

USDA FOREST SERVICE

Fiscal Year 2017 Monitoring and Evaluation Report

Klamath National Forest

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This report is located on the Forest Service website at:

http://www.fs.usda.gov/detail/klamath/landmanagement/planning/?cid=fsm8_049843

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Introduction

The 1995 Klamath National Forest Land and Resource Management Plan¹ (Forest Plan), as amended, provides a list of monitoring projects that are intended to be conducted on a regular basis. This fiscal year 2017 (FY 2017) Monitoring and Evaluation Report documents the evaluation of monitoring information related to the Forest Plan from October 1, 2016 through September 30, 2017. The objective of monitoring and evaluating Forest Plans is to determine whether programs and projects are meeting Forest Plan direction. Monitoring is the collection of information, on a sample basis, from sources identified in the Forest Plan. Evaluation of monitoring results is used to determine the effectiveness of the Forest Plan and the need either to change the Plan through amendment or revision or to continue with the Plan as written. Data are compared to data from past years, when appropriate. Monitoring results are emphasized rather than monitoring data. Evaluations are based on professional judgment when monitoring data are incomplete or lacking.

This report and the resources discussed within it closely follow the format of the Monitoring and Evaluation Requirements outlined in Chapter 5 of the Forest Plan (p. 5-11 through 5-14). Each resource section identifies monitoring objectives, methodology, analysis results, and further action required, as applicable.

In some cases, monitoring was not conducted as specified in the Plan. While most monitoring activities are accomplished on the prescribed schedule, some have been delayed due to funding shortfalls, lack of priority compared with other program needs, or lack of activity in that management program. Monitoring activities, if they occurred in addition to those identified in Chapter 5, are listed at the end of each resource area.

Geology

A. Landslides

Objectives: Test assumptions for landslide sediment production rates in the Forest Plan. Determine effectiveness of standards and guidelines in reducing landslide rates.

Methodology: Forest-wide landslide production rates can only be effectively monitored after landslide-producing storms, or the winter (wet) season. Thirty-eight new active landslides were reported by the Forest in FY 2017. The element was monitored in depth, and adjustments made to sediment production rates and management practices accordingly. The Forest monitored the application of geologic standards and guidelines by conducting field reviews of the Westside, and Jess Projects.

Results: Due to the wet winter of 2016/2017, 38 new active landslides were reported by the Forest in FY 2017. All landslides were field reviewed, mapped, analyzed, and added to the Forest data layers. The standards and guidelines and resultant project design features were

¹ The Forest Plan, as amended, is located at: <http://www.fs.usda.gov/main/klamath/landmanagement/planning>.

found to have been fully implemented for the Westside and Jess Projects. The current standards and guidelines were found to have been effective at avoiding disturbance to potentially unstable lands and impacts to landslide processes; however, new standards and guides have been implemented since to account for issues that were not previously protected. The high number of landslides in FY 2017 were due to a higher precipitation amounts during the winter season of 2016/2017 than that of the past recent years. Of the landslides that occurred in FY 2017 the majority were not directly caused by project implementation, but rather the above average precipitation when compared to the recent past. New project designs have been created to protect issues that were found during monitoring.

Further Action Required: None.

B. Geologic Hazards

Objectives: Determine the level of hazardous materials (asbestos, radon, etc.) and if the Forest is meeting required standards. Evaluate effectiveness of standards and guidelines for reducing environmental threats from geologic hazards.

Methodology: Naturally occurring hazardous materials would be investigated if new facilities were being proposed or new rock pits developed in ultramafic rock. Investigations include GIS analysis, review of previous investigations, and field review to determine the potential for the presents of hazardous materials. Laboratory testing for the presence or absence of hazardous materials may occur depending on the outcome of initial evaluation. Upon request by Forest staff, a geologic hazards risk evaluation would be completed using GIS analysis, review of previous investigations, and field review. The focus of the analysis would be to determine the threat to visitors and/or personnel from geologic events at a particular area or site on the Forest.

Results: No asbestos or radon monitoring was conducted, since no rock aggregate from quarries in ultramafic rock was used as road surfacing and no new radon threats were identified. No monitoring was done on hazards from abandoned mines, landfills, or seismic, volcanic or avalanche sources because the Forest was not aware of any new hazards relative to these threats for FY 2017.

Further Action Required: No further action is required.

C. Unique Geologic Areas

Objectives: Assess the condition of unique geologic areas and effectiveness of Forest Plan standards and guidelines and resource management programs in preserving and protecting these resources.

Methodology: Monitoring visits were conducted to Geologic Special Interest Areas at: Fourmile Hill Tree Molds, Little Glass Mountain, North Russian Landslide Dam, and Condrey Mountain Blueschist Geologic Areas. Three noteworthy caves, including Pluto's, Barnum, and Scorpion Caves were monitored for disturbance. Five photo points were established in Pluto's Cave to monitor graffiti and vandalism trends in the well-used cave.

Results: Geologic Special Interest Areas were all in good condition with little to no new disturbances. The Abney Fire of 2017 burned over portions of the Condrey Mountain

Blueschist Geologic Area, but no damage occurred to the Geologic Special Interest Area. The change in the surrounding appearance is consistent with the intention of the Geologic Special Interest Area. A comparison of photos taken in February 2016 to photos taken in February 2017 showed no new graffiti in Pluto's Cave, but some evidence of fire use in the cave. The two gates at Barnum Cave and Scorpion Cave were not vandalized this year.

Further Action Required: No further action is required.

D. Geologic Mapping

Objectives: Assess the accuracy of mapping units in the Forest Plan geologic database (rock type, geomorphic terrains, unstable and potentially unstable lands, etc.; Implementation, Effectiveness). Evaluate the unstable lands component of riparian reserves for accuracy (Implementation, Effectiveness).

Methodology: The Forest has been working toward updating geomorphic mapping as part of project-level analysis for portions of the Lovers, East Fork Scott, and Horse Creek, and Siead-Horse Projects. The resulting field mapping is used to refine the Forest geomorphic and bedrock layers.

Results: Generally, the inner gorges are over-mapped, especially in steep terrain. 38 new active landslides have been located. The bedrock mapping was found to be fairly accurate in the project areas. These data have been updated based on these results.

Further Action Required: No further action is required. Updates to the databases will be continued as needed.

Soils

Objective: To assess the implementation and effectiveness of soil standards, guidelines, and thresholds to maintain soil productivity. The overarching Forest Plan standards and guidelines for soils require that land management activities are planned and implemented to maintain or enhance soil productivity and stability; specific requirements for soil cover and soil organic matter are set. The Forest Plan calls for soil quality standards to be met on at least 85 percent of lands dedicated to producing vegetation. For soil compaction, a ten percent or more reduction in total soil porosity of the surface soil over natural conditions on 15 percent or more of the area is a variation from standards that requires further action. The Region 5 supplement to Forest Service Manual 2550 provides indicators including soil stability, soil organic matter, and soil structure to measure soil condition. Soil condition classes are defined as "Good" (meets desired condition), "Fair" (partially meets desired condition), and "Poor" (does not meet desired condition). To assess the effects of management actions on soil functions, desired condition of each indicator is evaluated and determined to either meet desired conditions or not meet desired conditions.

Methodology:

Activity units were evaluated to determine if desired condition for soil indicators (soil stability and soil structure) were met. Soil cover and effectiveness of erosion control, rutting and signs of erosion on suspended yarding, meadow protection, prescribed fire areas, and ground based

skidding were measured to evaluate soil stability. Soil stability desired condition is met if an adequate level of soil cover is present and signs of erosion are not visible or very limited in degree and extent. Forest Plan Standard and Guideline 3-2 provides guidance on adequate levels of soil cover levels by soil texture class, slope steepness, and management activity.

Units were monitored on a randomly selected subset of management areas. Randomly selected units are the same ones selected for Best Management Practice Evaluation Program monitoring and include: skid trails, suspended yarding, meadow protection, road decommissioning, temporary roads, landings, prescribed fire areas, ground based skidding, and OHV trails.

Results:

Prescribed Fire:

First Creek 2 on the Goosenest Ranger District was monitored and found to still be meeting contract requirements.

Suspended Yarding:

Mt. Ashland Stewardship unit 230 on Oak Knoll District was monitored and found to still be meeting contract requirements.

Mt. Ashland Stewardship unit 763 on Oak Knoll District was monitored and found to still be meeting contract requirements.

Grazing Management:

Indian Creek unit 05 on the Scott District was monitored and was found to meet desired conditions for all applicable indicators.

Ground Based Skidding:

Cedar Circle unit 5 was monitored on the Goosenest district and found to still be meeting contract and project requirements.

Cedar Circle unit 27 was monitored on the Goosenest district and found to still be meeting contract and project requirements.

Doolittle unit 77 on the Happy Camp District was monitored and found to still be meeting contract and project requirements.

Grider unit 62 on Oak Knoll District was monitored and found to still be meeting contract requirements.

Grider unit 260 on Oak Knoll District was monitored and found to still be meeting contract requirements.

Whites unit 410 on Salmon District was monitored and found to still be meeting contract requirements.

Whites unit 400 on Salmon District was monitored and found to still be meeting contract requirements.

Middle Creek unit 521 on Scott/Salmon District was monitored and found to be 1 percent over meeting contract requirements. Straw mulching was suggested from the timber resource group as a mitigation measure.

Mt. Ashland Stewardship unit 240 on Oak Knoll District was monitored and found to still be meeting contract requirements.

Mt. Ashland Stewardship unit 711 on Oak Knoll District was monitored and found to still be meeting contract requirements.

Conclusion: Forest Plan standards and guidelines for soil stability, soil organic matter, and soil structure were met for all areas monitored except for the one area mentioned above. Straw mulching as a mitigation would stabilize the unit to help it reach desired conditions.

Management of the soil resource can be improved for future projects if skidder operators are discouraged from turning on sideslopes where possible. The recommendation is to reduce the amount of soil displacement by having the operator travel perpendicular to the hillslope as much as possible where slopes exceed 35 percent. These recommended changes will increase the percentage of activity units meeting desired conditions and will improve the maintenance of soil productivity and stability on National Forest lands.

Further Action Required: No further action is required.

Water Quality

A. Best Management Practices Implementation and Effectiveness

Objective: Monitor implementation of best management practices (BMPs) and evaluate their effectiveness at meeting state and federal water quality laws, Forest Plan goals, and Forest Plan standards and guidelines.

Methodology:

BMP Implementation Monitoring Checklists

BMP implementation monitoring checklists are required for all projects covered under category B of the Regional Water Board's Waiver of Waste Discharge Requirements Order No. R1-2015-0021. The checklists are developed by the Forest Service and submitted with the Category B Waiver enrollment package for approval by the Regional Water Board staff.

Road Project BMP Effectiveness Monitoring Checklists

BMP effectiveness monitoring checklists are required only for road projects covered under category B such as new road construction, re-construction, stream crossing repair, and culvert replacements. Effectiveness monitoring checklists are completed after one winter to assess whether the BMPs and on-the-ground prescriptions were effective in protecting water quality.

Best Management Practices Evaluation Program (BMPEP)

In addition to the BMP checklists, the Waiver requires BMP implementation and effectiveness monitoring using the Forest Service BMP Evaluation Program. Unlike the checklists which are completed for every project, the BMPEP monitors only a random sample of recently completed projects. The evaluation method follows the National Best Management Practices Technical Guide which is more rigorous than the checklists. A description of the methods used and an annual report of findings is posted on the Klamath National Forest Water Quality

Monitoring webpage at:

<http://www.fs.usda.gov/resources/klamath/landmanagement/resourcemanagement>

Results: BMP Implementation Monitoring Checklists

In 2017 implementation monitoring was conducted by USFS Timber Sale Administrators and corrective actions were taken where needed. BMPs were implemented on projects that were inspected.

Road Project BMP Effectiveness Monitoring Checklists

In 2017 monitoring was conducted by engineering and the watershed staff and corrective actions were taken where needed. BMPs were effective on projects that were inspected (Table 1).

Best Management Practices Evaluation Program

In 2017 the Klamath completed BMP evaluations at 7 sites. Projects included road decommissioning, prescribed fire, cable or aerial yarding operations, aquatic ecosystem improvements, range, and ground-based skidding and harvesting. BMPs were rated as implemented and effective at all of the sites evaluated in 2017 (Table 1).

Form	Project/Site	Implementation Rating	Effectiveness Rating	6 th Field Watershed
Fire A	First Creek Unit 2	Implemented	Effective	Horsethief Creek
Veg A	Mt. Ashland LSR Unit 207	Implemented	Effective	Cow Creek-Grouse Creek
Veg A	Mt. shland LSR Unit 711	Implemented	Effective	Cow Creek-Grouse Creek
Veg B	Mt. Ashland LSR Unit 230	Implemented	Effective	Cow Creek-Grouse Creek
Veg B	Mt. Ashland LSR Unit 763	Implemented	Effective	Cow Creek-Grouse Creek
Range A	Indian Creek Allotment	Implemented	Effective	Indian Creek
Rec A	Kangaroo Lake Campground	Implemented	Effective	Upper East Fork Scott River

Table 1. Results of BMP evaluations in 2017

Further Action Required: None

B. In-stream Sediment and Temperature Monitoring

Objective: In-channel sediment monitoring is required by the Klamath National Forest Forest Plan Table 5-1, as a condition of the North Coast Water Board's Waiver of Waste Discharge Requirements, and in the Forest Service R-5 Water Quality management Handbook FSH 2509.22 Chapter 10. The purpose of the in-channel monitoring is to help determine whether USFS project management and BMPs are collectively effective in meeting water quality objectives at the watershed scale.

Methodology: The sampling methodology is described in the 2015 sediment monitoring report which provides a comprehensive overview of the sediment monitoring program (USDA

2016)². Fine sediment is monitored near the mouth of 79 tributary streams with each site sampled on a five-year rotation. Effects are evaluated by comparing values in managed streams with those in reference streams which are located in wilderness and roadless areas. Sediment deposition on stream beds is measured using three methods:

- Percent fine sediment in the bed subsurface is measured using a McNeil core sampler (Schuett-Hames et al., 1999)³
- Percent fine sediment on the riffle surface is measured using a sampling frame similar to Cover (2008)⁴
- The portion of pools filled with fine sediment is measured using the V* method (Hilton and Lisle, 1993)⁵

Stream temperature monitoring is located at the same sites as for sediment plus some additional sites that are suitable only for temperature monitoring. Stream temperature is measured using digital dataloggers sampling at half hour intervals. The procedures used for temperature sampling, data processing, and quality control are provided in a quality assurance project plan that was approved by the North Coast Regional Water Board in 2010.

Results:

Stream Sediment

In 2017 the Klamath National Forest monitored fine sediment in 16 streams (Table 2). The sampling locations and methods were the same as described in the 2015 sediment monitoring report and the Klamath National Forest Sediment and Temperature Monitoring Plan (USDA 2009). The emphasis for 8 streams was on re-measuring watersheds that burned at a high-severity during wildfires in 2014 and 2016. The trends in Figure 1 update those in last year's Waiver Monitoring Report from 2016. The emphasis for the other 8 streams was on re-measuring reference streams. The Klamath National Forest plans to resurvey of all 20 reference streams by next year (2019) and reevaluate the reference condition in the 5-year report due in 2020.

² USFS, 2016. Streambed Sediment Conditions on the Klamath National Forest 2009 to 2015. Klamath National Forest Pacific Southwest Region 1711 S. Main St. Yreka, CA 96097. Revised: 1-22-2016

³Schuett-Hames, D., R. Conrad, A. Pleus, and M. McHenry. 1999. *TFW Monitoring Program Method Manual for the Salmonid Spawning Gravel Composition Survey*. Prepared for the Washington State Dept. of Natural Resources under the Timber, Fish, and Wildlife Agreement. TFW-AM9-99-001. DNR #101. March.

