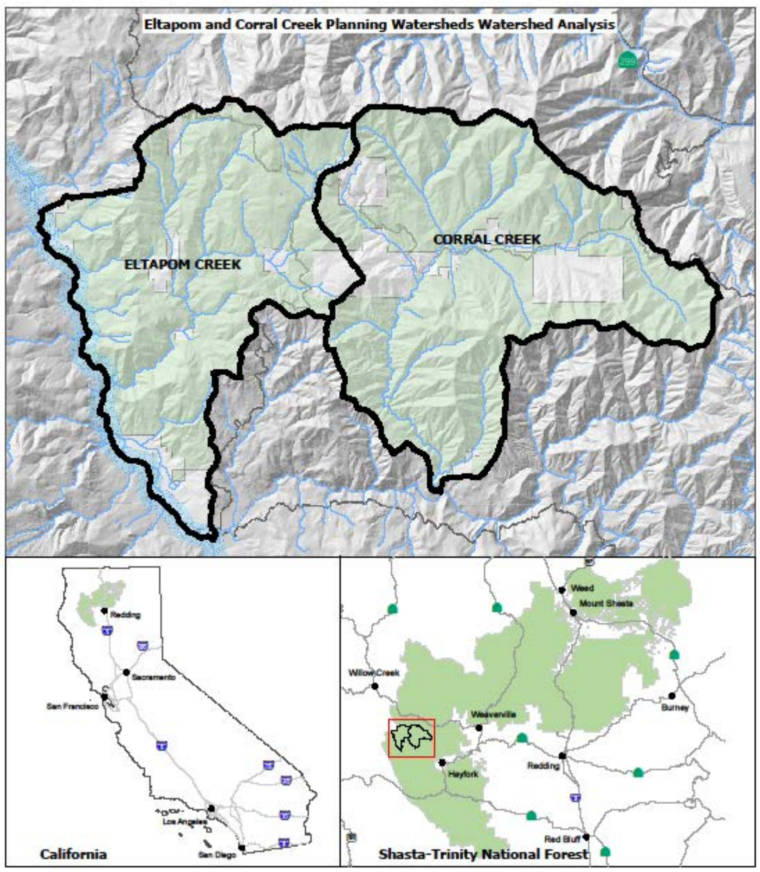
Eltapom Creek & Corral Creek Planning Watersheds Analysis



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INTRODUCTION

This Watershed Analysis is presented as an effort toward meeting the intent and requirements of the Aquatic Conservation Strategy adopted for the President's Plan, Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl; Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Related Species (USDA, 1994). A watershed analysis must be completed prior to implementing ground-disturbing actions in Riparian Reserves, Key Watersheds, or Inventoried Roadless Areas. The purpose is to assess the ecological health of watersheds and aquatic ecosystems within them on public lands. Assessment involves characterizing the watershed, describing current and historical conditions of physical and biological resources and human uses, then synthesizing those components to identify ecosystem links and process relationships. Conclusions reached generate recommendations for potential restoration or recovery actions that will restore or improve ecosystem functions in the target watersheds.

Watershed analysis provides a systematic, integrated procedure for characterizing watershed and ecological processes at a broader, watershed scale, to meet management and social objectives. It addresses the basic ecological conditions, processes, and interactions at work in the watershed, including biological, physical, and human contributions. It is not a decision-making process, but it provides the context for future management decisions. Through a standard, six-step process a team of resource specialists, documents the ability of watersheds to meet the objectives of the Aquatic Conservation Strategy and identifies opportunities to better meet those objectives through resource management.

Watershed analysis can be restricted to a single issue or cover a broad number of identified issues. There is no requirement that recommendations will be put into action in the future and an assumption that recommendations will be implemented as funding and ecosystem management priorities allow. Analysis reports are not static, but are expected to be updated with new information, as well as to analyze issues that weren't addressed in previous versions.

The Aquatic Conservation Strategy allows for analysis at any scale, as long as it is appropriate for the management purposes for which it is intended. Generally speaking, watershed analyses are conducted at the 5th-field scale, which provides a midscale analysis to provide the context for management through description and understanding of specific ecosystem conditions and capabilities. Eltapom Creek and Corral Creek planning watersheds are sub-watersheds of Lower South Fork Trinity River and Lower Hayfork Creek 5th-field watersheds respectively.

Rather than following entire 5th-field watershed boundaries, the Shasta-Trinity Land and Resource Management Plan delineates "planning" watersheds at a the 6th-field watershed scale. Eltapom Creek planning watershed contains 19,318 acres; all of Eltapom Creek 6th field watershed and 6,709 acres of the Hyampom 6th field watershed combined. Corral Creek planning watershed contains 23,154 acres and corresponds directly to the entirety of Corral Creek 6th field watershed only. Together, there are 42,472 acres of which 5,868 acres are under private ownership. For simplicity, "watershed" and "planning watershed" are used interchangeably throughout the document.

