measured. Sedimentation will increase slightly as a result of proposed actions, however the amount of increase will be indiscernible compared to the increased sediment from the Rim Fire.

Summary of Aquatic Macroinvertebrate Status and Trend at the Bioregional Scale
The Stanislaus NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale Index of Biological Integrity and Habitat monitoring for aquatic macroinvertebrates; hence, the lacustrine and riverine effects analysis for the Rim Fire Reforestation Project must be informed by these monitoring data. The sections below summarize the Biological Integrity and Habitat status and trend data for aquatic macroinvertebrates. This information is drawn from the detailed information on habitat and population trends in the 2010 Sierra Nevada Forests Bioregional MIS Report (USDA Forest Service 2010a), which is hereby incorporated by reference.

Habitat and Index of Biological Integrity Status and Trend. Aquatic habitat has been assessed using Stream Condition Inventory (SCI) data collected since 1994 (Frasier et al. 2005) and habitat status information from the Sierra Nevada Ecosystem Project (SNEP) (Moyle and Randall 1996). Moyle and Randall (1996) developed a watershed index of biotic integrity (IBI) based on distributions and abundance of native fish and amphibian species, as well as extent of roads and water diversions. According to this analysis, seven percent of the watersheds were in excellent condition, 36 percent were in good condition, 47 percent were in fair condition and nine percent were in poor condition.

Sierra Nevada MIS monitoring for aquatic (benthic) macroinvertebrates (BMI) was conducted in 2009 and 2010 (Furnish 2011). Benthic macroinvertebrates were collected from stream sites during both the 2009 and 2010 field seasons according to the Reachwide Benthos (Multihabitat) Procedure (Ode 2007). The initial BMI data from 2009 and 2010 found 46% (6 of 13) of the surveyed streams indicate an impaired condition and 54% (7 of 13) indicate a non-impaired condition (see USDA Forest Service 2010a, Table BMI-1). This is similar to the IBI conditions estimated by Moyle and Randall (1996). Therefore, current data from the Sierra Nevada indicate that status and trend in the RIVPACS scores appears to be stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Aquatic Macroinvertebrates Habitat Trend as the change in flow, and shade are too small to be measured and the increase in sedimentation above the levels resulting from the Rim Fire are indiscernible, the Rim Fire Reforestation Project will not alter the existing trend in the habitat or aquatic macroinvertebrates across the Sierra Nevada bioregion.

Wet Meadow Habitat (Pacific tree frog)

Habitat/Species Relationship.
The Pacific tree frog was selected as an MIS for wet meadow habitat in the Sierra Nevada. This broadly distributed species requires standing water for breeding; tadpoles require standing water for periods long enough to compete aquatic development, which can be as long as 3 or more months at high elevations in the Sierra Nevada (CDFG 2005). During the day during the breeding season, adults take cover under clumps of vegetation and surface objects near water; during the remainder of the year, they leave their breeding sites and seek cover in moist niches in buildings, wells, rotting logs or burrows (ibid).

Project-level Effects Analysis – Wet Meadow Habitat

Habitat Factor(s) for the Analysis: (1) Acres of wet meadow habitat [CWHR wet meadow (WTM) and freshwater emergent wetland (FEW), (2) CWHR herbaceous height classes, (3) herbaceous ground cover, or (4) meadow hydrology.

Current Condition of the Habitat Factor(s) in the Project Area: There are approximately 25 acres of wet meadow habitat (CWHR WTM) within the Project analysis area and within or immediately adjacent to proposed treatment units.

Wet meadows are characterized by generally being lower gradient areas of deposition. The accumulation of fines provides substrate for a unique plant community. The fine substrate can be disturbed by flow alteration, compaction, or removal of ground cover. Hydrologic alteration can result in changes to channel morphology, resulting in channel downcutting, over-widening, and lowering of the water table. Wet meadows within the project area have been affected by past fires, timber harvesting, livestock grazing, and roads. Some have evidence of incision (channel downcutting), although many provide water sufficient for breeding sites for Pacific tree frog.

Direct and Indirect Effects to Habitat. The Rim Fire Reforestation Project alternatives propose a mix of one or more of the following activities: site preparation, planting, prescribed fire, mechanical and/or chemical release, noxious weed eradication (mechanical and/or chemical), and plantation thinning.