⁴ Cover, M.R., C.L. May, W.E. Dietrich, and V.H. Resh. 2008. *Quantitative linkages among sediment supply, streambed fine sediment, and benthic macroinvertebrates in northern California streams*. J. N. Am. Benthol. Soc. 27(1):135-149.

⁵ Hilton, S., and T.E. Lisle. 1993. *Measuring the Fraction of Pool Volume Filled with Fine Sediment*. USFS PSW-RN-414-WEB. July.

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Stream		Portion of Pools Filled (V*)	Surface Fines (%)	SubSurface Fines <6.35 mm (%)	SubSurface Fines <.85 mm (%)
South Russian Creek	Managed	0.095	4.8	50.8	14.7
Elk Creek 2	Managed	0.093	6.0	54.8	19.1
Walker Creek 1	Managed	0.035	3.3	72.2	32.1
Whites Gulch	Managed	0.058	3.2	40.3	11.3
Canyon Creek Scott 2	Managed	0.073	1.9	47.7	14.6
Grider Creek 1	Managed	0.033	3.5	45.8	15.2
Horse Creek 1	Managed	0.098	4.4	57.1	22.4
Beaver Creek 1	Managed	0.030	3.6	50.2	19.1
Mill Creek Etna	Reference	0.007	0.5	19.4	2.7
Canyon Creek Seiad 1	Reference	0.048	2.5	32.9	8.0
Fort Goff 1	Reference	0.032	3.6	43.9	19.8
Portuguese Creek 1	Reference	0.036	1.5	35.9	11.9
Twin Valley Creek	Reference	0.015	0.6	24.1	5.2
Uncles Creek	Reference	0.082	3.3	43.8	16.0
Upper S.F. Salmon River 2	Reference	0.042	2.5	45.3	10.2
Wooley Creek 2	Reference	0.030	0.9	37.7	8.7

Table 2. Stream Sediment monitoring results for 2017

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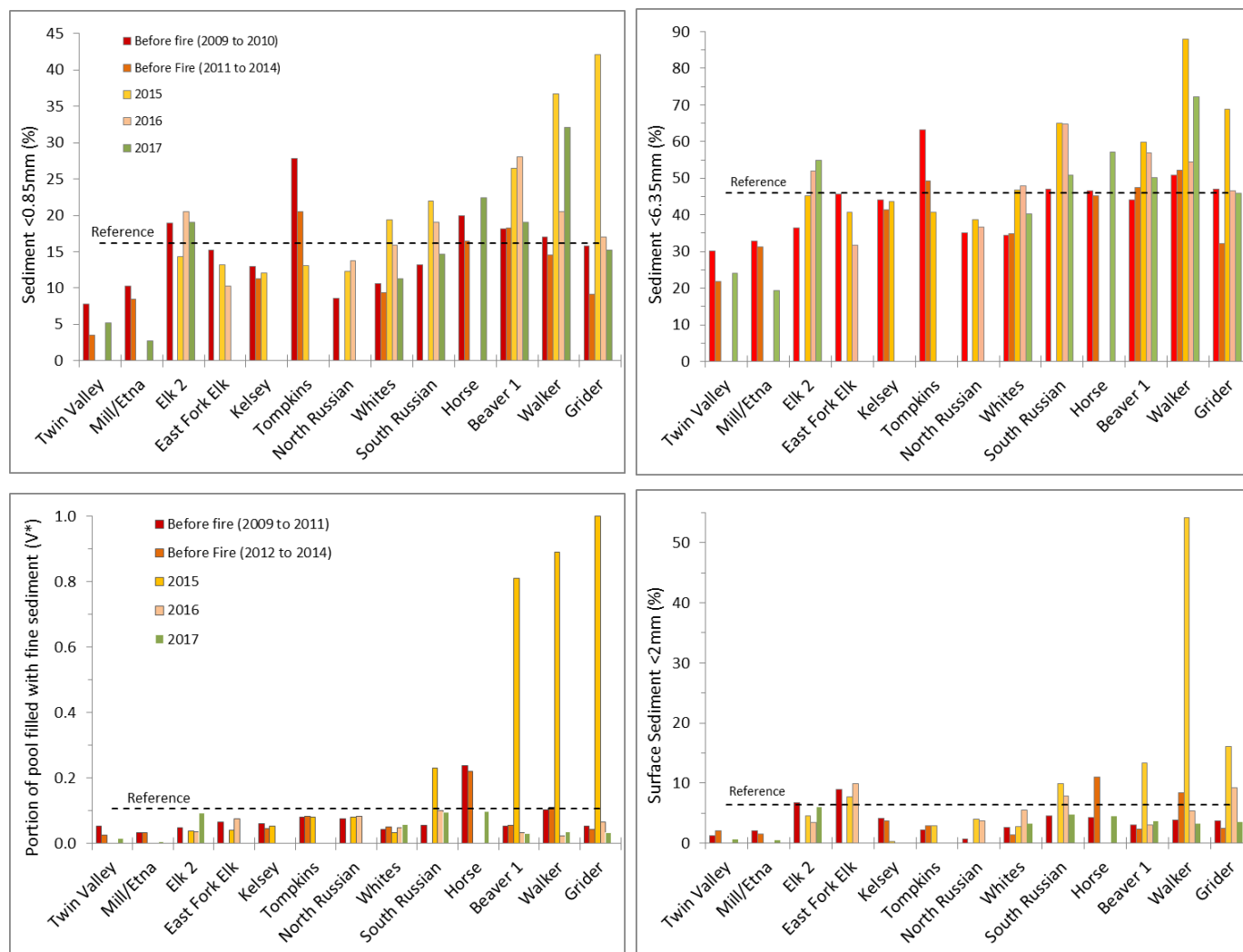


Figure 1. Trends in streambed fine sediment before and after high severity burns in 2014. The reference condition represents sediment values in unmanaged reference streams as described in the 2015 sediment monitoring report (USFS 2016).

Stream Temperature

Stream temperature dataloggers were deployed at 125 sites including all of the sites listed in the Klamath National Forest monitoring plan. There was data entered into the Forest Service database. As required by the Waiver the Klamath National Forest will conduct an analysis of the data for the five-year summary report due in 2020.

Further Action Required: None.

C. Forest Cumulative Watershed Effects Modeling

Objective: Test the validity of the techniques used for determining thresholds of concern in the Forest Plan. Required in Table 5-1 of the Forest Plan.

Methodology: The validity of the Forest cumulative watershed effects models are tested by comparing equivalent roaded area and modeled sediment supply with the in-stream fine sediment measured in section B above.

Results: The 2015 report to the Regional Water Board identified potential thresholds for equivalent roaded area and road density based on the probability of exceeding reference conditions for in-stream fine sediment. The full results are posted on the Klamath National Forest water quality monitoring webpage.

Further Action Required: An interagency review is needed to interpret the potential thresholds identified in the sediment analysis and recommend revision of the CWE thresholds.

Air Quality

Objective: Monitor the effects of forest management activities on air quality related values (biologic resources and visual quality) of the Class I area in Marble Mountain Wilderness using methods identified in GTR-RM-168 and to comply with the Clean Air Act.

Methodology: Data on the impacts of ozone and sulfur/nitrogen deposition data were compiled for sub-watersheds (6th field Hydrologic Unit Code) on the Forest during the Watershed Condition Classification analysis in 2010 and are still valid. Air quality related lichen plots, installed and photographed in 1992, were re-photographed in the Marble Mountain Wilderness in 2012. This fiscal year, the photos were digitized and quantitatively analyzed to determine if there have been any changes in air quality between 1992 and 2012.

Results: The sub-watersheds in the Marble Mountain Wilderness (Upper Elk Creek, Upper Wooley Creek, Middle Wooley Creek, Lower Wooley Creek, North Fork Wooley Creek, Hancock Creek, Grant/NF Salmon River, Right Hand Fork Salmon River, Yellow Dog Creek, Shackleford Creek, Canyon Creek, and Kelsey Creek) all have sulfur/nitrogen deposition that is at least 10 percent below the critical terrestrial threshold.

The findings of the lichens study indicate that there was not a strong correlation that could be observed based on predominate wind flow direction or elevation; of the trends observed, the parent material and vegetation type did not appear to have any bearing on the trend increasing or decreasing over time. However, three of the plots in Marble Valley sites showed slightly decreasing populations. This indicates that of all the lichen plot locations, the Marble Valley may be receiving the most air pollutants

or otherwise has had some environmental event that is causing slight decrease in the trend of lichen populations in the Marble Valley. It is hard to pinpoint the exact cause of these trends but the pollutants associated with the decreasing trends are fluoride, sulfur dioxides, and oxidants.

The primary sources of fluoride emissions in or adjacent to Siskiyou County are the use of chemicals related to agriculture including pesticides. The primary sources of sulfur dioxide emissions found in or around Siskiyou County are industrial processes such as wood pulping, paper manufacture and petroleum refining. And the primary source of oxidants is vehicle emissions and emissions from manufacturing. Forest management is very distantly and indirectly associated with these sources and is not likely to be measurably contributing to this trend in air quality in Marble Valley.

Further Action Required: No further action is required. The next round of long-term photo monitoring will be conducted again between 2025 and 2030.

Biological Diversity

A. Size and Shapes of Openings

Objective: Ensure timber harvest openings are consistent with ecosystem composition, structure, and function.

Methodology: The use of remote sensing data for this monitoring is identified in the Forest Plan. Since vegetative treatments have not created openings large enough to trigger remote sensing analysis, no monitoring has been conducted.

Results: N/A

Further Action Required: No further action is required.

A. Other Monitoring Efforts – Russian Wilderness forest composition, structure, and health

Objective: Analyze and write up data from over 200 vegetation plots in the Russian Wilderness on the Klamath National Forest that were originally established in 1969 to assess changes in tree species composition over the last 45 years. Vegetation plot data was also supplemented by the collection on detailed forest pathology data on *Abies magnifica* var. *shastensis* (Shasta red fir) and an assessment of fuel build-up around large legacy *Pinus lambertiana* (sugar pines) in lower elevation mixed conifer forests within the Russian Wilderness.

Methodology: The province ecologist and two graduate students from Humboldt State University analyzed vegetation data collected from 207 repeat plots in the Russian Wilderness to look at the roles of fire, fire exclusion, and the potential impacts of climate change on forest structure and composition over time. The goal of this study is to better understand forest disturbance processes in enriched mixed conifer forests on National Forest lands.

Results: The first publication from this monitoring work was published in the journal *Fremontia* in January 2016. It is titled “Revisiting John Sawyer and Dale Thornburgh’s 1969 vegetation plots in the Russian Wilderness: a legacy continued.” Two additional manuscripts have been submitted for publication in peer-reviewed journals and are currently in review. This study is part of a series of

research projects by several graduate students at Humboldt State University. All field work has been completed and published results are forthcoming.

Further Action Required: No further action in future years is required.

B. Other Monitoring Efforts – Red fir monitoring

Objective: The primary objective of our study was to quantify the level of Shasta red fir mortality across a uniquely diverse region in the Klamath Mountains, and to better understand what endogenous and exogenous processes are contributing to recent mortality.

Methodology: In 2016, 19 monitoring plots were established on burned and unburned National Forest land in the Marble Mountain Wilderness. Plot locations were chosen using a particularly defined selection protocol, wherein the location had to have greater than 50 percent red fir canopy cover, must be unlogged and 100 meters from any human disturbances or other plots, and must have been moderately burned twice with the most recent fire being after 1980. Unburned control plots were established near the burned locations and have similar geographical features.

Results: Tree mortality rates are increasing in North America, yet our understanding of the processes affecting mortality across different tree species is limited. We assessed drivers of recent mortality in the Russian Wilderness, an area in the Klamath Mountains (California, USA) with the highest conifer diversity on record. We surveyed 3446 trees across 142 plots and document widespread die-off of *Abies magnifica* var. *shastensis* (Shasta red fir), a common species across this area, and notably high levels of mortality for *Abies lasiocarpa* (subalpine fir) and *Pinus contorta* var. *murrayana* (lodgepole pine). Both fir species were susceptible to *Arceuthobium abietinum* subsp. *Wiensii* (Wien's dwarf mistletoe), and for Shasta red fir, mistletoe rating was positively correlated with the proportion of trees with fir engraver beetle (*Scolytus ventralis*). Shasta red fir mortality increased with stand density, and in plots with larger recent increases in minimum winter temperature. We also document mortality and levels of pests and pathogens for nine additional conifer taxa, including several species with limited distributions. Our study highlights the complexity of climate, stand density, pathogens, and insects as they relate to tree mortality across different taxa, and is the first to investigate the current die-off of Shasta red fir.

These plots are part of a larger effort by the Region 5 Regional Ecology Program to better understand recent mortality in red fir throughout its range in Region 5. The most recent publication from this work is: Melissa H DeSiervo, Erik S Jules, Drew S Bost, Emily L De Stigter, Ramona J Butz; Patterns and Drivers of Recent Tree Mortality in Diverse Conifer Forests of the Klamath Mountains, California, *Forest Science*, <https://doi.org/10.1093/forsci/fxx022>.

Further Action Required: This study is part of a region-wide effort in red fir monitoring. Data is currently being analyzed and published results are forthcoming. No further action in future years is required.

C. Other Monitoring Efforts – Knobcone pine monitoring

Objective: Fire plays an important role in the evolution of life history strategies of plant species around the world, especially in regions that experienced frequent fires. Because of this, there is global concern that many populations of fire adapted species currently exist in a decadent state and are at risk of local extirpation from fire exclusion over the last century. These populations face uncertain futures in which cones never open and larger trees senesce without producing offspring. At the same time, there is also

concern that recent increases in fire activity and shortened fire return intervals pose a risk in young stands as fire might kill trees before they reach a cone-producing age (i.e., immaturity risk, interval squeeze). While conceptual models for assessing vulnerability to both threats exist, there are a lack of empirically-based studies on how populations of fire-dependent are being affected both across their ranges and at more localized spatial scales. Despite recent increases in wildfire activity across its range, most knobcone pine populations exist in mature and old-growth stages and recently initiated stands were relatively rare.

Methodology: We used a systematic sample of forest inventory plots measured over a 10-year interval to examine the population dynamics of a closed-cone pine, *Pinus attenuate* (knobcone pine) across its range in southwestern Oregon and California, USA to answer the following questions: 1) what are recent trends in the amount of area burned within the range of knobcone pine?; 2) how does stand-scale population structure vary across its range and how is it changing?; and 3) what are current population trends and how do colonization and extirpation vary geographically?

Results: Less than 25 percent of the plots contained populations that were stable over the 10-year period, while a similar number of plots experienced either gains or losses. Knobcone pine experienced local extirpations across slightly more than 15 percent of its range. However, new colonization occurred across almost 25 percent of the plots, and resulted in a cumulative expansion of knobcone pine across its range. Expansion of knobcone pine into shrublands and chaparral may provide alternative pathways of persistence for this species, but could affect selection for serotiny (cones dependent on heat to release seed) and loss of biodiversity associated with forest encroachment. Our results highlight the unanticipated effects of fire exclusion and the potential for alternative pathways of persistence under climate change and anthropogenically (changes in nature made by people) altered disturbance regimes. Our study also provides a general framework that can be used assessing range-wide population dynamics of other fire-dependent species with commonly available spatial data.

Further analyses of these data are currently underway. Multiple manuscripts are being written and will be submitted for publication and provided to the Forests. This study is part of a Northern Province effort on knobcone pine monitoring. Data are currently being analyzed and published results are forthcoming.

Further Action Required: No further action in future years is required.

Sensitive Plants

Objective: Assure maintenance of sensitive plant populations and/or species viability.

A. Project Planning

Methodology: About 1,400 acres were inventoried in FY 2017 for projects in planning stages. Surveys were conducted for Forest Sensitive species, Survey and Manage Category A and C species, and federally Endangered plant species. Different types of projects included: forest management (Harlan, East Fork Scott, Horse Creek, Elk Creek etc.), habitat restoration (channel restoration) mining, grazing, right of way (Pacific Power line replacement) and hazardous fuel reduction where threats and protection measures needed to be identified. Surveys were intuitively controlled, searching suitable habitats for new populations of Sensitive plant species, and confirming status of known populations.