For the purposes of this report, the Eltapom and Corral Creek Planning Watershed Analysis will be limited to a single broad issue that focuses on fuel reduction, forest health improvement, road density reduction and road maintenance, and water quality and fish habitat improvement. This analysis does not comprehensively address all resource issues and it would be updated prior to planning additional projects in the watershed. Any recommended projects that are implemented would require further impact analysis that complies with the National Environmental Quality Act [1](NEPA).

This analysis follows the format provided in Part 2 of *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis - Version 2.2* (USDA, USDI, 1995). This format consists of six steps:

Step 1. Characterization of the watershed
Step 2. Identification of issues and key questions
Step 3. Description of current conditions
Step 4. Description of reference conditions
Step 5. Synthesis and interpretation of information
Step 6. Recommendations

Five core topics will be addressed throughout the analysis. The core topics represent major and common ecological elements and their relationships that are present in all watersheds. Core analysis topics help ensure that analyses are sufficiently comprehensive to develop a basic understanding of the watershed.

Core Topic	**Resource**
Erosion Processes	Soils, Geology, Hydrology
Hydrology, Stream Channels, & Water Quality	Hydrology, Fisheries
Vegetation	Silviculture, Fuels
Species and Habitats	Botany, Wildlife, Fisheries
Human Uses	Archaeology, Roads

1 42 U.S.C. § 4332

STEP 1: CHARACTERIZATION OF THE WATERSHEDS

The dominant physical, biological, and human processes or features of the watersheds that affect ecosystem function or condition are described in this section. The relationship between these ecosystem elements and those occurring in the river basin or province is established. This step provides the watershed context for identifying elements that should be addressed in the analysis.

1.1 LOCATION AND WATERSHED SETTING

Eltapom Creek and Corral Creek watersheds are located approximately 25 miles west of Weaverville, 12 miles northwest of Hayfork, and about 7 miles southwest of Big Bar, California. Together, the watersheds meet the boundary between the Six Rivers and Shasta-Trinity National Forest. The watersheds are located entirely within Trinity County and are bisected by the boundary between the Big Bar Ranger District (Trinity River Management Unit) and Hayfork Ranger District (South Fork Management Unit).

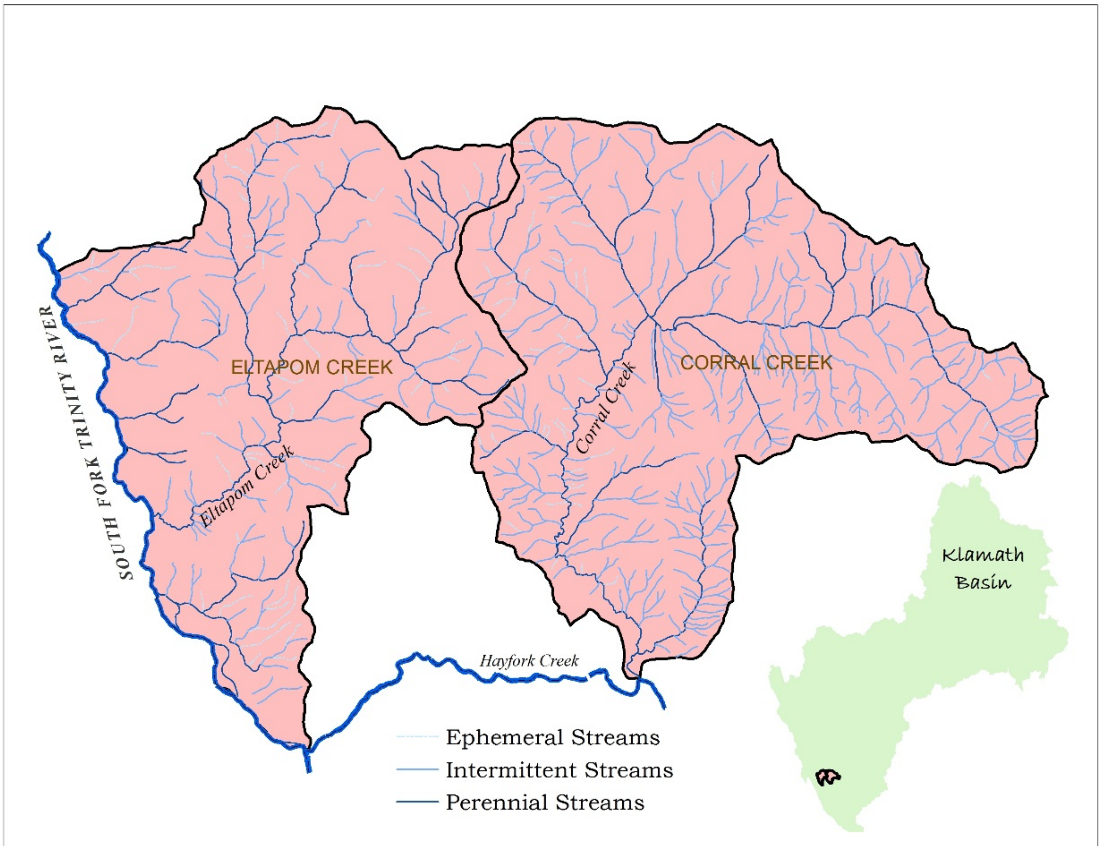
Eltapom Creek, Hayshed Creek, and Hyampom Creek are the largest perennial streams in the two planning watersheds. As shown in Figure 1, The South Fork of the Trinity River forms the western boundary of Eltapom Creek watershed and receives all water draining from both watersheds, although Corral Creek feeds first into Hayfork Creek, which then drains into the South Fork of the Trinity River. Eltapom Creek watershed drains an area of 19,318 acres; 16,761 of which are National Forest System lands. Corral Creek watershed drains an area of 23,154 acres; 19,843 of which are National Forest. The northern boundary of the two watersheds is delineated by a long series of ridges that include Underwood Mountain, Chaparral Mountain, and Monument Peak. The western boundary follows the South Fork of the Trinity River and the southern boundary follows a lower set of ridges that span from Hyampom on the west to Haypress Meadow on the east.