All action alternatives have the potential to increase stream sediment input. Ground disturbing treatment, such as deep tilling, is most likely to mobilize sediment. Herbicide treatment poses the lowest risk due to the lack of soil disturbance. Prescribed fire generally poses an intermediate risk, as fire intensity is kept low to prevent substantial soil exposure. Alternative 3 would likely produce an increased chance of sediment mobilization as compared to the other alternatives due to the increase in deep tilling acreage. Alternative 4 would likely produce the least chance of sediment increase due to reduced acreage of ground disturbance. Alternatives 1 and 5 would produce intermediate values, with Alternative 5 exhibiting slightly higher values due to increased acreage of active reforestation (e.g., deep tilling) versus natural regeneration. The potential for additional sediment delivery to streams is minimized by implementation of management requirements. In addition, all Alternative would protect existing native riparian

vegetation, which should maintain bank stability and provide a filter for any sediment mobilized from treatment.

There is a small chance of low-concentration herbicide contamination in a few wet meadow edges. There is a chance of short-term impacts to herbaceous vegetation within a few acres (project-wide) of meadow edge habitat. The short-term potential impacts to a small quantity of wet meadow vegetation would be followed by an increase in native vegetation, as one of the purposes of the project is to eradicate/lessen the distribution of noxious weeds. Herbicide application would not occur under Alternative 3, and would be limited to glyphosate only under Alternative 4.

Cumulative Effects to Habitat in the Analysis Area. The watershed report discusses Cumulative Watershed Effects using the Equivalent Roaded Area (ERA) model used by the Pacific Southwest Region. Grazing was not included in ERA calculations as grazing effects are more of a site issue than a watershed issue.

Under this project two HUC 6 and four HUC 7 watersheds exceeded the Threshold of Concern (TOC) based on ERA percentage, almost entirely due to the contribution from previous non-project actions. These watersheds are the same watersheds that exceeded the TOC under the Rim Fire Recovery Project with the exception of the Lower Jawbone Creek HUC7 watershed that remained under TOC under this project. All of the rest of the analysis watersheds under this project were below the TOC (watershed report). In nearly all watersheds, the project alternatives would contribute less than 1% to the ERA total. The main differences between the action alternatives are the percentage of ERA calculated and the length of time the TOC is exceeded; exceedance of TOC is only possible in a small minority of project area watersheds, and these few watersheds are expected to fall below TOC within a maximum of 6 years. Although there are small differences in ERA values between the action alternatives, measurable cumulative impacts on fish are expected to differ very little.

Management Requirements and Best Management Practices are expected to minimize the effects of the action alternatives on the streams. The action alternatives are not expected to result in adverse off-site cumulative effects to sediment-related water quality parameters or to watershed condition or to water temperatures. Although grazing has the potential to result in streambank disturbance and to slow recovery of riparian vegetation, effects will be localized and existing Standards and Guidelines should allow for riparian vegetation recovery to progress naturally.

> **Cumulative Effects Conclusion:** Changes to wet meadow habitat will be too small to be measured, as very little treatment would occur in these areas. Sedimentation will increase slightly as a result of proposed actions, however the amount of increase will be indiscernible compared to the increased sediment from the Rim Fire, especially in low-gradient meadow habitat.

Summary of Pacific Tree Frog Status and Trend at the Bioregional Scale
The Sierra NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the Pacific tree frog; hence, the wet meadow effects analysis for the CFRFR Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the Pacific tree frog. This information is drawn from the detailed information on habitat and population trends in the SNF Bioregional MIS Report (USDA - Forest Service 2008), which is hereby incorporated by reference.

Habitat Status and Trend. There are currently 66,000 acres of wet meadow habitat on National Forest System lands in the Sierra Nevada. Within the last decade, the trend is stable.

Population Status and Trend. Since 2002, the Pacific tree frog has been monitored on the Sierra Nevada forests as part of the Sierra Nevada Forest Plan Amendment (SNFPA) monitoring plan (USDA - Forest Service 2006, Brown 2008). These data indicate that Pacific tree frog continues to be present at these sample sites, and that the distribution of Pacific tree frog populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Pacific Tree Frog Trend. There would be no substantial changes anticipated in wet meadow habitat within the Project area. No changes in acres or meadow hydrology are expected; herbaceous vegetation cover/class could be minimally affected along the margins of a few wet meadows, with a long-term benefit expected due to reduction of non-native vegetation. Of the 25 acres indicated to be wet meadow, those within or adjacent to treatment units would generally be expected to be protected by project design measures. The project would not alter the existing trend in the habitat, nor would it be expected lead to a change in the distribution of Pacific tree frogs across the Sierra Nevada bioregion.

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