Results: One previously unknown population of *Eriogonum hirtellum* (Klamath Mountain Buckwheat) was found during surveys for the Horse Creek Community Protection and Forest Restoration Project on

the Oak Knoll Ranger District. The population was documented and entered in Forest and National (NRIS) databases.

Expansion of known populations of *Cypripedium fasciculatum* and *C. montanum* were documented on the Salmon River District. Populations were within the Jess Vegetation Management project and were flagged for avoidance. Populations were documented and data was updated in Forest and National (NRIS) databases.

Known populations of *Cypripedium fasciculatum*, *Eriogonum hirtellum*, *Erythronium hendersonii*, *Ivesia pickeringii*, *Minuartia stolonifera*, *Thermopsis robusta*, and *Ptilidium californicum* were surveyed for and/or revisited in FY 2017. If necessary populations were flagged for protection in FY 2017. These species were buffered for protection from activities associated with Forest management activities.

Further Action Required: Sensitive plant inventories are a regular component of the Klamath National Forest botany program and will continue. Populations buffered for avoidance during project planning stages will be monitoring for implementation effectiveness in future years.

B. Mitigation and Implementation Effectiveness Monitoring

About 150 acres of field monitoring was conducted on sites where mitigation measures (buffers) have been applied for project implementation. Monitoring measured 1) implementation (if buffers correctly applied) and 2) effectiveness (if buffers protected species as expected).

Cypripedium fasciculatum and *C. montanum* (clustered and mountain lady's slipper)

Methodology: Selected populations are revisited annually within project areas under evaluation and where projects have already been implemented. In 2017, populations protected during the 2016 Gap Fire were revisited to assess the effectiveness of protection buffers.

Results: Monitoring indicates that protection measures have been effective at protecting plants and their habitat. No management related mortality was documents.

Further Action Required: No further action is required.

Calochortus persistens (Siskiyou mariposa lily)

Methodology: Monitoring plots were established in the Craggy Vegetation Management Project area to document the effects of prescribed fire and hand thinning on Siskiyou mariposa lily populations as well as the abundance of non-native invasive species.

Results: Data collected in FY 2017 will help establish a baseline for the number of lilies and the abundance of invasive species in each plot prior to project implementation.

Further Action Required: Baseline data collection will continue until the project is implemented. Following implementation, plots will be monitored for five years to document impacts of project activities on the lily and invasive species.

Ivesia pickeringii (silky mousetail)

Methodology: Project design features protecting silky mousetail from impacts associated with pile and burning activities in the Roo project were monitored.

Results: Implementation in the Roo project area was successful. The trees that were hand-cut and piled on the edge of the meadow were piled in areas designated by the botanist, and some piles were burned

during the fall/winter of 2016. Four monitoring plots, including a control, were established in FY 2013 to observe the effect of pile burning on silky mousetail. The response adjacent to piles that have been burned to date, has been favorable. Presently, meadow habitat containing *Ivesia* sp. appears to be thriving. The area of meadow that was planted with *Festuca idahoensis* (Idaho Fescue) plugs in the fall of 2011 continues to show improvement in vegetative cover.

Further Action Required: No further action is required.

Minuartia sotolonifera (Scott Mtn. Sandwort):

Methodology: Populations within the Roo project area where monitored for project related impacts.

Results: Populations occur in rocky outcrops and gravel barrens that were not anticipated to be affected by project activities and subsequently no project design features were implemented. Monitoring indicates that the project did not negatively affect populations. In fact, thinning treatment of nearby Jeffrey pine stands appear to have increased available habitat and encouraged expansion of the population.

Further Action Required: No further action is required

Phacelia greenii (Scott Valley Phacelia):

Methodology: Populations within the Roo project area where monitored for project related impacts.

Results: Monitoring indicates that protection measures (flag and avoid) have been effective at protecting plants and their habitat. No flagged populations were impacted by project activities.

Further Action Required: No further action is required.

Ptilidium californicum (Pacific fuzzwort)

Methodology: Project design features protecting Pacific fuzzwort populations for the Two-bit project area were monitored.

Results: Monitoring indicates that protection measures have been effective at protecting plants from management related mortality. Tree's hosting Pacific fuzzwort were not removed or damaged during skidding operations. Although a few buffer zones were impacted by skidding operations, populations were not directly impacted and were still alive and healthy during FY 2017 monitoring.

Further Action Required: No further action is required.

Thermopsis robusta (robust false lupine)

Methodology: Fruiting populations of robust false lupine were protected from suppression related impacts during the Pony Fire. Robust false lupine populations tend to benefit from disturbance, especially mastication and ground disturbance, therefore, not all individuals were protected.

Results: Monitoring indicates the protection measures were effective and no management related mortality was documented for protected individuals. It was too soon after the Pony Fire to evaluate regeneration in disturbed areas.

Further Action Required: No further action is required.

C. Other Monitoring

a. Rare and Declining Species

Objective: To determine the condition of special habitat occupied by rare and declining species that may be federally listed as threatened or endangered, or Federal candidate species.

Callitropsis nootkatensis (Yellow cedar)

Methodology: Collaborative surveys were conducted by Michael Kauffmann and the California Native Plant Society to better map and inventory 10 yellow cedar stands on the Klamath National Forest, including sites at Elk Hole, Bear Lake, The Lieutenants, Echo Bell, and Twin Valley. The California Native Plant Society and California Department of Fish and Wildlife Combined Vegetation Rapid Assessment Form (revised on 06/06/2017) was used for data collection. In addition, Klamath National Forest crews revisited the stand at Polar Bear Mountain.

Results: Six of the ten identified sites were visited in 2017. Remaining sites were missed due to fire activity. General trends show that trees are healthy, producing cone, and reproducing through both germination and cloning. In certain cases, populations appear to be expanding.

Further Action Required: Surveys of the remaining four sites and a final report summarizing findings are planned for completion in FY 2018.

Pony Fire BAER Surveys

Methodology: Surveys were conducted in areas impacted by suppression activities such as fire lines, safety zones, heli-spots, and drop points.

Results: One new infestation of meadow knapweed was discovered near a water drafting site. Existing sites within the fire area were treated by Klamath National Forest staff and the Mid Klamath Watershed Council.

Further Action Required: New and known infestations will continue to be treated as funding, staffing, and priorities allow.

Gap Fire BAER Surveys

Methodology: Surveys were conducted in areas impacted by suppression activities such as fire lines, safety zones, heli-spots, and drop points.

Results: Twelve new infestations of *Isatis tinctoria* (dyer's woad) were located and treated by Forest BAER survey crews.

Further Action Required: New infestations will continue to be treated as funding, staffing, and priorities allow.

Calochortus persistens (Siskiyou Mariposa Lily)

Methodology: This species is geographically limited to three known occurrences west and north of Yreka, CA. The main threats to the species are thought to be an invasive species, *Isatis tinctoria*, locally known as Marlahan mustard or Dyer's woad, and the risk of fire suppression activities. In FY 2013 a Conservation Agreement was signed between the Klamath National Forest, the Fish and Wildlife Service, and the Bureau of Land Management. The schedule of conservation actions in the document specifies annual actions, including annual weed treatment.

Annual weed treatments have been conducted for fourteen years in specific areas that are adjacent to and within occupied habitat, in order to reduce seed production and invasive species impact. In FY 2017, 140 acres were treated for *Isatis tinctoria*.

In FY 2017, Forest staff established monitoring plots to document the effects of prescribed fire and hand thinning on Siskiyou mariposa lily populations as well as the abundance of non-native invasive species. Baseline data is currently being collected and will continue to be until the project is implemented. Following implementation, plots will be monitored for an additional five years.

Results: Due to the effective implementation of the Conservation Agreement and the continued reduction of noxious weed infestations located within suitable habitat, Siskiyou Mariposa Lily was removed from the Federal Candidate list in FY 2015. Continued monitoring of occupied habitat indicates that where treatment has been taking place, Siskiyou Mariposa Lily is gradually decreasing.

Further Action Required: Continued implementation of the Conservation Agreement.

Parnassia fimbriata var. *intermedia* (fringed grass of Parnassus):

Methodology: Site visit to assess health and viability of population at Kangaroo Lake.

Results: Population was very healthy during monitoring visit. There was no sign of disturbance to population.

Further Action Required: No further action is required.

Raillardella pringlei (showy raillardella):

Methodology: Site visit to assess health and viability of population at Little Mill Creek Meadows.

Results: Population was very healthy during monitoring visit. There was no sign of disturbance to population.

Further Action Required: No further action is required.

b. Vegetation Recovery, O'Neil Pond

Methodology: Monitoring of vegetation recovery around the salmon rearing pond constructed at O'Neil Creek for the purposes of enhancing riparian habitat in lieu of habitat loss due to culvert replacement by Caltrans, along Hwy 96.

Vegetation recovery will be monitored for five years, or until 65 percent re-vegetation has been reached. Plots will be established using a standard sampling protocol.

Results: Forty-four plots were monitored along a 110 meter transect. Mean vegetation cover was 61 percent in 2017, a 2 percent increase from 2016. To increase cover on the constructed edge of the pond, 4 alder, 6 Oregon Ash, and 11 arroyo willow were planted. Trees were planted in burlap sacks due to very limited top soil present on the rocky, river bar. Tree survival will be reported in FY 2018.

Native species represent 73 percent of identified plants and the majority are facultative wetland or obligate wetland species. Non-native *Melilotus albus* (white sweet clover), and *Rubus armeniacus* (Armenian blackberry) were removed in the vicinity directly surrounding the pond. Other non-native species recorded at the site include: *Daucus carota*, *Hypericum perforatum*, *Lotus corniculatus*, *Melilotus albus*, *Mentha arvensis*, *Plantago major*, and *Veronica anagalis-aquatica*. These are all low priority weed species on the Forest, and are generally considered naturalized across the county.

Euphoria esula (Leafy spurge) is known to be present on the river bar near the pond, however none has been recorded during pond surveys.

Further Action Required: Final monitoring and report are due in FY 2018.



Figure 2. O'Neil Creek pond August 2017.

Wildlife

A. Bald and Golden Eagles

Objectives: 1) Determine trend and productivity of breeding population; 2) evaluate trend of habitat delineated to meet Recovery Plan objectives; 3) determine use, condition and trend of identified active and potential roost sites; and 4) assess effectiveness of Forest Plan standards and guidelines.

Methodology: The Forest monitors bald and golden eagles annually using two primary methods of monitoring: 1) mid-winter eagle counts and 2) breeding period surveys.

Mid-winter eagle counts monitor bald and golden eagle winter use along seven monitoring routes covering the Mid-Klamath, Salmon and Scott Rivers, and the Shasta and Scott Valleys (about 200,000 acres in total). These monitoring results are combined with a larger dataset of the winter use trends of bald and golden eagles across the western United States. Breeding period surveys target known nest

locations and river habitat where eagles are expected to occur and document the nesting chronology and reproductive success of each nest by repeated observations over the course of the breeding season (March through August).

Bald and golden eagle monitoring in FY 2017 was conducted by Forest Service personnel, California State Fish and Wildlife, and community volunteers.

Results:

Breeding Period Surveys

Goosenest Ranger District: In FY 2017, 12 of 16 known bald eagle nest sites were monitored across the District. Of these 12 nests, seven nests produced ten young, five were inactive and the status on the remaining nests was unknown (inconclusive). There are 15 historic golden eagle nests on Goosenest Ranger District. In FY 2017, 2 nests were surveyed and determined to be occupied but reproduction was undetermined.

Happy Camp/Oak Knoll Ranger District: Breeding period monitoring for the District in FY 2017 monitored three known bald eagle nest locations along the Klamath River. All nest sites were active during the 2017 season. Reproduction was confirmed at two nests.

Salmon/Scott River Ranger District: In FY 2017, the breeding survey monitoring occurred on three known bald eagle nest locations along the Salmon and Scott River watersheds. Two of the three known bald eagle nests were active and had confirmed reproduction. A total of 15 visits were made to monitor the nests.

Mid-Winter Eagle Counts

On the Goosenest District, bald eagles were detected at two of three known winter roosts, and seven adult and six immature bald eagles were observed along the 180 mile census route. Six golden eagles were also observed along the Goosenest census route. In addition, 112 raptors representing eight diurnal species, including 40 ferruginous hawks, were observed along the route.

On the westside of the Forest between the Happy Camp/Oak Knoll and Salmon/Scott River Ranger Districts, seven winter census routes were surveyed and 50 adult bald eagles and 19 golden eagles were observed.

Table 3 shows the combined results of the mid-winter bald eagle counts on the Happy Camp/Oak Knoll and Salmon/ Scott River Ranger Districts from 2007-2017. The population trend for bald eagles has been stable or improving.

Year	Number of Eagles Observed
2007	30
2008	30
2009	30
2010	37
2011	11
2012	12

Year	Number of Eagles Observed
2013	14
2014	11
2015	24
2016	16
2017	63

Table 3. Mid-Winter Bald Eagle Counts for Happy Camp/Oak Knoll and Salmon/Scott River Ranger Districts: 2007-2017.

Further Action Required: Successful nesting and winter use indicates that management standards are effective. No further action is required.

A. Peregrine Falcon

Objectives: 1) Verify nesting and reproductive success during breeding season. 2) Assess effectiveness of Forest Plan standards and guidelines.

Methodology: Field monitoring using spotting scopes and/or binoculars to determine nesting status and reproductive success at known peregrine falcon eyries (or nests).

Results:

Goosenest Ranger District: No known peregrine falcon eyries on the District.

Happy Camp/Oak Knoll Ranger District: Two peregrine falcon eyries were monitored on the District. Two eyries were active and reproductively successful.

Salmon/Scott River Ranger District: One peregrine falcon eyrie was monitored. Nesting was not confirmed. No new nest sites were discovered in FY 2017.

Peregrine falcons are no longer listed as an endangered species under the Endangered Species Act due to a long-term improving trend in the population. Forest Plan standards and guidelines designed to maintain habitat and minimize disturbance to sites have been effective.

Further Action Required: No further action is required.

B. Northern Spotted Owl

Objective: Assessment of northern spotted owl (NSO) in project areas and within late successional reserves (LSRs).

Methodology: Standardized protocols were used for all inventories (USFWS 2012). Monitoring was conducted by Forest Service personnel, with assistance from student interns from the Student Conservation Association, U. S. Fish and Wildlife Service, and private contractors.

Results:

Goosenest Ranger District: Over 41,500 acres were surveyed for NSOs as part of the monitoring process for the Butte Mountain LSR Habitat Restoration Project. Eighteen NSO territories were monitored within the project area. Two territories were occupied by NSO pairs and produced two NSO fledglings.

Surveys were coordinated with Fruit Growers Supply Company in Bull Meadow, Lucky Springs and four other Activity Centers that occur on private land. On the eastside of the district 41,288 acres were surveyed. A total of 30 territories were surveyed with various intensities (Table 2). Nine NSO territories were monitored, of which one territory had one NSO individual detected; the remaining territories had no detections. Barred owls were detected in several regions of the Butte Mountain project area. In FY 2017, barred owls were detected on 12 of the 18 call routes surveyed on the district, compared to two routes in FY 2006.



Figure 3. Northern spotted owl pair with young at Harris Creek on Goosenest Ranger District.

Photo courtesy Melissa Hunt

Happy Camp/Oak Knoll Ranger District: A total of 65 NSO activity centers in seven project areas were monitored in FY 2017. Survey efforts in FY 2017 included project areas and monitoring known sites within the Westside Fire Recovery and Gap Fire. A total of five pairs were located over the course of the survey season. All five of these pairs successfully nested and produced fledge. In addition, 13 single NSOs were detected in the survey areas. At least one barred owl activity centers was identified across multiple project areas with that pair nesting successfully and producing fledge.