1.2 RELATIONSHIP TO LARGER SCALE SETTINGS

Eltapom Creek and Corral Creek watersheds ultimately drain into the South Fork of the Trinity River, the fourth largest sub-basin in the Klamath River Basin. It joins the Trinity River and downstream flows into the Klamath Basin, which drains an area of roughly 15,751 square miles. 65% of the Basin is in California and 35% in Oregon.

Most of the Klamath Basin is sparsely populated. The upper Klamath Basin is high desert and dominated by privately owned agricultural farm lands; the lower basin is dominated by mixed conifer hardwood forest, most of which is National Forest System lands. Timber harvest, ranching, and subsistence fishing are the predominant economic activities in the basin. There is a high level of recreational use, including fishing, camping, and hiking. Three major wilderness areas encompassing 1.8 million acres are present in the basin in Siskiyou and Trinity Counties. The South Fork of the Trinity River is the longest, undammed National Wild and Scenic River in California.

Figure 1. Location of Eltapom Creek and Corral Creek Planning Watersheds and Relationship to the Klamath Basin.



1.3 Physical Features

Eltapom Creek and Corral Creek watersheds are characterized by rugged, steep topography. Prominent physical features include the South Fork Trinity River, Monument Peak, and Pattison Peak. The Rattlesnake Creek Terrane, a geologic area rich in serpentine soils, runs through most of the Eltapom Creek watershed the far southwest edge of the Corral Creek watershed.

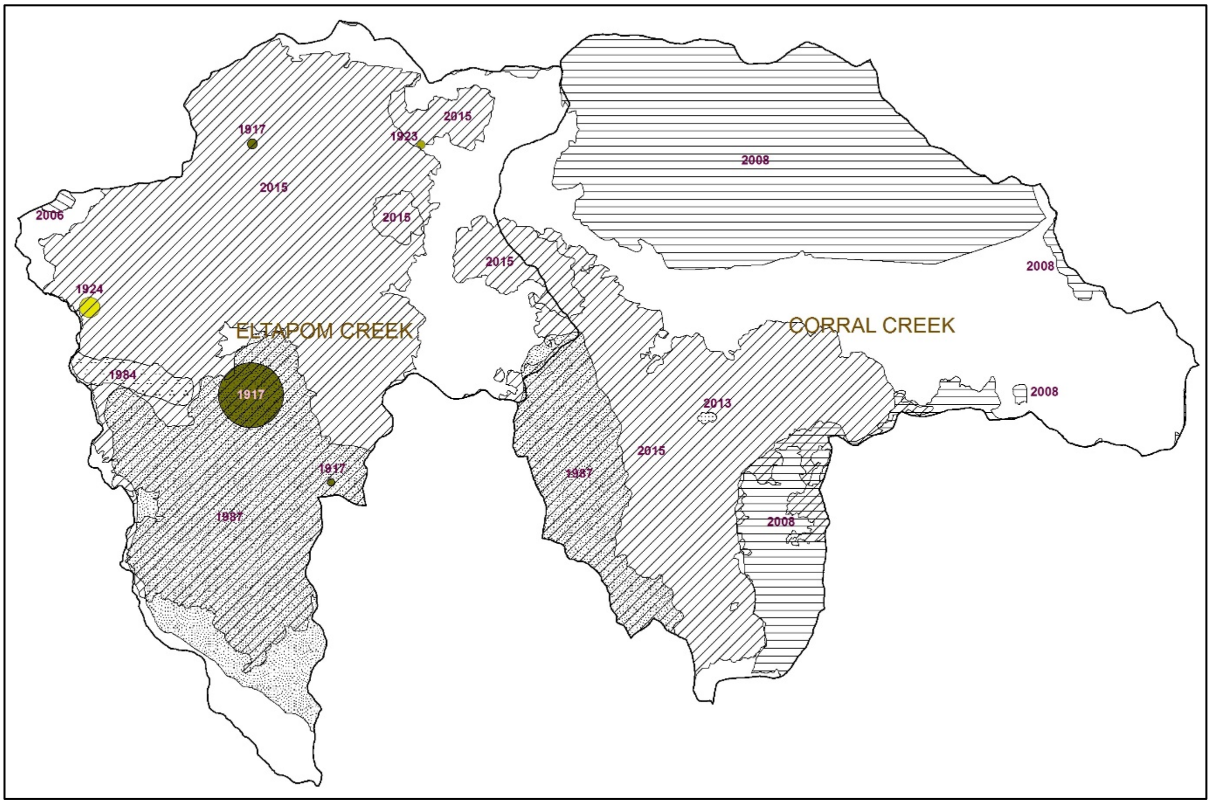
Climate

The climate of the watersheds can be described as Mediterranean with coastal influence; characterized by warm dry summers and cold wet winters. Temperatures range from average highs in the mid-90s°F (often exceeding 100° in the summer months), to average lows in the mid-30s°F during the winter months. Average annual rainfall ranges from 35 to 50 inches depending primarily on elevation.

Wildfires

39,456 acres have been burned in 23 documented wildfires within the two planning watersheds (42,472 acres) since about 1915. 17 of those fires occurred since 1980, but they account for 99% of the acres burned (Figure 2).

Figure 2. Fire History



1.4 Erosion Processes

Geology

The Corral Creek and Eltapom Creek watersheds lie within the Klamath Mountains Physiographic Province, which is predominantly underlain by Paleozoic and Mesozoic metavolcanic and metasedimentary rock, along with minor amounts of Tertiary and Quaternary sediments. Ultramafic minerals (serpentinite, peridotite and amphibolite), also known as serpentine minerals, exist within the watersheds, primarily in the Rattlesnake Creek Terrane. Some serpentine areas provide a source of naturally occurring asbestos (NOA), a known hazard when rocks break down release asbestos fibers into the air.

Most of the bedrock that underlies the watersheds has been cracked, broken and sheared by tectonic forces and therefore is prone to natural surficial processes, such as weathering from rain, ice and wind. Combined with the ruggedness and steepness of the terrain, many slopes in this area are subject to a high degree of mass wasting such as shallow slope failures, rock fall, and rock slides.

Soils

Corral Creek watershed is dominated by Ironside granitic soils that are more susceptible to erosion than other soils. Eltapom Creek watershed contains metasedimentary soils that are less susceptible to erosion than granitics. The Rattlesnake Creek Terrane, which runs in a wide northwest to southeast swath through Eltapom Creek watershed and a small piece of Corral Creek watershed, holds an unusually high concentration of serpentine soils. Other types of soil present are sedimentary, fine textured loams, and wetland soils. All soils are described in more detail in Step 3, Current Conditions.

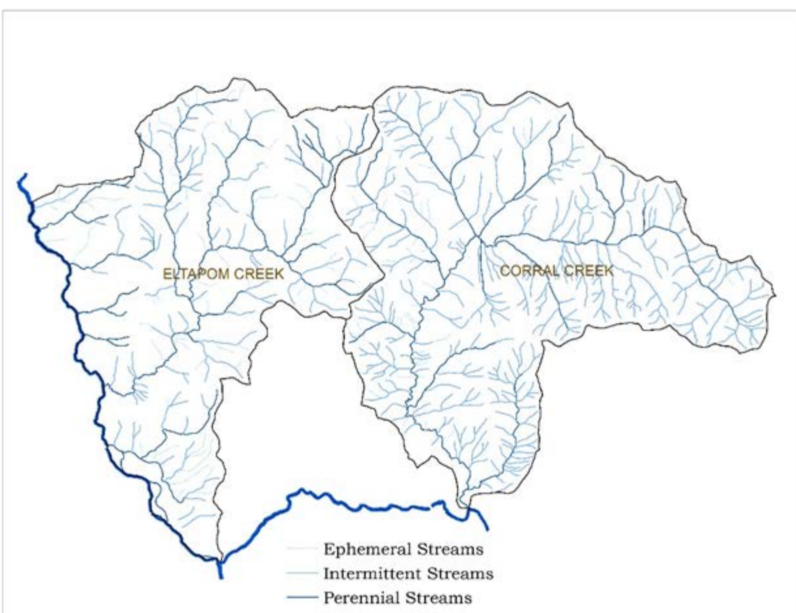
Old stable and dormant landslides in metavolcanic and metasedimentary rock on slopes less than 40% tend to be more weathered and fine textured. These are deep, productive soils with high water availability and are found within the Hohmann, Holland, and Hugo series. Steep mountain slopes in the watersheds hold metamorphic rocks that are moderately deep to deep gravelly loams on forested north and east facing slopes, and shallow to moderately deep gravelly loams on brushy south and west facing slopes.