Salmon/Scott River Ranger District: Of the approximate 34 NSO activity centers monitored in eleven project areas, five sites had a single NSO detected; one site had non-reproductive pair; and one site had reproduction confirmed. The remaining 27 historic activity centers were surveyed and determined to be unoccupied for the FY 2017 field season. One barred owl was detected in the Cherry Creek area.

Further Action Required: No further action is required.

C. Northern Goshawk

Objective: Determine occupancy of suitable habitat.

Methodology: Standardized protocols were used for all inventories. Monitoring was conducted by Forest Service personnel, with assistance from student interns from the Student Conservation Association, USFWS, and private contractors.

Results:

Goosenest Ranger District: A total of 31 of 52 known territories across 43,800 acres on the District were surveyed for northern goshawk. A total of 23,080 acres were surveyed on the east side of the district and

a total of 20,800 acres were surveyed on the west side of the district. Nine territories were determined to be active and six fledglings were produced. The remaining territories were assumed to be inactive.

Happy Camp/Oak Knoll District: Goshawk surveys were conducted within the Happy Camp Fire, Two-Bit, Beaver and Gap Fire project areas. One territories had goshawk activity documented. No nesting was confirmed.

Salmon/Scott River Ranger District: No goshawks were monitored in FY 2017.

Further Action Required: No further action is required.

D. Willow Flycatcher

Objective: Determine occupancy of suitable habitat.

Monitoring and Results:

Goosenest Ranger District: No willow flycatcher detections or captures occurred at the Antelope MAPS station.

Happy Camp/Oak Knoll and Salmon/Scott River Ranger Districts: Due to active wildfires and road closures surveys were not conducted for willow flycatchers in 2017 (Table 4).

Further Action Required: No further action is required.

Year	Number of captures
2010	17
2011	3
2012	3
2013	10
2014	9
2015	1
2016	1
2017	0

Table 4. Willow flycatcher captures at Seiad Valley PCT1 Constant Effort Mist Netting Station: 2010-2017.

E. Great Grey Owl

Objective: Determine occupancy of suitable habitat.

Monitoring and Results: No monitoring was conducted in FY 2017 on the Klamath National Forest because pre-project surveys are not required. Removal of suitable habitat is not proposed by current projects.

Further Action Required: No further action is required.

F. Other Monitoring - Migratory Songbirds

Objective: Gather baseline data on Neotropical migrants.

Monitoring and Results:

Goosenest Ranger District: Antelope Creek MAP Station is run by the Klamath Bird Observatory and the methods follow protocol as described by the Institute of Bird Populations. During the banding season about 40 species of migratory birds were captured and numerous other species were observed. Volunteers from the Student Conservation Association assisted with banding efforts in FY 2017.

Happy Camp/ Oak Knoll and Salmon/Scott Ranger Districts: Due to active wildfires and road closures surveys were not conducted for migratory songbirds in 2017.



Figure 4. Yellow-breasted Chat

G. Other Monitoring – Swainson’s hawk and Butte Valley National Grassland avian monitoring

Objective: Gather baseline data.

Methodology: Monitoring in Butte Valley National Grassland in Macdoel, California continues as part of an ongoing program that has provided data on Swainson’s hawk survival, reproduction, recruitment and migration for over 40 years. About 120 hawk territories are regularly assessed.

Monitoring and Results:

In FY 2017, 103 Swainson’s hawk territories were monitored and 105 nests were located in and around Butte Valley National Grassland. Fifteen of the 94 nests were on National Forest System land. Fifteen adults were trapped and 3 transmitters were deployed. Apparent nest success was 74 percent (70 nests were successful) with 24 nests failing over the season. A total of 157 nestlings were banded, exceeding the previous record of 115 banded in a single season. Average productivity was 1.7 young per nest, an increase of 0.5 over 2016. For unknown reasons phenology of nesting was advanced this year. Banding typically extends into August, this year all banding was completed before August.

Data gathered during Butte Valley surveys are contributing to studies on natal dispersal and manuscripts on mating patterns, stable isotopes, and seasonal interactions are being submitted to peer-reviewed journals. Nestlings are banded with two types of leg bands for ease of identification: plastic color bands and metal bands as shown in photo (below). One bird fitted with a transmitter was confirmed to complete the 5,000 mile migration to Buenos Aires, Argentina.

Other avian species monitored on the Butte Valley National Grassland include American kestrels, great horned owls, barn owls and red-tailed hawks.

Partnerships were established with the Golden Gate Raptor Observatory and Colorado State University – Ft. Collins. In 2017 over 1600 hours were spent on the Swainson’s hawk project by researchers and volunteers, including Student Conservation Association volunteers, contributed over 400 hours assisting with banding and data collection.



Figure 5. Volunteers holding barn owls during Butte Valley avian monitoring

H. Other Monitoring – Breeding Bird Survey:

The Breeding Bird Survey is a large-scale survey of North American birds. It is a roadside survey, primarily covering the continental United States and southern Canada, although survey routes have recently been initiated in Alaska and northern Mexico. The Breeding Bird Survey was started in 1966 and now contains over 5,000 survey routes which are surveyed in June by experienced birders. The primary objective of the Breeding Bird Survey has been the estimation of population change for bird encountered along habitats surveyed from roadsides.

Objective: The mission of the North American Breeding Bird Survey is to provide scientifically credible measures of the status and trends of North American bird populations at continental and regional scales to inform biologically sound conservation and management actions. Determining population trends, relative abundance, and distributions of North American avifauna is critical for identifying conservation priorities, determining appropriate conservation actions, and evaluating those actions.

Monitoring and Results: For FY 2017 season, the Cecilville Route (#14429) was surveyed on June 10, 2017. The Forest detected about 20 species at many locations along the 15-mile route. The highest frequency species detected were western tanager and Steller’s jay.

I. Other Monitoring – Gray Wolf

Objective: Gather baseline data for uncommon species.

Bait station remote cameras were run in key locations during the FY 2017 field season across the Klamath National Forest. This is a rare species that is potentially re-establishing in Northern California. Little is known of current distribution. Initial detections of the Shasta Pack were recorded on the nearby McCloud Ranger District of the Shasta Trinity National Forest in 2015. In addition, in 2017, howling surveys were conducted from mid-June thru mid-July in specific locations in the Marble Mountain Wilderness and the Goosenest Ranger District. No wolves were detected from these 2017 efforts.

Further Action Required: No further action is required.

Fisheries Management

A. Sensitive Species

Objective: Determine population trends and habitat conditions for steelhead trout and Chinook salmon.

Summer-run steelhead and spring Chinook holding census, Happy Camp/Oak Knoll Ranger District

Methodology: The Forest conducts fisheries census and maintains population trend data for summer steelhead and spring Chinook, which are Forest Service designated sensitive species. Direct observation snorkel surveys were used to collect the census data for all five tributaries to the Klamath River. The population trend data has been collected on a continuous or nearly continuous basis since 1987. In July and August 2017 a total of seven tributaries (compared to nine in 2016) to the Klamath River were surveyed. The stream reaches surveyed totaled about 42 miles (compared to 73 in 2016).

Results: Summer steelhead were observed in five of the seven tributaries. Total counts were 43 adults and 95 half-pounders. Spring Chinook salmon were observed in two tributaries. The stream reaches surveyed where Spring Chinook salmon were observed totaled about 5.7 miles. The total count was 2 adults and 0 jacks.

Salmon River Summer-run steelhead holding census, Salmon/Scott River Ranger District

Methodology: The Forest, in cooperation with other agencies, completes annual survey (monitoring) of the mainstem, the North Fork, the South Fork, the East Fork of the Salmon River, and Wooley Creek. This data has been actively collected since the late 1960s and is important for the tracking of spring Chinook and summer steelhead trends over time. The census is conducted by direction observation snorkel dives. All stream reaches (about 89 miles) were completed over a five day period (July 25-26, 31, and August 1 and 3). Efforts were made possible through the collaboration of about 80 volunteers and other fish biologists (from California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Resource Conservation Districts, local tribes, etc.).

Results: The 2017 summer steelhead run totals were 68 adults, down from 2016 (195 adults) and 135 half-pounders, up from 2016 (132 half-pounders). Overall, the population trend for the summer steelhead run in the Salmon River has been stable since 2001, declining between 1987 and 2000 due to drought conditions and the 1997 flood.

Salmon River Spring-run Chinook holding census, Salmon/ Scott River Ranger District

Methodology: The Forest, in cooperation with the Karuk Tribe and other agencies, continued the long-term monitoring of spring Chinook presence in the Salmon River drainage. Although species of primary interest was spring Chinook, steelhead and other anadromous salmonids were tallied as encountered. The Salmon River drainage was divided into reaches, and the reaches surveyed by teams of snorkelers.

In July 2017, a total of 89 miles of the Salmon River were surveyed. Of the 89 miles, about 63 miles (including North Fork, South Fork, East Fork, and a portion of the mainstream) occur on the Forest. The Six Rivers National Forest completed the mainstem and Wooley Creek (about 28 miles) reaches. Although the primary non-governmental participant was Salmon River Restoration Council, additional crews were present from adjacent National Forests, California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Karuk Tribe, and local volunteers.

Results: The final count for all reaches was 166 Chinook (133 adults and 33 jacks). The 2017 spring Chinook salmon run was down from 2016 (370 adults and 36 jacks). Overall, the population trend for the spring Chinook salmon run in the Salmon River has been stable since 2007, fluctuating between 1987 and 2006 due to drought conditions, ocean survival conditions, and the 1997 flood.

Salmon River Spring-run Chinook Redd and Carcass Surveys

Methodology: This monitoring effort began in 2010 and consists of spawning ground surveys from a cooperative effort between the Forest Service, California Department of Fish and Wildlife as lead agency, Salmon River Restoration Council, and the Northern California Resource Center. In addition to providing information to land managers on fish spawning locations, these surveys are used to estimate the total in-river spawner escapement of spring Chinook salmon by the Klamath Fisheries Management Council and the Pacific Fisheries Management Council for determination of harvest allocations for the subsequent year.

The upper reaches of the North Fork Salmon and South Fork Salmon Rivers were surveyed twice each week during the spawning run. The Salmon River survey was conducted on every Monday and Thursday. Surveys began during the first week of September and continue into late- October. It is important to note that these surveys overlap from one fiscal year into the next. Therefore, for FY 2017 the totals include those done during the 2016 survey (from 10/3 to 10/13) and the 2017 survey (from 09/11 to 09/28).

Redd Surveys: In FY 2017, redd surveys were conducted on the North Fork Salmon River from mile marker 8 on the North Fork to Mule Bridge Trailhead. Redd surveys were conducted on the South Fork Salmon River from Matthews Creek to Little South Fork Salmon River. Redd surveys were conducted on the East Fork of the South Fork Salmon River from the Shadow Creek confluence to the confluence with the South Fork Salmon River.

Carcass Surveys: Scales, tissue, and otoliths biological samples were collected from carcasses found during the surveys. Since these biological samples are analyzed by the California Department of Fish and Wildlife, detailed methods for biological sample collection and redd counts are found in the 2017 Fall Chinook Spawning Survey Report⁶. Scales, tissue and otolith biological samples were collected from carcasses on the North Fork Salmon River, and the South Fork Salmon River. These biological samples are analyzed by the California Department of Fish and Wildlife to gather information for conducting genetic and disease studies, as well as track the overlap in use location and run timing between fall- and spring-run Chinook.

⁶ USDA Forest Service. 2017. 2017 Fall Chinook Spawning Survey Report. Klamath National Forest. Supervisor's Office.

Results:

For the North Fork of the Salmon River Spring Chinook Salmon Redd Surveys, the total counts were 33 redds, and 30 lives. This is an increase from 2016 when the total counts were 23 redds, and 14 lives. For the South Fork of the Salmon River Spring Chinook Salmon Redd Surveys, the total counts were 154 redds, and 101 lives, as compared to 2016 of 117 redds, and 178 lives. For the East Fork of the South Fork Salmon River, the total counts were 2 redds, and 0 lives.

Middle Klamath Fall-run Chinook Spawning Surveys: Salmon River (and tributaries), Scott River (and tributaries), and Middle Klamath River tributaries (Happy Camp/ Oak Knoll RD)

Methodology: This monitoring effort began in 1992. It consist of spawning ground surveys from a cooperative effort between the Forest Service, California Department of Fish and Wildlife as lead agency, Yurok Tribe, Karuk Tribe, Quartz Valley Tribe, Salmon River Restoration Council (SRRC), Scott Valley RCD, Middle Klamath Watershed Council, Northern California Resource Center, and local schools and volunteers. In addition to providing information to land managers on fish spawning locations, these surveys are used to estimate the total in-river spawner escapement of fall Chinook salmon by the Klamath Fisheries Management Council and the Pacific Fisheries Management Council for determination of harvest allocations for the subsequent year. The Salmon River, Scott River, and other mid-Klamath River tributaries are surveyed on an annual basis using both carcass mark-recapture and/or redd count techniques. Redd data is used to make spawner estimations on smaller tributaries, while the mark-recapture technique (and in some cases redd counts) are used for population estimations on the Salmon and Scott Rivers.

The Salmon and Scott Rivers were surveyed twice each week during the spawning run. The Salmon River survey was conducted on every Tuesday and Friday and the Scott River survey was conducted on every Monday and Thursday. Miscellaneous tributary streams were surveyed every Wednesday. The surveys began on October 10 and ended on December 9, 2016. In addition to the spawning ground survey effort on the Scott River a fish counting video weir was operated at roughly river mile 18. The video weir is operated by the California Department of Fish and Wildlife's Klamath River Project and is the primary method for estimating adult abundance in areas of the Scott River upstream of the weir. This video weir on the Scott River has been in operation since 2007. In addition to the video weir described above, fish counting video camcorders (video weirs) have been set up on the Shasta River and Bogus Creek (one video weir on each stream). The video weirs on the Shasta River and Bogus Creek have been in operation since 2001 and 2003, respectively.

Salmon River and Scott River Fall Chinook Salmon Surveys

Methodology:

Carcass Surveys: Detailed methods for carcass surveys and redd counts are from the 2016 Fall Chinook Spawning Survey Report (USDA Forest Service 2017). Carcass surveys were conducted on the Scott River, North Fork Salmon River, South Fork Salmon River, and Mainstem Salmon River from Forks to Nordheimer using the mark and recapture methodology. This methodology is utilized by the California Department of Fish and Wildlife to estimate run size for the Mid Klamath River and its tributaries. Therefore carcass counts are not listed in the tables below for these rivers. In the portion of the lower Mainstem Salmon River, Salmon River tributaries, Scott River tributaries, and the Mid Klamath River tributaries, mark and recapture methodology was not conducted.

Redd Surveys: In FY 2017 (October 10 to December 9, 2016), redd surveys were conducted on the Salmon River from mile marker 12 on the North Fork to the confluence with the South Fork, and from Matthews Creek campground on the South Fork to the confluence with the North Fork. The mainstem Salmon River from Forks to Nordheimer Creek (Reach 4; R4) was surveyed twice weekly; the other three mainstem Salmon reaches (R1, R2, and R3), from Nordheimer to the Klamath River, were surveyed for redds by snorkel diving approximately one time per week. Redd surveys on the Scott River were conducted from the confluence of the East Fork Scott River to the confluence of the Klamath River. However, access to private land excluded some reaches from being surveyed and known poor spawning reaches were not surveyed. Mid-Klamath tributaries surveyed included: Beaver Creek, China Creek, Clear Creek, Dillon Creek, Elk Creek, Fort Goff Creek, Grider Creek, Horse Creek, Independence Creek, Indian Creek, Rock Creek, Rogers Creek, Thompson Creek, Ti Creek, and Ukonom Creek. Salmon River tributaries surveyed included: Blackbear Creek, East Fork Knownothing Creek, Knownothing Creek, Little NF Salmon River, Methodist Creek, Nordheimer Creek, West Fork Knownothing Creek, and Wooley Creek. Scott River tributaries surveyed included: Canyon Creek, French Creek, Kelsey Creek, Shackleford Creek, Sugar Creek, and Tompkins Creek. The mapping occurred the first week of November on both the Scott and Salmon Rivers. Based on surveys from past years, this is typically the approximate peak of the fall Chinook spawning season.