Serpentine soils have erosion potential for a number of reasons, but they are much less erosive than granitics. These are some of the least productive soils in northern California because they contain high concentrations of selected heavy metals and low amounts of calcium. The lack of productivity relative to other forest soils is well-demonstrated by sparse or no tree cover and absence of surface vegetation where these trees are present.

HYDROLOGY, STREAM CHANNELS, WATER QUALITY

The primary riparian areas in the two planning watersheds include the South Fork of Trinity River, Eltapom Creek, and Corral Creek. Both planning watersheds directly or indirectly drain into the South Fork Trinity River which defines the western boundary of the Eltapom Creek planning watershed. Eltapom Creek drains directly into the South Fork of the Trinity River and is a part of the Lower South Fork Trinity River 5th-field watershed. Corral Creek flows into Hayfork Creek at the southern tip of the watershed, before meeting with the South Fork of the Trinity River about 15 miles downstream; it is within the Lower Hayfork Creek fifth-field watershed. Together, the two comprise 42,472 acres; 19,318 acres in the Eltapom Creek watershed and 23,154 acres in the Corral Creek watershed.

Figure 3. Riparian Stream Distribution



1.5 Vegetation

Plant Communities

The terrestrial vegetation within the Eltapom and Corral Creek watersheds is typical of the mid to upper montane ecological zone of the Klamath Mountains Bioregion (Skinner, C. N., A. H. Taylor, and J. K. Agee, 2006) (Skinner et al. 2006). This is a vegetation-diverse area dominated by Douglas-fir with lesser amounts of ponderosa pine, sugar pine, white fir, red fir, incense cedar, Oregon white oak, bigleaf maple, giant chinquapin, Pacific madrone, tanoak and grey pine, collectively called Klamath Mixed Conifer.

Jeffrey pine/incense cedar woodlands have a notable presence in Eltapom Creek watershed due to their location within the Rattlesnake Creek Terrane and relatively high amount of ultramafic/serpentine soils. In contrast to Klamath Mixed Conifer, serpentine woodlands are sparsely vegetated with widely spaced Jeffrey pine and incense cedar trees or no trees where serpentinite minerology is the dominant soil component ("serpentine barrens"). Wedgeleaf ceanothus is the most common shrub species where present.

In addition to riparian areas associated with riparian reserves, there are a number of spring-sourced wetlands, primarily in Corral Creek watershed. Perennial wetlands, including fens, springs, and seeps, support a unique group of obligate and facultative wetland species, such as sedges and rushes, not seen in upland areas.

Fuels

The Klamath Mountains are defined by complex topography with a high degree of variation in fuel type and accumulation depending on elevation, aspect, and slope position. Throughout the Klamath Mountains, fires often occur as lightning events during the dry, hot Mediterranean summer in which many fires are ignited over the course of one to several days. The number of fires can overwhelm fire suppression resources. Steep terrain and difficult access also hamper fire suppression efforts.

Critical fire behavior conditions occur under three common weather patterns: strong pre-frontal southwesterly or westerly winds associated with a cold front, strong post-frontal northerly or northeasterly winds after the passage of a cold front, and strong high pressure systems that promote topographically driven fire behavior and result in strong inversions.

Historically, the majority of the Eltapom Creek and Corral Creek watersheds experienced frequent low- to mixed-severity fires on an interval of 0 – 35 years. The historic fire regime was defined by fires burning with high spatial complexity in a heterogeneous landscape consisting of a variety of vegetation types and stand structures.

1.6 Species and Habitats

Wildlife

In regard to wildlife and wildlife habitat quality, Eltapom and Corral Creek watersheds are similar to others on the west side of the Shasta-Trinity National Forest, largely a mixture of early- and late-successional mixed conifer forest. The mix of successional stages provide moderate to good quality habitat for northern spotted owls, the only federally-listed wildlife species with known occurrences on the Forest. The density of known NSO activity centers in these watersheds is low to moderate, but this is likely due more to the survey effort in these watersheds than the actual density of NSO's. This may be an artifact of low survey effort, but may also be due to other factors such as past wildfires and timber harvest.

NSO Relative Habitat Suitability modeling indicates the best potential habitat for viability and reproduction is in the Corral Creek watershed and eastern portion of the Eltapom Creek watershed. Riparian habitats in these watershed are also typical of the west side of the Shasta-Trinity National Forest, varying in flow volume and velocity depending on slope position and stream order. This supports a wide diversity of wildlife species that are adapted to different riparian characteristics, especially those seen with elevation changes.