Results:

The Salmon River probably reached peak spawning in early or mid-October, although specific dates cannot be determined because by October 10, 2016 (FY 2017) spawning activity had already begun (Figure 6). Overall, the survey effort was affected by the availability of surveyors, weather, and flows. For the Mainstem Salmon River Fall Chinook Salmon Redd Surveys, total counts were 68 redds, and 60 lives. For the North Fork of the Salmon River Fall Chinook Salmon Redd Surveys, total counts were 34 redds and 47 lives. For the South Fork of the Salmon River Fall Chinook Salmon Redd Surveys, total counts were 94 redds and 169 lives.

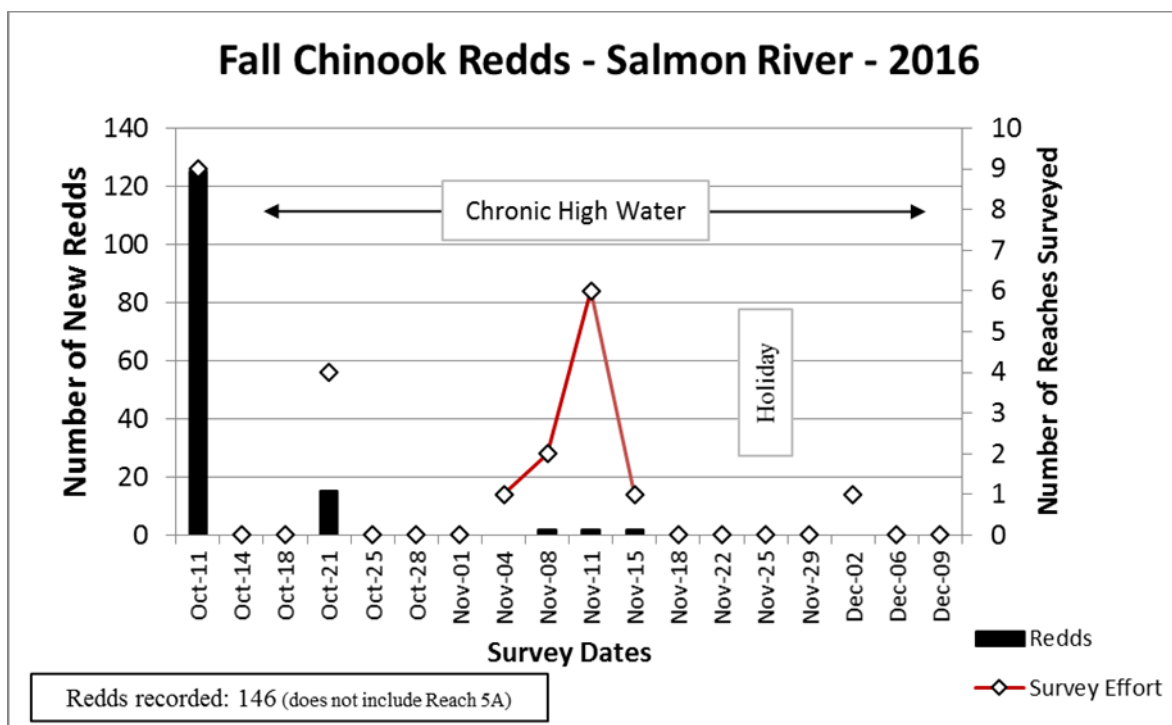


Figure 6. Fall Chinook redds observed on the Salmon River in FY 2017.

Prediction for fish returning to the Klamath River system, including Salmon River, was for low numbers. How fish may have distributed themselves in a low-run year is unknown due to the confounding factor of high water disrupting the survey effort. What little data which was able to be gathered suggests that fish were primarily spawning in concentrated use areas and other often-used locations as identified in past years. Only 143 redds were identified in 2016, not including Reach 5A (and 164 redds with Reach 5A). This is compared to an average of ~830 redds and ~925 redds, respectively as per previous, for surveys conducted between 2011 and 2015. Unlike other years, no reach recorded over 100 redds, with cumulative most observed on Reach 5B (SF Salmon River) with 25 redds.

Using survey data, the Salmon River is estimated to have had 1,058 fall-run Chinook salmon return in the fall of 2016 (Figure 7). Based on long-term tracking data compiled by CDFW, 2016 was below average, ranking 35th (of 39 years) for run size.

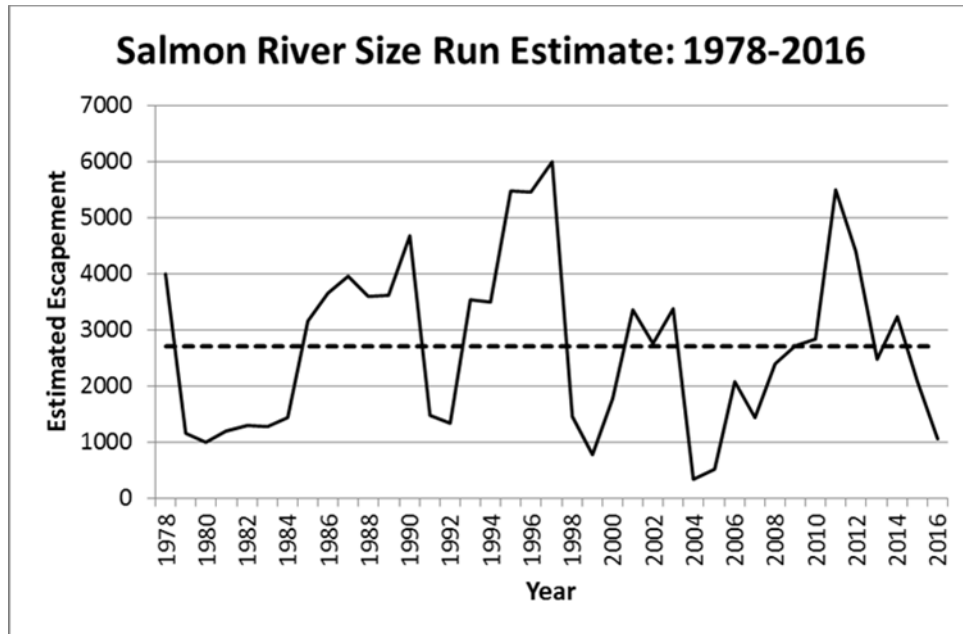


Figure 7. Salmon River Run Size Estimates from 1978-2016

Live Chinook and steelhead were tallied during surveys (Figure 8). As with redds, survey effort is impacted by high flow; and fish observation is affected by number of surveyors, weather, discharge conditions, and surveyor experience. Peak live Chinook was observed on the first survey of October 11th; and steelhead numbers were low throughout the survey season. However, similar to the redd count, river conditions of extended high discharge and turbidity negatively affected ability of surveyors to walk/boat reaches, or detect fish when it was safe to enter the water. It is likely that more Chinook and steelhead were present than were reported.

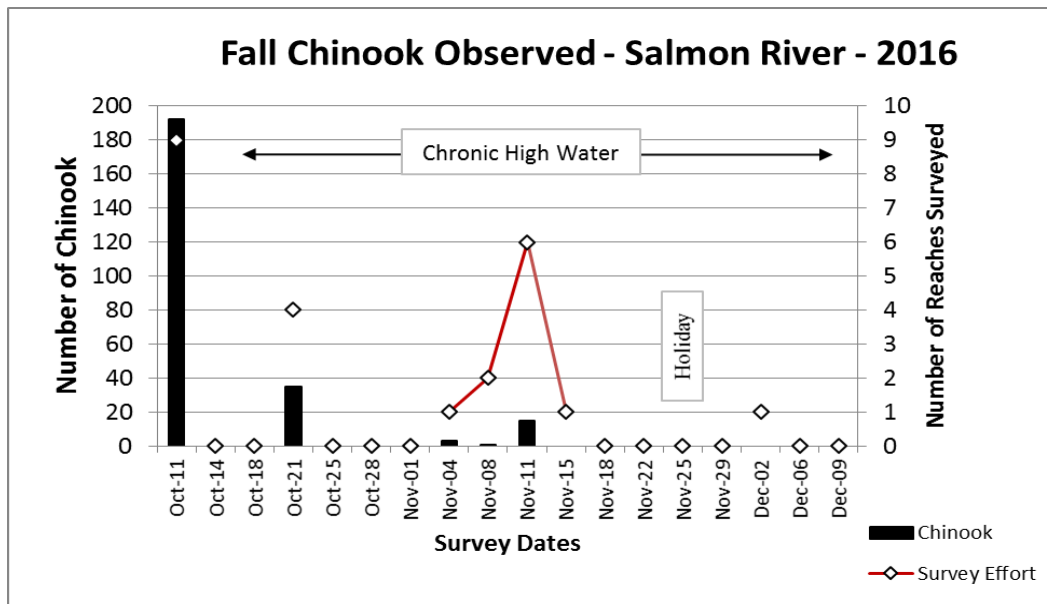


Figure 8. Observation of fall Chinook during the fall of 2016 Salmon River surveys.

Based on the available data, the Scott River reached the peak of spawning in mid-October for Reach 1 through Reach 8 (Figure 9). Due to differences in redd tracking between canyon and valley reaches, data displayed is for Reach 1 through Reach 8 only. Similar to the Salmon River, the exact date is difficult to determine due to high water and turbid conditions inhibiting the ability of surveyors to observe redds. Multiple survey cancellations due to unsafe river discharge also impacted gathering of data. Overall survey effort was affected by number of surveyors available, weather, and flows.

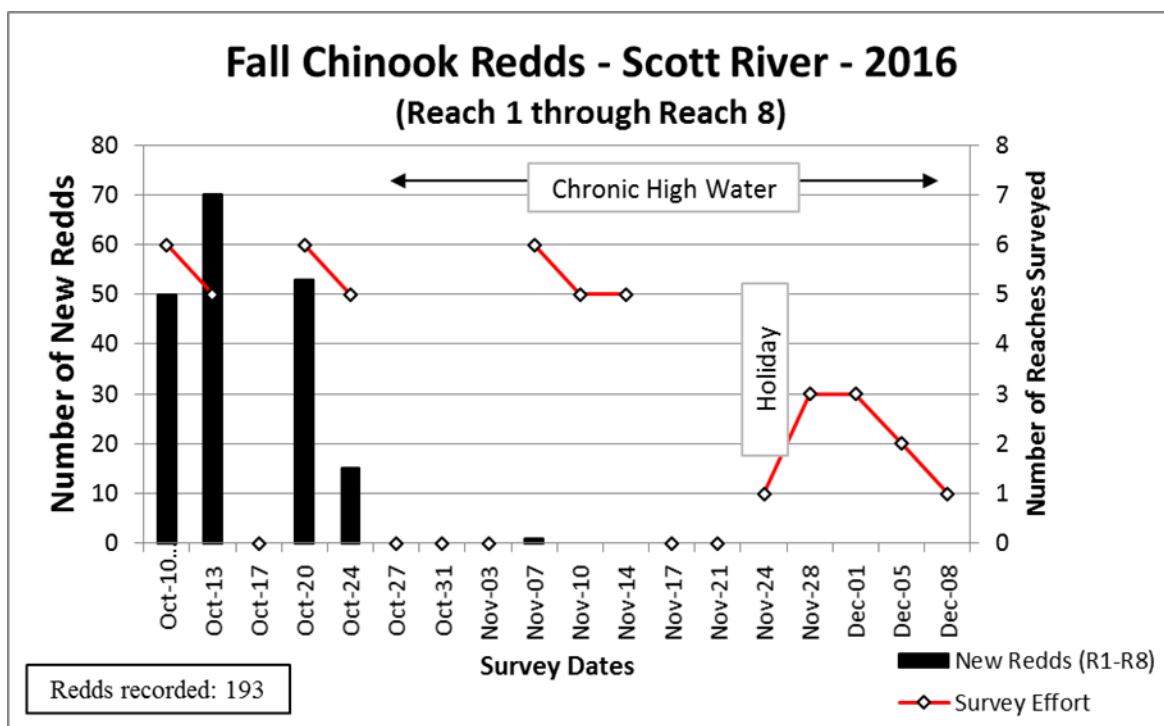


Figure 9. Fall Chinook redds observed on the Scott River in 2016.

Prediction for fish returning to the Klamath River system, including Scott River, was for low numbers. How fish may have distributed themselves in a low-run year is unknown due to the confounding factor of high water disrupting the survey effort. What little data which was able to be gathered suggests that fish were primarily spawning in concentrated use areas and other often-used locations as identified in past years. Only 193 redds were identified in 2016 in Reach 1-8, compared to an average of ~830 redds for surveys conducted between 2011 and 2015.

The Siskiyou Resource Conservation District (RCD) performed redd and carcass surveys upon private property from Reach 9 through Reach 16, as well as several Scott Valley tributaries. Landowner preference is to leave redds unflagged. Normally, because “new” and “old” redds cannot be reliably differentiated, all redds are counted during each survey date. However, for 2016, the amount of spawning was so low that GPS was able to be used to track individual redds and log the appearance of new construction (L. Magranet, per. comm). A total of 91 redds were recorded; and peak spawning for most reaches was reached in the latter half of October (Table 6). Similar to the canyon reaches, the Scott Valley reaches and tributaries experienced high flow in October. Because of the storm event, redds both completed and in-progress were flattened; and water visibility afterwards was limited. For additional information concerning the Scott Valley effort, contact RCD for a copy of their spawning survey report.

	Reach 9	Reach 10	Reach 11	Reach 12	Reach 13	Reach 14	Reach 15	Reach 16	Total
Total Redds	1	N/A	0	0	11	16	61	2	91
	Oct-26				Oct-24	Oct-24	Oct-24	Dec-05	

Table 5. Total number of Redds observed for Reach 9 through Reach 16 for Scott River in 2016

Specific areas of the Scott River display a greater preference for use by spawning Fall Chinook. Five years of mapping redds by GPS (with hardcopy map back-ups) is revealing patterns. There are areas which show annual use at both high and low densities, as well as scattered redds which likely represent opportunistic use of habitat which may be locally limited in extent and/or only available under certain discharge conditions..

In 2016, identification of fish distribution patterns was confounded by early season storms which created difficult-to-survey river conditions. Many of the relatively few redds observed generally fell within the bounds of previously identified concentrated use areas. The number of redds recorded in 2016 was 193, as compared to the range of 476 to 1128 redds (annual average ~830) counted between 2011 and 2015. As a consequence of the 2016 low redd count, redd density throughout the survey area was also low, even within areas of normally elevated use.

Using survey data and video weir observation, the Scott River is estimated to have had 1,515 Fall Chinook salmon return in 2016 (Figure 10). Based on long-term tracking data compiled by CDWF, 2016 was below average, ranking 37th (of 39 years) for run size.