FISHERIES

The extent of anadromy in the two watersheds is limited by a number of natural barriers. Fish passage is blocked 1.8 miles upstream on Eltapom Creek by a 12 foot vertical drop. There are a series of six total or partial barriers documented in Corral Creek, the lowest being only 300 feet upstream from the confluence with Hayfork Creek. These natural barriers include a 10-12 foot cascade and a 14 foot waterfall that migrating salmonids can't ascend. The South Fork of the Trinity River is passable to anadromous fish for the full extent of the boundary with Eltapom Creek watershed, approximately 9.5 miles.

Eltapom Creek and Corral Creek each contain stretches of stream gradient less than 4%, among more common gradients of 4-10%; the longest being Corral Bottom in Corral Creek watershed and unnamed segments in Eltapom Creek watershed. Gentle stream gradients typically contain superior fish habitat and historic records validate this for the two planning watersheds. As expected, these areas are also where private property inholdings are found.

The South Fork Trinity River has historically been recognized as a major producer of chinook and coho salmon and steelhead trout (Brown et al, 1994). The South Fork originates in the North Yolla Bolly Mountains about 50 miles southwest of Redding, and runs northwest for approximately 90 miles before reaching its confluence with the Trinity River near Salyer.

PLANTS

Species diversity is high within the watersheds due to the number of different habitats present, including riparian, chaparral, conifer forest, oak woodland, open grassland, and serpentine barrens. With the exception of Corral Bottom and isolated springs, seeps and seasonal meadows, water availability is fairly low in most parts of the watersheds, which limits species diversity. Habitat for Sensitive, Survey & Manage, and Forest Plan Endemic plant species is present in late-seral conifer forests. The Rattlesnake Creek Terrane, a geologic area high in serpentine plant species including a number of Sensitive and endemic species, runs through the Eltapom Creek watershed.

1.7 Human Uses

Roads

Approximately 165 miles of roads are present within the Corral Creek and Eltapom Creek watersheds, mostly on National Forest System administration but a small number crossing private lands. About 42% of the Forest roads are closed and the rest are operational maintenance levels 2, 3, and 4. About 24.4 miles of road are paved or have a bituminous surface. The rest are either rocked or native surface material. The road density of Corral Bottom and Eltapom Creek Watershed is about 2.5 miles per square mile, but this includes a number of maintenance level 1 roads. Removing maintenance level 1 roads brings the road density down to 1.2 miles/mi^2 in Eltapom Creek watershed and 1.6 miles/mi^2 in Corral Creek watershed. Roads receiving the highest volume of traffic are 5N60 (Underwood Mtn Rd), 4N47 (Corral Bottom Rd), and County Roads 301 and 311. These roads serve as access to residences in the Hyampom area, fire suppression activities, logging, service work, and Forest Service recreation sites (Infra 2017), as well as an alternative route between Weaverville and the Coast when Highway 299 is closed.

Heritage

Native Americans are known to have lived in the watersheds for the past 7000 to 9000 thousand years, where they camped along the South Fork of the Trinity River and hunted and gathered in the uplands. Over the last 50 years, over 34 prehistoric and historic archaeological sites have been discovered within the two watersheds.

Illegal Marijuana Cultivation

Illegal growing has been occurring in both watersheds for over thirty years. There are multiple marijuana grow sites in both watersheds; the collective number of sites can divert significant amounts of water from local streams and add toxic pollutants downstream or to surrounding soils as a byproduct of irrigation runoff. Marijuana grow sites can cause natural and cultural resource damage by displacing cultural artifacts, damaging and removing native plant communities, and contaminating and displacing water resources. Illegal grow sites on National Forest System lands, including those within the two watersheds, have not significantly decreased since new cultivation regulations governing cultivation were enacted in the last 10 years that effectively allowed cultivation on private property under specific conditions (Smith, 2016).

Other uses

Human uses occurring in and adjacent to the watershed consist of private and federal timber harvest activities, state highway, and domestic water withdrawal. Outdoor recreational activities such as off road vehicle use, hunting, mountain biking, and hiking. A utility corridor bisects both watersheds. Within the corridor are two electrical transmission lines, Humboldt-Trinity 115 kV and Trinity-Maple Creek 60 kV, both carry power from Redding to Humboldt Bay.

1.8 Land Allocations and Management Direction

Management direction for the Shasta Lake West Watershed is found in *the Shasta-Trinity National Forests Land and Resource Management Plan* (LMP) which incorporates direction from the *Record of*

Decision (ROD) *for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl.*

Management Direction

Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) (Appendix A) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands because aquatic resources have seen the greatest decline in ecosystem function. Watershed analysis is done to assess whether management actions meet the objectives of the Aquatic Conservation Strategy on lands within the range of the northern spotted owl at a landscape scale rather than at the scale of individual projects. The strategy identifies nine objectives aimed at maintaining and restoring ecosystem function in aquatic ecosystems.

North Coast Basin Plan

Water quality standards for all hydrologic units and waterbodies within the North Coast Region are defined by the North Coast Regional Water Quality Control Board (Water Board) in the Water Quality Plan for the North Coast Region (North Coast Basin Plan) (NCRWQCB, 2011). The Plan provides water quality standards to help managers preserve and enhance water quality and protect beneficial uses in the North Coast Region, in an effort to meet the intent of Section 13050(f) of California's Porter-Cologne Water Quality Control Act[2] and the federal Clean Water Act[3].

The Water Board has identified one or more of 27 "beneficial uses" to all hydrologic units/waterbodies within the North Coast Region and these beneficial uses are identified in the North Coast Basin Plan. Beneficial uses of the waters of the state are to be protected against water quality degradation including, but not limited to, domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

Wild and Scenic River Designation

The South Fork Trinity River, which forms the western boundary of the Eltapom Creek watershed and a portion of the southern end of MA 17, is designated Wild and Scenic River, based on its outstandingly remarkable anadromous fishery values. It possesses a Recreational classification along the boundary of Eltapom Creek watershed, and Wild, Scenic, and Recreation classifications along other selected segments of the river from where it drains into the Trinity River to about 200 miles upstream.

Shasta-Trinity National Forest Land and Resource Management Plan

Management Areas

Eltapom Creek and Corral Creek planning watersheds are within the Corral Bottom Management Area (MA17) and Hayfork Creek Management Area (MA16). Each management area includes portions of

[2] 23 CA ADC §3831

[3] 33 USC 1151

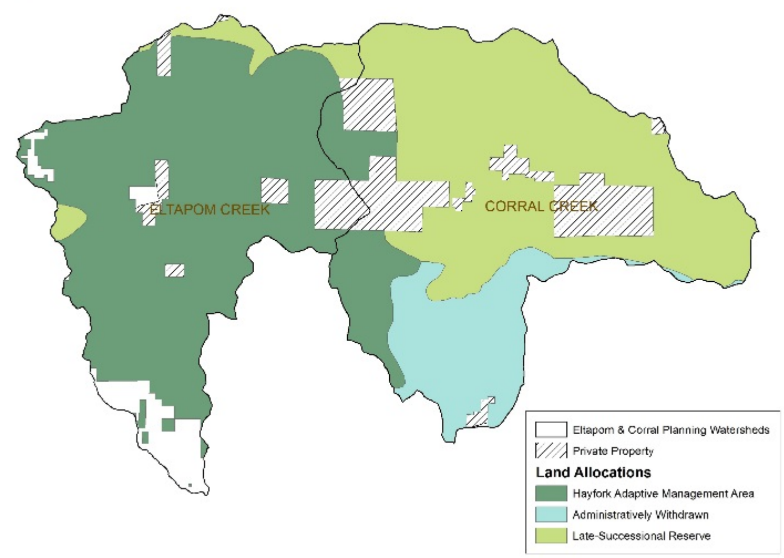
both planning watersheds. Management Area 17 emphasizes recreation and scenic activities along the South Fork Trinity River and Hayfork Creek Canyon areas. Over half of Management Area 16 is within the Late-Successional Reserves land allocation where management of Late-Successional Reserves and Threatened and Endangered species is of the greatest importance. Outside of Late-Successional Reserves, timber harvesting is an important consideration with the goal of managing forest stand densities at levels to maintain and enhance growth and yield to improve and protect forest health and vigor. Management activities are primarily directed at enhancement of anadromous fisheries and recreation opportunities.

LAND ALLOCATIONS

LATE-SUCCESSIONAL RESERVES

15,553 acres of Late-Successional Reserve (LSR) RC332 (Corral LSR) are present in both planning watersheds. As shown in Figure 4, 64% of Corral Creek watershed is designated LSR (14,781 acres), but only 772 acres of LSR are present in Eltapom Creek watershed. The intent of designating LSR 332 was to provide habitat for an area that would support 20 pairs of spotted owls in the future.

Figure 4. Land Allocations



At the time the plan was written, 76% of the total land base was in fuel models 9 and 10, which predict more intense ground fires and densely stocked pole size trees with closed canopies. Corral LSR has been identified as having a hazard/risk rating of Moderate/High because of steep slopes and a history of a large number of lightning caused fires.