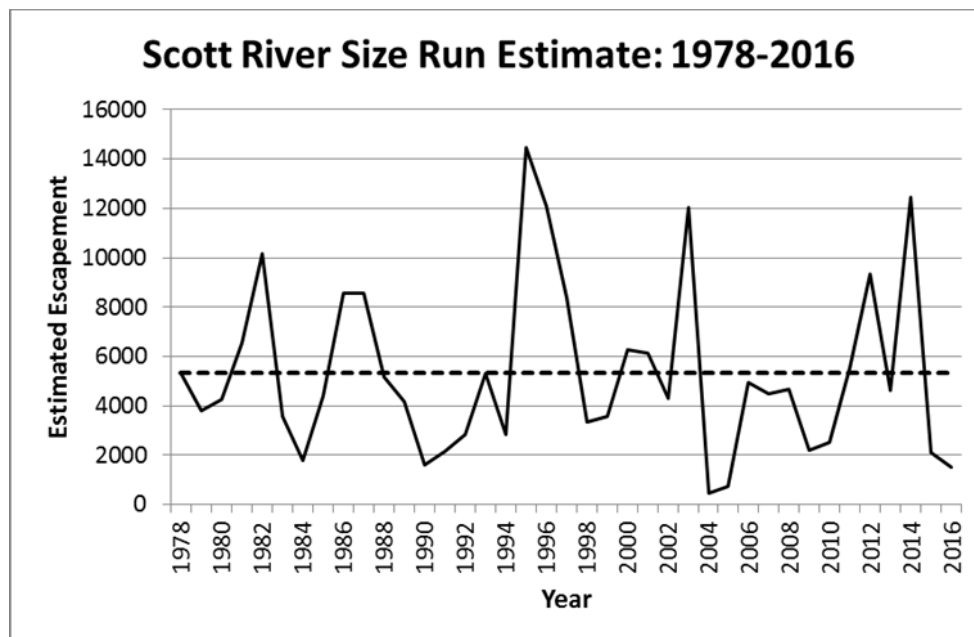


Figure 10. Scott River fall run size estimates for 1978 to 2016. Dashed line is average over long-term survey period.

Live Chinook were tallied during surveys (Figure 11). As with redds, fish observation is affected by number of surveyors, weather, discharge conditions, and surveyor experience. Peak live Chinook was observed in mid-October; and numbers were generally low. However, similar to the redd count, river conditions of extended high discharge and turbidity negatively affected ability of surveyors to detect fish. Additionally, the few crewmembers whom attempted to snorkle reported a poor ability to see to the bottom of pools where fish (and carcasses) typically congregate. It is likely that more Chinook were present than were reported.

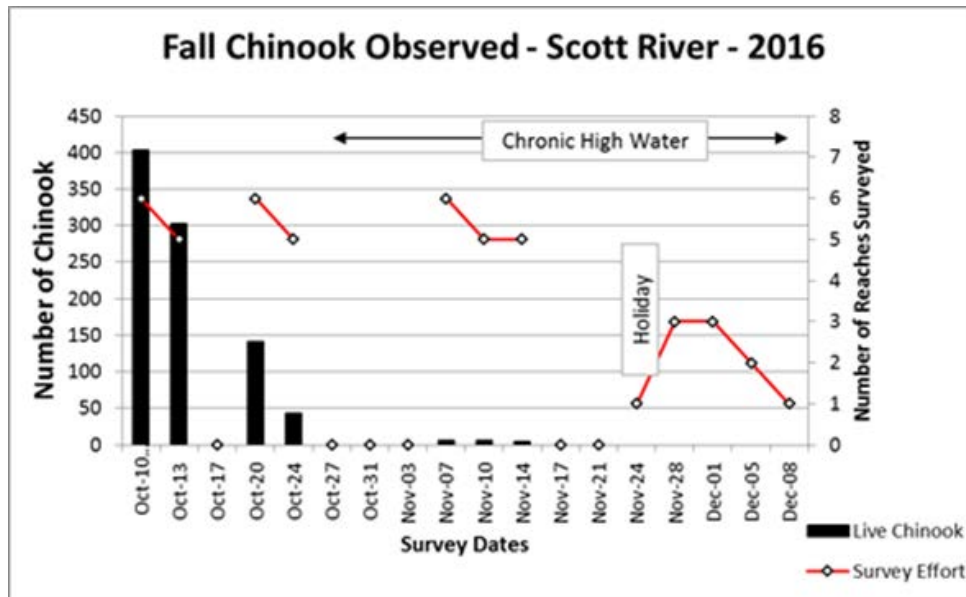


Figure 11. Observation of fall Chinook during the 2016 Scott River surveys.

Scott River Tributaries Fall Chinook Redd Surveys resulted in a total of 10 redds, and five lives. No Scott River tributaries with greater than nine redds were recorded in 2016.

Salmon River Tributaries Fall Chinook Salmon Redd Surveys resulted in a total of five redds, and 10 lives.

MKR tributaries (Happy Camp Area) that recorded greater than nine redds in 2016 were Beaver, Clear, Dillon, Elk, Fort Goff, Grider, Indian, and Thompson Creeks. MKR tributaries (Orleans Area) that recorded greater than nine redds in 2016 were Camp, Red Cap, and Slate Creeks.

The lack of fish present in the Salmon River and Scott River tributaries is difficult to explain. Due to early rains, there would not have been any access issues at the mouth, which is a problem many years early in the spawning season; and if there are little or no precipitation, then tributaries may have few to no fish presence. If anything, one would expect that tributaries would represent refuges from high water on the mainstem. However, this did not appear to be true. While it is possible that redds could have been flattened by high discharge, similar to the mainstem/forks, it was expected that more fish or faint evidence of redds present would have been observed, especially on creeks which typically support a number of fish such as Knownothing, Methodist, and Nordheimer.

The number of Klamath River fall Chinook salmon returning to the Klamath River Basin in fall 2016 is estimated on Table 6 (includes both total number of natural spawner escapement and the number of fish taken by recreational and tribal harvest)⁷.

Age	Count	Percent of Total Run
2	2,786	10.19
3	8,615	31.49
4	15,443	56.46
5	509	1.86
Total:	27,353	100

Table 6. Fall Chinook Salmon returning to the Klamath River Basin

For more information on survey results, see Appendix D of the *Klamath River Fall Chinook Salmon Age-Specific Escapement, River Harvest, and Run Size Estimates, 2016 Run* by the Klamath River Technical Team, dated 16 February 2017.

Further Action Required: Continue coordination with California Department of Fish and Wildlife for the annual Fall Chinook Salmon Spawning Ground Surveys. Continue coordination with Salmon River Restoration Council for the annual Salmon River Spring-run Chinook holding census and Spring-run Chinook Spawning Ground Surveys. Continue conducting the Summer-run steelhead and spring Chinook holding census on Happy Camp/Oak Knoll Ranger District.

B. Management Indicator Species

Objective: Determine population trends and relationship to habitat changes for steelhead trout and rainbow trout.

Methodology: Monitoring for steelhead trout is covered under Sensitive Species monitoring (above). California Department of Fish and Wildlife is conducting a field study of fish, amphibians, and reptiles in the High Mountain Lake surveys of the Klamath, Cascade, and Sierra Nevada mountains. The multiyear project, begun in 1995, has collected data on three fourths of the Sierra Nevada's 10,000 high mountain lakes, and on nearly all high mountain lakes in the Klamath and Cascade mountains of California⁸. Habitat changes are measured through the Aquatic and Riparian Effectiveness Monitoring Plan (AREMP) program and the Klamath National Forest has an intensive watershed condition monitoring program for 'managed' and 'reference' streams organized through the Klamath National Forest hydrology department in coordination with Total Maximum Daily Load (TMDL) compliance.

Results: The AREMP program has found an overall positive trend in watershed conditions over the last 20 years (final report is pending).

⁷ Klamath River Fall Chinook Salmon Age-Specific Escapement, River Harvest, and Run Size Estimates, 2016 Run by the Klamath River Technical Team dated 16 February 2017

⁸ (Chapter 4 in <http://www.dfg.ca.gov/news/pubnotice/hatchery/>)

Monitoring populations of the resident form of rainbow trout is confounded by potential impacts from 1) fish stocking operations conducted by private interests and the California Department of Fish and Wildlife and 2) the targeting of rainbow trout common in recreational fishing. The number of high mountain lakes stocked with hatchery (resident rainbow) trout by the California Department of Fish and Wildlife has been reduced since 2008 and now no hatchery (resident rainbow) trout are stocked within the currently managed range of the Southern Oregon/Northern California coho salmon (Figures 4-36 and 4-34 respectively in the January 2010 Environmental Impact Report (EIR)), and one location for the Klamath Mountains Province (KMP) steelhead⁹. Salmon and steelhead are stocked at five locations within the KMP steelhead distinct population segment (DPS) in the Klamath and Trinity River basins (Figure 4-36 of the same January 2010 EIR). Naturally produced steelhead juveniles may be preyed on by hatchery steelhead that may be residualizing in the Klamath and Trinity Rivers below Iron Gate and Trinity River Hatcheries. Hatchery steelhead that fail to emigrate to the ocean, and predation on naturally produced salmon and steelhead fry has been demonstrated in the Trinity River, representing a potential threat to natural salmon and steelhead populations. Based on the time and size at release, hatchery coho salmon yearlings may also prey on naturally produced steelhead fry. The hatchery programs have the potential to cause significant impact to the survival of wild juvenile salmon and steelhead. Rainbow trout have been observed preying upon juvenile steelhead; additionally, their diets and habitat preferences overlap. Therefore, hatchery rainbow trout may prey upon native steelhead or compete with them for rearing and spawning habitat. According to the January 2010 EIR prepared by California Department of Fish and Wildlife, the “implications of competitive interactions between hatchery and wild fish may be particularly serious for steelhead because the freshwater environment probably limits production.” There is also a potential for hatchery trout to compete for spawning sites with native steelhead, due to overlapping spawn times and spawning habitat preferences. These influences on the population make habitat monitoring a more reliable system of tracking trends for fish Management Indicator Species.

Further Action Required: Coordinate with California Department of Fish and Wildlife on their ongoing monitoring, continue coordination with AREMP.

C. Fisheries Management

Objective: Determine effectiveness of Forest Plan standards and guidelines in meeting objectives.

Methodology: The Northwest Forest Plan, a management strategy applied to 24 million acres of federal land in the Pacific Northwest, was approved in 1994 and incorporated into the Forest’s 1995 Forest Plan. The Northwest Forest Plan’s Aquatic Conservation Strategy that requires the protection, restoration, and monitoring of aquatic ecosystems under the Plan’s jurisdiction was incorporated. The AREMP program¹⁰ was developed to fulfill the monitoring component of the strategy. Monitoring is conducted at the subwatershed scale (US Geologic Survey 6th-field hydrologic unit). These sub-watersheds are approximately 10,000-40,000 acres in size. In 2015 invasive aquatic species were also monitored.

⁹ California Department of Fish and Wildlife, U.S. Fish and Wildlife Service Biological Resources, Final Hatchery and Stocking Program, Environmental Impact Report/Environmental Impact Statement 4-73 January 2010

¹⁰ <http://www.reo.gov/monitoring/reports/watershed-reports-publications.shtml>.

Results: The AREMP monitoring reflects the effectiveness of standards and guidelines related to aquatic systems, including the implementation of the Aquatic Conservation Strategy identified in the Forest Plan, as adopted from the Northwest Forest Plan Record of Decision. The AREMP monitoring effort determines present watershed condition every five years for every 6th-field watershed (with greater than 25 percent federal ownership along the stream length) based on upslope and riparian data derived from GIS layers and satellite imagery. In-channel attributes are also measured each year in a subset of watersheds to supplement the watershed condition assessments and validate the models used to assess stream condition. AREMP also tracks changes in watershed condition over time; and reports on the Northwest Forest Plan's effectiveness across the Northwest Forest Plan area.

AREMP Data for the 2017 field season (June through September) is available at the website: <http://www.reo.gov/monitoring/reports/watershed-reports-publications.shtml>

Further Action Required: None.

D. Other Monitoring – Klamath River Water Temperature

Objective: Monitoring water temperature

Methodology: In conjunction with information from the water temperature monitoring program, streamflow monitoring can be used to model and better understand thermodynamics in the Klamath River; and can be used to plan fisheries restoration projects such as restoration, enhancement, and creation of cold-water summer thermal refugia that facilitate salmon and steelhead survival in hot periods when water quality in the Klamath River becomes sub-optimum or lethal for salmonids. Seven sites on the Klamath River and 104 sites on Klamath River tributaries were surveyed in 2017.

Results: The resultant data will be analyzed to establish existing baseline aquatic habitat conditions, to determine fish species distribution, and to estimate fish species abundance. Stream survey information will be used to plan and assess the effects of restoration forestry, will be used to plan and assess effects of upslope watershed restoration, and will be used to plan and assess effects of fisheries restoration projects.

Further Action Required: None.

E. Other Monitoring – Clean Water Act, TMDL

Objective: Collect data to determine stream conditions for reference and managed streams to meet Clean Water Act-TMDL conditions. Monitoring was also done as part of the AREMP watershed condition monitoring for the Northwest Forest Plan area.

Monitoring: Techniques used were developed with the California Water Quality Control Board staff to measure sediment, temperature, shade values, and V^{*11} and included the use of a specialized camera and Hobo-temp data loggers. There are 144 Hobo temp sites monitored in 2017 as part of this project. Stream temperature was monitored in a network of 80 watersheds representing most of the major tributaries on the Forest. Reference conditions were monitored in 11 minimally disturbed watersheds that represent the natural background condition. The Forest monitored sampled areas with well-mixed

¹¹ Stream Monitoring Field Guide: Protocols and Methods. USDA Forest Service Pacific Southwest Region. Klamath National Forest. November 2009

stream temperatures in order to better understand the overall watershed condition. Temperatures in thermal refugia at the reach scale were not measured.

Results: Data was provided to evaluate listing/delisting of streams under the Clean Water Act. There are 16 watersheds on the Forest that have altered shade due to human-caused disturbance and stream temperatures higher than the Water Quality Control Board threshold for support of beneficial use for salmonids. In these streams the objectives for temperature are not attained. Watersheds with human-caused shade loss of less than 0.1 percent have a negligible effect on stream temperature at the watershed scale. The remaining 64 watersheds appear to meet the temperature objectives of the Basin Plan. All of these streams have either no human-caused alteration of stream shade, or any alteration has not reduced stream temperatures below the threshold required to support beneficial uses. In no instances have stream temperatures increased by more than the 5°F (2.8°C) allowed in the Basin Plan temperature objective. The natural receiving temperature of many streams on the Forest is warmer than the thresholds used by the Water Quality Control Board to assess adverse effects to beneficial uses for salmonids. Nearly half of the reference streams on the Forest exceed the 16°C threshold identified for support of beneficial uses for adult salmonid migration and non-core juvenile rearing. However, salmon are still occupying these streams. Some researchers suggest that salmon in the Klamath River system are adapted to naturally warmer temperatures.

Further Action Required: None.

Visual Resource Management

A. Visual Condition and Scenic Character

Objective: To determine the trends of Forest-wide Visual Condition and Scenic Character.

Further Action Required: A monitoring report was provided for FY 2016 using 2016 data. The Forest Plan requires a visual condition report every 10 years unless the trend is contrary to the desired future conditions. No further action is needed at this time.

B. Visual Quality Objectives

Objective: Determine compliance with Forest Plan Visual Quality Objectives.

Further Action Required: A monitoring report was provided for FY 2016 using 2016 data. The Forest Plan requires a visual quality condition report every three to five years unless the trend is contrary to the desired future conditions.

Wilderness

Objective: Use the Limits of Acceptable Change concept to refine future wilderness management direction.

Methodology:

Wilderness monitoring on National Forest lands is now conducted within the framework of the national Wilderness Stewardship Performance (WSP) and Wilderness Character Monitoring program. Through this program, the Klamath NF expects to establish a wilderness character baseline for each wilderness in

the Forest by 2020. Wilderness character is comprised of five qualities; untrammelled; natural; undeveloped; solitude or primitive and unconfined recreation; and other features of value. The WSP elements track the stewardship actions the Forest takes to preserve wilderness character, some of which include monitoring. Wilderness Character Monitoring will track the outcomes of these actions, and will be the means by which the Forest can measure how well wilderness character is being preserved. Monitoring these elements is also expected to help inform the development of standards and guidelines during Forest Plan revision.

The Forest selected a set of 10 WSP elements for each wilderness that reflect local stewardship priorities. There are three sets of WSP elements on the Klamath NF: one set for the Marble Mountains and Russian Wildernesses; a second set for the Siskiyou Wilderness; and the third set for the Trinity Alps Wilderness. Several of the WSP elements are applicable to the limits of acceptable change concept. The WSP elements with a monitoring component selected for the Marble Mountains and Russian Wildernesses include: invasive species management; range and riparian condition on livestock grazing allotments; trails; and opportunities for solitude. The WSP elements with a monitoring component selected for the Trinity Alps Wilderness include: invasive species management; range and riparian condition on livestock grazing allotments; and opportunities for solitude. The WSP elements with a monitoring component selected for the Siskiyou Wilderness include: invasive species management; and opportunities for solitude.

Invasive weeds in Marble Mountains, Russian, and Trinity Alps Wildernesses: An informal survey of trails, trailheads, and campsites was conducted in 2015 to determine presence of non-native invasive weeds in these wildernesses. Records of population locations are maintained in the Threatened, Endangered and Sensitive Species database. In 2017, staff and agency partners conducted hand-pulling treatments to control Dyer's woad (*Isatis tinctoria*) populations at six locations in the Kelsey Creek drainage of the Marble Mountains Wilderness, along the road access to Taylor Lake trailhead in the Russian Wilderness, and around the Carter Summit area adjacent to the Trinity Alps Wilderness.

Invasive weeds in Siskiyou Wilderness: The Six Rivers NF non-native invasive species management plan (2015) identified the priority invasive species and sites for control efforts in this wilderness. In 2017, control treatments and/or effectiveness monitoring was completed in 11 of the 26 priority sites across both the Six Rivers and Klamath NF portions of this wilderness: five sites had no invasive weeds due to consecutive treatments in previous years; four sites had fewer than 10 plants; two sites had fewer than 20 plants; and one site had 228 plants. Total area treated was 5.5 acres.

Range allotments in Marble Mountains, Russian, and Trinity Alps Wildernesses: Range staff annually conduct routine utilization and multiple indicator monitoring on active allotments within the three wildernesses. See rangeland implementation monitoring report for additional details.

Trails in Marble Mountains and Russian Wildernesses: In 2017, the location and condition of user created trails was surveyed, which helps assess the degree of visitor impacts to the natural quality of wilderness character. As part of the user trail survey, campsite conditions in key areas were reassessed, and allow comparison to the conditions documented during a wilderness-wide campsite inventory that was conducted in 2009-2010.

Results: Observations have enabled Forest wilderness managers to identify needs and develop strategies to protect wilderness character. The Limits of Acceptable Change and the Recreation Opportunity Spectrum management tools identified in the Forest Plan will need to be refined for Forest Plan revision to better support the achievement of desired wilderness conditions.

Further Action Required: None required. Klamath NF staff will continue to conduct annual invasive weed and range allotment monitoring in wilderness.

Lands Program Management

Objective: Determine if land adjustments have increased administrative efficiency, and whether Forest outputs are adversely affected.

Methodology: Since FY 2002, the Forest has acquired 840 acres in five parcels. No parcels were acquired in FY 2017.

Results: About 4.5 miles of Forest boundary has been eliminated since FY 2002, reducing the total miles of landline that requiring location and posting.

Further Action Required: No further action is required.

Timber Management

A. Growth and Yield Projections

Objective: Determine if growth and yield projections for silvicultural prescriptions are occurring as projected.

Methodology: The Region 5 Remote Sensing Laboratory maps and monitors vegetation throughout the Region. Lab personnel use baseline inventory maps in conjunction with inventory plots to assess the vegetation resources and associated uses such as forest health, timber volume and growth, wildlife habitats, old growth forests, watershed conditions, and surface fuel mapping. The Klamath National Forest was inventoried in 2004 and updates were done in 2007 using Landsat photos and validated by the Province Ecologist.

Results: Growth projections are in line with Forest Plan expectations.

Further Action Required: None.

B. Wildland Fire Effects on Plantations

Objective: Determine average rate of loss of plantations to wildland fire.

Methodology: Locations of plantations from FACTS were overlaid with fire boundaries of wildfires that burned in 2017. A silviculturist visited the fire area in the fall of 2017 and mapped the fire effects to both natural stands and plantation. That information was used to plan the reforestation needs following the fire.

Results: About 2,436 acres within 60 plantations were impacted by wildfire. Portions of these plantations (917 acres) burned at low severity (0-25 percent basal area loss). Within the 2,436 acres, 1,519 acres of plantations were significantly impacted by moderate to high severity (50-100 percent basal area loss) fire with few of the trees within these areas surviving.

Further Action Required: Most plantations affected by moderate to high severity fire will be reforested within the Abney fire. Areas with poor site quality and historical brush and hardwood stands

will not be reforested. Site preparation for planting will begin in 2019 and continue through 2021. The Forest has completed the Seiad-Horse Risk Reduction environmental analysis for areas affected by the Abney Fire. Under analysis is about 955 acres of site preparation and reforestation without salvage (plantations and small diameter natural stands) and 1,269 acres of site preparation, reforestation after salvage harvesting.

C. Dispersal of Harvest Openings

Objective: Ensure that spacing of harvest openings conforms to Regional policy and Forest Plan direction.

Methodology: The Forest Plan modeled Green Tree Retention (GTR) harvest as the primary silvicultural system to be implemented on the Klamath National Forest. This prescription has been used only sparingly on the forest since the adoption of the Plan. Understory thinning, the primary prescription for timber harvest, does not create openings in the forest canopy. Large openings due to timber harvest are rare and spacing is not an issue. For this reason, no monitoring has been conducted.

Results: N/A

Further Action Required: None.

D. Timber Stand Improvement

Objective: Determine success of release and stand improvement practices to meet desired future condition.

Methodology: The Forest pre-commercially thinned 198 acres of wild stands and plantations combined and released 759 acres of plantations in 2017. These stands were inspected to validate that the prescriptions were appropriately applied. Monitoring consisted of placing plots in many of the stands and recording spacing of the trees and the amount of competing vegetation removed. Other stands were inspected by a visual walk-through method to determine if treatments met standards. The stands take a number of years to respond to the treatments after being suppressed for a period of time, so immediate measurement of the plantations would not yield an increase in height or diameter growth.

Results: 100 percent of treated stands met the required standards.

Further Action Required: None.

E. Other Monitoring Efforts – Timber Marking, Reforestation Success, and Sale Implementation

Timber marking is reviewed by Quality Control Group check cruiser for conformance with Timber Theft Plan. Reforestation success was monitored through survival surveys and certification of planted stands. Post-sale treatments required under contract were monitored by sale administration personnel and reviewed by program staff from the Supervisor's Office.

F. Other Monitoring Efforts – Site Preparation and Reforestation Targets

The annual reforestation program fluctuates, dependent largely on wildfire and post-fire salvage and fuels treatment. Planting and subsequent release on burned sites where fire-killed trees are not removed

continue to pose a management challenge. The immediate threat of falling trees and the development of substantial fuel loading as the result of fallen fire-killed vegetation render many of these sites impractical to manage.

In 2017, the Klamath planted 2,288 acres. Of the 2,288 acres, Table 7 lists the acres that were planted within these fire areas:

Fire	Acres Planted	Description
Tennant (2009)	53	Replant
Little Deer (2014)	1,564	Initial Plant
Beaver (2014)	114	Replant
Frying Pan (2014)	301	Replant

Table 7. Acres planted within fire areas

Species planted included ponderosa pine, Douglas-fir, sugar pine, incense cedar, Shasta red fir and white fir. First year survival ranged between 15 to 75 percent. Administrative processes delays continue to cause a delay of planting these acres until late spring.

G. Other Monitoring Efforts – Timber Targets

Allowable Sale Quantity (ASQ), reforestation, and timber stand improvement activity accomplishments are derived from data in the Planned Timber Sale Accomplishment Report, the Forest Service Activity Tracking System, and the yearly Plantation Survival Report. The Forest offered and awarded about 52,787 hundred cubic feet of timber and convertible products in FY 2017. This exceeded the assigned target of 50,000 hundred cubic feet by about 6 percent. The volume offered for sale includes sawlogs, biomass, posts, poles and firewood produced through a combination of forest management activities, including thinning, salvage, fuelwood and post and pole cutting. The majority of the timber offered and awarded were thinning projects designed to reduce hazardous fuels and improve wildlife habitat.

H. Other Monitoring Efforts – Loss of trees to wildfire

Region 5 annually tracks the acreage where trees have been lost to wildfires, concentrating on fires that burn more than 1,000 acres of National Forest forestland. There were two large complex fires the Eclipse and the Salmon August. The Eclipse complex included the Cedar, Oak, Clear, Fourmile, Abney, and Prescott fires for a total of 91,100 acres. The Salmon August complex included the Wallow, Island, Grizzly, Mary, and Garden fires for a total of 65,900 acres. A summary of past monitoring efforts is located on the web at <http://www.fs.usda.gov/detailfull/r5/landmanagement/resourcemanagement>.

Fire Management

Objectives: Primary objective is to meet Fire Fighter Line Production Capability, and to assure there is compliance of the initial attack's 90th percentile objective.

Methodology: The Forest analyzed the number of fire starts and escapes.

Results: In 2017, the Klamath National Forest had a total of 146 wildfires, of which 131 were started by lightning. The total acres burned in 2017 was 145,000 acres. These included the Eclipse Complex, Salmon-August Complex, and Abney Fire.

Further Action Required: No further action is required

A. Prescribed Fire and Fuels Management Program

Objectives: Determine effectiveness of prescribed burn program in reducing wildfire effects. Monitor conditions of fire severity within a range of vegetation types.

Monitoring and Results: For FY 2017, the assigned Forest target for hazardous fuels reduction was 13,887 acres. The Forest exceeded target, accomplishing 20,125 acres. An additional 93,305 acres of fuels accomplishment were claimed as a result of low severity wildfire acres. Of the Forest treatments accomplished, about 75 percent were located within areas considered to be Wildland Urban Interface.

Further Action Required: No further action is required.

B. Other Monitoring Efforts - Fire Ecology

The Forest, in coordination with Pennsylvania State University, is looking at the interactions between inversions and fire severity. Peer reviewed scientific papers is expected from this project, and is expected to improve forecast modeling of inversions.

The Forest has also completed treatment effectiveness monitoring on numerous projects, including prescribed burns. We are currently using the Firemon-Feat Integration ecological monitoring tool. The Forest is using this program in order to create a cooperate database for fire monitoring, which will standardize the collection, analysis, and results of Forest monitoring data.

The Forest continues to look into research and monitoring opportunities for the Sugar Creek Research Natural Area, which contains the most diverse coniferous forest in the world.

Further Action Required: No further action is required.

Range Management

A. Range Health

Objective: Determine vegetative ecological condition and trend.

Methodology: Range health and forage availability are monitored through a combination of methods that look at utilization, riparian condition, and vegetative trend. Monitoring methods include Best Management Practices Effectiveness Evaluations, Multiple Indicator Monitoring, Photo Points, California Rapid Assessment Method, and Rooted Frequency. All these methods were used to evaluate conditions on key areas (sites that represent allotment conditions, or are indicators of a specific habitat type, such as riparian reserves). In FY 2017 four frequency plots on the Oak Knoll District were read: two plots were new installations. Six sites were evaluated according to the California Rapid Assessment Method within the Salmon River Ranger District. Best Management Practices Effectiveness Program evaluations were conducted on four allotments.

Results: Range health (ecological condition) on permitted allotments is generally good, with a stable or upward trend on most sites.

Further Action Required: No further action is required.

B. Permitted Animal Unit Months

Objective: Compare permitted to Forest Plan projected Animal Unit Months (AUMs).

Methodology: The Forest Plan projected that the Forest would support 34,000 AUMs. Permitted use is determined by the grazing use defined in active permits. Actual use is tracked by billing documents and allotment inspections.

Results: Permitted use was 20,451 AUMs with an actual use of 19,180 AUMS.

Further Action Required: The Forest needs to complete environmental analyses on several vacant allotments prior to permitting additional AUMs in order to bring the permitted or actual use closer to projected Forest Plan levels.

C. Wild Horse Management

Objective: Determine number of wild horses and territory expansion.

Methodology: None conducted. Population numbers are estimates based on observation, with adjustments made using knowledge of history of herd dynamics and removal efforts.

Results: Current estimates are 130-150 head for McGavin Peak (target of zero animals) and 50-75 head for Three Sisters (target of 20 animals). No horses were removed in FY 2017.

Further Action Required: Removal of horses to meet target populations is subject to availability of funding and scheduling with the Department of Interior, Bureau of Land Management.

D. Riparian Health

Objective: Assure Annual Operating Instructions contain riparian objectives and Forest Plan standards and guidelines are being met.

Methodology: Allotment Management Plans, Grazing Permits, and Annual Operating Instructions were reviewed to determine whether Aquatic Conservation Strategy and riparian health objectives have been included.

Results: All documents have incorporated guidelines to address Aquatic Conservation Strategy and riparian health objectives. The Annual Operating Instructions were revamped this year and better represent the guidelines set forth in the Forest Plan and Allotment Management Plans.

Further Action Required: No further action is required.

E. Forage Availability

Objective: Determine compliance with Forest Plan standards and guidelines for forage utilization.

Monitoring: The Forest has a total of 47 allotments, of which 39 were active in FY 2017. Five allotments were in partial or full non-use for the grazing season. On the active allotments, 129 key areas and 11 non-key areas were monitored on 32 different allotments.

Results: Of the 140 monitored areas, 134 met resource standards (see Table 6). Resource standards were not met on six individual plots within five allotments. In each case, a Forest Service range specialist met with the permittee to resolve the situation. Annual Operating Instructions were adjusted in all cases for the following year.

Further Action Required: No further action is required.

F. Implementing Range Project Decisions

Objective: Ensure that range project decisions include standards and guidelines and that the standards are implemented.

Monitoring: The Forest worked on two range projects consisting of four allotments during this fiscal year. Decisions are anticipated for four of the allotments in FY 2019.

Results: Decisions will incorporate Forest Plan standards and guidelines. To date, the Forest has completed analyses and made decisions on 35 of 45 allotments, all of which have incorporated Forest Plan standards and guidelines into the Allotment Management Plans and Annual Operating Instructions.

Further Action Required: No further action is required.

G. Noxious Weeds

See the *Noxious Weeds* section of this report for information.

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Table 8. Forest Range Monitoring Data Summary for FY 2017¹²

Allotment Name	# of Key Areas	# of Key Areas Monitored	# of Non-Key Areas Monitored	M. Method	CAMP w/ P Y/N	Data Source	# Met Resource Standards	# Not Meeting Resource Standards	Results shared w/ P. Y/N	P. Cooperation Y / N	AOI Compliance Y / N	Actions Taken or Remarks
Ball Mountain-Kuck's	13	10	0	LA,SH	N	FS	10	0	Y	Y	Y	3 key areas not read due to early snow
Bogus	4	2	0	LA,SH	N	FS	2	0	Y	Y	Y	Early snow allowed access to 2 key areas only
Bray	8	6	0	LA	Y	FS,P	5	1	Y	Y	Y	Rested 2 key areas
Butte Valley NG	17	15	0	LA	N	FS	13	2	Y	Y	Y	Rested 2 key areas
Deer Mountain	5	5	0	LA	N	FS	5	0	Y	Y	Y	
Dry Lake	6	6	0	LA	N	FS	6	0	Y	Y	Y	
East Red Rock	11	9	0	LA	N	FS	9	0	Y	Y	Y	
Haight Mountain	8	8	0	LA,SH	N	FS	8	0	Y	Y	Y	
Horsethief	7	6	0	LA	N	FS	6	0	Y	Y	Y	
McGavin Peak	4	4	0	LA	N	FS	4	0	Y	Y	Y	
Mount Hebron	3	3	0	LA	N	FS	3	0	Y	Y	Y	
Orr Lake	6	6	0	LA	N	FS	6	0	Y	Y	Y	

¹² The information presented in Table 8 is summary data (only) from a larger data set. Acronyms and abbreviations are defined as follows: # (number), AOI (Annual Operating Instructions), CAMP (Cooperative Allotment Monitoring Plan), FS (Forest Service), BMP (Best Management Practices Effectiveness), LA (Landscape Appearance - Herbaceous), LAB (Landscape Appearance - Browse), M (Monitoring), MIM (multiple indicator monitoring, all annual indicators monitored), N (no), NG (National Grassland), OC (ocular), P (permittee), PVT (private), S (South), SH (Stubble Height), Y (yes), N (no), and N/A (not applicable).

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Allotment Name	# of Key Areas	# of Key Areas Monitored	# of Non-Key Areas Monitored	M. Method	CAMP w/ P Y/N	Data Source	# Met Resource Standards	# Not Meeting Resource Standards	Results shared w/ P. Y/N	P. Cooperation Y / N	AOI Compliance Y / N	Actions Taken or Remarks
Panther/Ball Mtn	4	2	0	LA	N	FS	2	0	Y	Y	Y	2 key areas not read due to early snow
Red Rock	7	5	0	LA	N	FS	5	0	Y	Y	Y	
Shafter	4	4	0	LA	N	FS	4	0	Y	Y	Y	
Three Sisters	10	6	0	LA	N	FS	6	0	Y	Y	Y	4 key areas not grazed due to lack of water
Ash Creek	0	0	0		N	FS	0	0	Y	Y	Y	
Big Flat	4	0	0									VACANT
Big Meadows	2	2	0	LA, MIM	Y	FS, P	2	0	Y	Y	Y	
Big Ridge	6	0	0		Y	P			Y	Y	Y	NON-USE
Boulder Creek	4	0	0		N	FS			Y	Y	Y	NON-USE
Carter Meadows	4	3	3	LA	N	FS	5	1	Y	Y	N	AOI was changed for 2018
Cuddihy	3	0	0									VACANT
Deadwood	0	0	0		N	FS	0	0	Y	Y	Y	
Dry Lake (west-side)	3	2	3	LA, MIM	N	FS	4	1	Y	Y	N	AOI was changed for 2018
Eagle Creek	4	3	0	LA, LAB,	N	FS	2	1	Y	Y	N	Exclosure will be erected
East Beaver	4	2	0	LA, MIM	N	FS	2	0	Y	Y	Y	
East Fork	2	2	0	LA	N	FS	2	0	Y	Y	Y	
Etna Creek	3	2	0	LA	N	FS	2	0	Y	Y	Y	
Granite/Fox	3	0	0									VACANT
Grouse Creek	2	2	0	LA	N	FS	2	0	Y	Y	Y	
Hornbrook	0	0	0		N	FS	N/A	N/A	Y	Y	Y	

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Allotment Name	# of Key Areas	# of Key Areas Monitored	# of Non-Key Areas Monitored	M. Method	CAMP w/ P Y/N	Data Source	# Met Resource Standards	# Not Meeting Resource Standards	Results shared w/ P. Y/N	P. Cooperation Y / N	AOI Compliance Y / N	Actions Taken or Remarks
Horse Creek	3	1	0	LA	N	FS	1	0	Y	Y	Y	
Indian Creek	1	1	1	LA	N	FS	2	0	Y	Y	Y	
Kidder Creek	3	0	0									VACANT
Lake Mountain	1	0	0		N	FS			Y	Y	Y	NON-USE
Little North Fork	4	1	1	LA, MIM	N	FS	2	0	Y	Y	Y	
Marble Valley	2	0	0		N	FS			Y	Y	Y	NON-USE
Middle Tompkins	4	0	0									VACANT
Mill Creek	4	4	0	LA, MIM	N	FS	4	0	Y	Y	Y	
Red Rock Valley	3	3	1	LA	N	FS	4	0	Y	Y	Y	
S. Klamath	2	0	0									VACANT
Seiad Johnny	2	0	0									VACANT
Shackleford	4	2	1	LA, MIM	N	FS	3	0	Y	Y	Y	
Shelly Meadows	3	1	0	LA, MIM	N	FS	1	0	Y	Y	Y	
South Fork Saloon	4	0	0									VACANT
South Russian	3	1	1	LA	N	FS	2	0	Y	Y	Y	
TOTALS	204	129	11		3		134	6	39	39	36	

Noxious Weeds

Objective: Determine if noxious weeds have increased to damaging levels.

The Klamath National Forest noxious weed and non-native invasive plant program follows National direction with six main emphasis areas.

A. Early Detection/Rapid Response

Methodology: The Forest list contains 45 noxious weed species, 30 of which are high priority species for control. Even small levels of weeds are a concern, as they increase very rapidly, and then become uncontrollable. The Forest strategy focuses on treating high priority weed species in high priority places before they get to damaging levels, as funding allows.

Early detection and rapid response (EDRR) prevention practices are implemented. The Forest continues high priority treatments of the few noxious weed species known to exist within Wilderness on the Forest. The Forest prioritized treatment of infestations outside Wilderness by considering factors such as species, proximity and dispersal ability to Wilderness and trailheads, State ratings of species, and the ability to be successful with available control methods.

Results: New infestations of meadow knapweed were located in the Eclipse complex fire area, new infestations of dyer's woad were located in the Horse Creek Community Protection Project area, and new infestations of dyer's woad, starthistle, and puncture vine were located within the Klamath River corridor. New infestations of knapweed are actively being treated by the Forest and its partners. Other new infestations are being triaged for priority based on the elements described above in Methodology.

Further Action Required: None required. Current protocols of early detection and rapid response will continue.

B. Inventory/Control/Management

Methodology: In FY 2017, the Forest had a 2 person Forest noxious weed crew stationed out of the Supervisor's Office in Yreka. The Forest also has a small dedicated force of employees and volunteers that contribute in many substantial ways to the weed treatment program. This cadre includes: the Happy Camp District Botanist, Happy Camp seasonal botany crew, a small YCC crew at Goosenest and Salmon/Scott River Districts; the River Ranger; fire crews, and range and recreation technicians. The Forest also has community partners: the Salmon River Restoration Council, the Mid-Klamath Watershed Council, Siskiyou County School groups, volunteers from US Fish and Wildlife Service (USFWS), the Natural Resource Conservation Service, and the Siskiyou Satellite of the California Conservation Corps in Yreka. We also work closely with the Siskiyou County Department of Agriculture for treatment on private lands adjacent to the Forest.

All treatments on Forest lands are conducted using manual or mechanical methods, no chemical are used. Effectiveness of treatment methods is measured on the first visit to the site the year following treatment, and then throughout the season on return visits. This evaluation is entered into the national Natural Resource Information Service Invasive Species database.

Results: In FY 2017, the Forest and its partners treated 721 acres including 16 different species on over 200 sites. About 20 percent (143 acres) of treatments were accomplished using volunteer efforts. Treatments occurred in high priority sites including: burned areas, trailheads, river accesses, wilderness,

roads leading into wilderness, watersheds with few infestations to date, small satellite sites away from main river corridors, and larger infestations of “A” rated weeds that carry mandatory eradication direction from the State. In conjunction with these treatments, around 2,000 acres were monitored for the presence of noxious weed infestations and/or to determine treatment needs. In partnership with the Salmon River Restoration Council we continue to map and inventory *Potentilla recta* (Sulphur cinquefoil) across the Forest. To date we have mapped 24 sites infesting about 50 acres.

Isatis tinctoria (dyer’s woad) continues to spread throughout the forest, along roads, river corridors, and anywhere there is disturbance (e.g. fire, timber harvest, mastication, or any activity that creates large openings in the canopy). *Centaurea solstitialis* (Yellow starthistle) is also quite prevalent in hotter, drier sites. *Cytisus scoparius* (Scotch broom) is prevalent along the Klamath and Lower Scott watersheds. These species are only treated in geographically prioritized areas since they are so common on the Forest and throughout Siskiyou County.

Further Action Required: No further action is required. The Forest plans to continue with current treatment and monitoring efforts.

C. Project-level monitoring and treatment

Methodology: Project level monitoring and treatment, if possible, is conducted within three years of project completion. Some areas, depending on the project, are monitored annually dependent upon risk factors and types of disturbance. All projects have project design features that intend to limit the risk of introduction and spread of invasive species.

Results: Some highlights of specific projects:

- Big Ridge Grazing allotment: Treatment has been occurring at South Fork Kelsey Meadows and Bear Lake for many years. Dyer’s woad has been steadily declining, especially since follow-up visits were instituted in the late-summer in order to capture re-sprouts and seeding. In FY 2017, the infestations at the Kelsey Meadow sites were robust and more numerous than in 2016. Revisits were made in the late summer to clean up re-sprouts and missed rosettes. The Bear Lake infestations continues to decline and was treated in half of a day by 3 people, re-visits to this site were not deemed necessary in FY 2017.
- Butte Mountain LSR Habitat Restoration Project: Surveys indicate that handwork within the Little Shasta Meadows Special Interest Area did not spread, exacerbate or otherwise impact Canada thistle infestations.
- Two Bit Vegetation Management Project: Treatment and inventory of dyer’s woad continue in this project area. Infestations located along Greyback road are extensive and appear to be spreading. As this roadway is heavily used by recreationists, locals, tourists, and others, there are many possible vectors contributing to this spread.

Further Action Required: No further action is required. Continuing monitoring and treatment in project areas are planned.

D. Educational Outreach and Prevention

Methodology: As an integral member of the Siskiyou County Weed Management Area group, the Forest has participated in numerous outreach events and has led an educational booth at the Siskiyou County Fair every year since 2001.

Results: The 2017 fair booth reached about 940 people, including 95 children.

Further Action Required: No further action is required. The Forest plans to continue with current efforts and expanding efforts where possible.

E. Restoration and Rehabilitation

Methodology: Following removal of noxious weeds, native species are typically given time to return naturally to treated sites. If the site is extensive, treated using solarization, or part of fire rehabilitation than native perennial grass seed is used to occupy bare ground until native vegetation can become established. In FY 2017, funds were obligated for the purpose of growing and obtaining native plant materials for future needs.

Results: Several beds producing grass seed and propagules are in production at Coeur d'Alene and J. Herbert Stone Forest Service Nurseries.

Further Action Required: No further action is required. The Forest will continue eradicating small sites of selected species and holding, controlling, or decreasing the populations of other priority species at known, selected sites. Native plant materials collection and increase will also continue.

F. Strategic planning

Methodology: Efforts were conducted at national, State, and local levels.

Results: At the national level, the Invasive Species Strategy and Implementation Plan of 2004 has been updated. The Forest Service National Strategic Framework for Invasive Species Management, August 2013, is now the current direction. This document is available at:

<http://www.fs.fed.us/publications/invasive/invasive-framework-2013.pdf>

At the State level, the State-wide weed mapping project implemented cooperatively with the California Invasive Plant Council and partners, funded by USDA State and Private Forestry resulted in prioritized eradication targets for Siskiyou County. The Klamath National Forest and Weed Management Area Partners are currently writing grant proposals to fund these eradication targets. The North Central Eradication Plan, which includes the Klamath National Forest and Siskiyou County, is available on-line at <http://calweedmapper.calflora.org/regions/>.

Further Action Required: No further action is required. The completion of a forest strategy, and adoption of prevention Best Management Practices are planning goals. We will also continue our efforts to build partnerships and find opportunities for outside funding sources to support the program.

Cultural Resource Management

Monitoring Objective: The purpose of monitoring is to identify effects to heritage resources and provide appropriate mitigation in the event that effects are adverse. It is extremely important that adverse effects to significant sites are recognized and mitigated before the sites lose the information and integrity that makes them eligible for the National Register of Historic Places. Monitoring also aids in determining whether mitigation measures are working to address adverse effects and stabilize sites.

Monitoring: Site monitoring is a necessary component of the process required to comply with Section 106 of the National Historic Preservation Act. As part of the project review process, previously recorded historic properties within the Area of Potential Effect (APE) are identified and monitored for past effects as well as to identify any potential effects that may occur as a result of project implementation. Site monitoring is also required under Section 110 of the National Historic Preservation Act as part of a pro-

active heritage program. Sites are monitored to assess current conditions, identify past or on-going effects and to determine appropriate mitigation measures. Monitoring information can also be used to update site records and assist in the nomination of the site to the National Register.

Results: About 87 sites were monitored last year to identify effects from project implementation, environmental conditions, OHV use, wildland fire and fire suppression activities and looting. Monitoring data gathered from these sites aided the Forest in providing information during consultation with the State Historic Preservation Officer and interested Tribal officials. This information was also used to update site records, assess National Historic Preservation Act eligibility and develop mitigation. Monitoring related to project planning and implementation (Section 106) occurs for every project the Forest develops. Monitoring completed in compliance with Section 110 has increased due to a greater focus on non-project related accomplishments and appropriate budget allocations. The Forest continues to meet heritage program objectives and targets established by the Region.

Further Action Required: Continue updating the heritage database with monitoring information. Monitor more sites for Section 110 compliance.

Planning

A. Forest Plan Modeling

Objective: Validate assumptions used in the Forest Plan to predict impacts to resource programs including visual, wildlife, and earth sciences.

Monitoring, Results, & Future Action Required: See preceding discussions for each resource area or program.

B. Program and Budget

Objective: Determine actual costs associated with implementing planned management prescriptions as compared with costs estimated in the Forest Plan

Methodology: Forest budget and annual budget projections are tracked.

Discussion: The economic analysis for the environmental impact statement for the Forest Plan focused on the impact of each alternative on the present net value (the estimate of the market value of forest resources after all costs have been subtracted). Program budgets have fluctuated according to a variety of congressional laws and earmarks, and court requirements (Northwest Forest Plan, Herger-Feinstein Act, Lake Tahoe Deliverables, Southern California Forest Plan revisions, Northwest Forest Plan Settlement Agreement, Fire Transfer, etc.). A recap of the Forest budget indicates that, since 1995, most resource program budgets have been stable or declining, with timber management fluctuating between high and low points, fire stabilizing after several years of expansion, and fuels declining, like most other resources.

Further Action Required: No further action is required.

C. Other Monitoring – Outputs of Timber Harvest and Fuels Treatments

Objective & Monitoring: Compare the acres of timber harvest and fuels treatments, as modeled for the Forest Plan, with actual accomplishments on an annual basis.

Results: In the Forest Plan, timber harvest from regulated lands was modeled at an average of 51 million board feet (7.6 million cubic feet) per year over the first decade (1995-2004). This amount of timber harvest was intended to be accomplished on only 4,040 acres primarily using green tree retention prescriptions to accomplish this goal. However, since 1998, timber harvest has been achieved primarily through thinning instead of green tree retention methods. As a result, the intensity of timber harvest treatments has been reduced, and treatments are required over a larger amount of acres to achieve the same volume of timber removal. Since the Forest Plan was approved, the Forest has achieved or exceeded its annual fiscal year timber target nine times (1996, 1997, 2009, 2010, 2011, 2012, 2013, 2014, 2016, and 2017). The Forest offered and awarded about 52,787 hundred cubic feet of timber and convertible products in FY 2017. This exceeded the assigned target of 50,000 hundred cubic feet by about 6 percent.

The Forest Plan modeled timber harvest from unregulated lands (where trees are harvested solely to achieve goals of ecosystem health) at about 6,000 to 12,000 acres per year, while unregulated lands are not programmed and are generally incidental.

See the *Timber Management* section of this report for more information.

The Forest Plan modeled fuels treatments at about 27,000 acres per year, including 9,375 acres of prescribed burning, 3,183 acres of timber-related treatments, and 14,550 acres of other fuels treatments (e.g. mastication). For FY 2017, the assigned Forest target for hazardous fuels reduction was 13,887 acres. The Forest exceeded target, accomplishing 20,125 acres. An additional 93,305 acres of fuels accomplishment were claimed as a result of low severity wildfire acres. Of the Forest treatments accomplished, about 75 percent were located within areas considered as wildland urban interface. See the *Fire Management—Prescribed Fire Program* section of this report for more information.

Further Action Required: Annual comparisons will be continued for FY 2018.