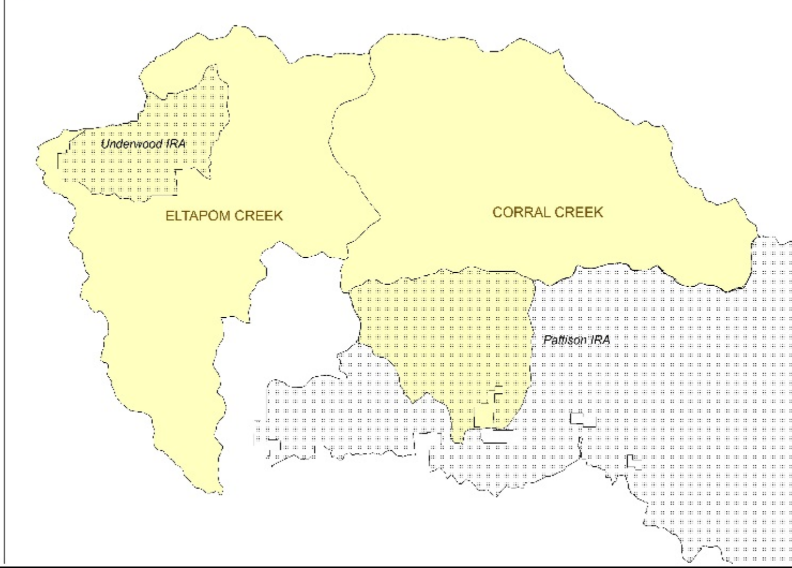
ADAPTIVE MANAGEMENT AREAS

All but about 350 acres of National Forest System lands in the Eltapom Creek watershed are within the Hayfork Adaptive Management Area (AMA) land allocation; Corral Creek watershed contains 8,386 acres within the AMA allocation; about 33% or of the watershed. Lands within AMA are managed similarly to those in other land allocations, but have an overall objective to use experimentation to develop innovative management practices that integrate ecological and economic values. Management of lands in AMA must comply with all laws, regulations, and policies for land management and are not exempt from any specific planning requirements.

ADMINISTRATIVELY WITHDRAWN /INVENTORIED ROADLESS AREAS

Two Inventoried Roadless Areas (IRA) (administratively withdrawn land) are present in the planning watersheds (Figure 5). Underwood IRA is completely contained in the Eltapom watershed and is 3,044 acres. 5,168 acres of the larger Pattison IRA sits at the southern end of Corral Creek watershed. Inventoried Roadless Areas were established under the 2001 Roadless Rule to provide lasting protection for IRAs in the context of multiple-use management. Within IRAs road construction or reconstruction and timber harvesting are prohibited on National Forests unless reviewed and approved by a higher Forest Service level of authority. Reviews and approval give careful consideration to the need to remove or cut timber or construct roads to emergency situations involving wildfire suppression, search and rescue operations, or other imminent threats to public health or safety in inventoried roadless areas. In the Pacific Southwest Region, the State of California also participates in reviews of proposed projects within inventoried roadless areas.

Figure 5. Inventoried Roadless Areas



Step 2: Issues and Key Questions

Background

The purpose of this chapter is to focus the analysis on the key elements of the ecosystem that are most relevant to the management questions and objectives, human values, or resource conditions in the watershed. Watershed concerns are identified and framed within the context of issues. Part 2 of *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis, Version 2.2* (USDA, 1995) lists seven core topics that should be addressed in all watershed analyses, singly or in combination with like processes. The core topics and core questions that accompany each topic address the basic ecological conditions, processes, and interactions (elements) at work in the watershed.

Watershed Core Topics

1. Erosion Processes
2. Hydrology, Stream Channels, Water Quality
3. Vegetation
4. Species and Habitats
5. Human Uses

Issues focus the analysis on the main management questions to be addressed. Issues are those resource problems, concerns, or other factors upon which the analysis will be focused. Due to limited time and resources this watershed analysis has been confined to a single, important issue, *Watershed Recovery in Riparian Reserves within Eltapom and Corral Creek Watersheds*. Excessive sediment and degradation of the anadromous fishery in the South Fork Trinity River is one of the highest areas of concern in the two watersheds. Because this watershed analysis is confined to a single issue it will be necessary to revise the analysis prior to planning future projects in the Eltapom Creek and Corral Creek watersheds that don't fit within the scope of this report.

Issue: Watershed Recovery in Riparian Reserves within Eltapom and Corral Creek Watersheds

Ecosystem processes in the two watershed are operating at less than their potential due to a number of environmental and managed disturbance events over time and there are elevated levels of sediment in the South Fork Trinity River. The once outstanding anadromous fishery has declined enough to warrant federal listing for Coho salmon. The South Fork Trinity River watershed was included on California's Clean Water Act (CWA) Section 303(d) *Total Maximum Daily Load* (TMDL) list as water quality impaired due to excessive sediment. Past management actions implemented before regulations and policies were in place to limit environmental impacts continue to contribute sediment into the South Fork Trinity River.

Key Questions:

1. What is the current status of water quality and hydrologic function?
2. What is the array of plant communities and how does that array contribute to meeting ecosystem needs?
3. Do current ecosystem processes allow for providing public safety?

STEP 3: CURRENT CONDITIONS

This step identifies conditions of the planning watersheds that are relevant to the issue and key questions from Step 2 in more detail. It documents the current range, distribution, and condition of core topics and other relevant ecosystem elements.

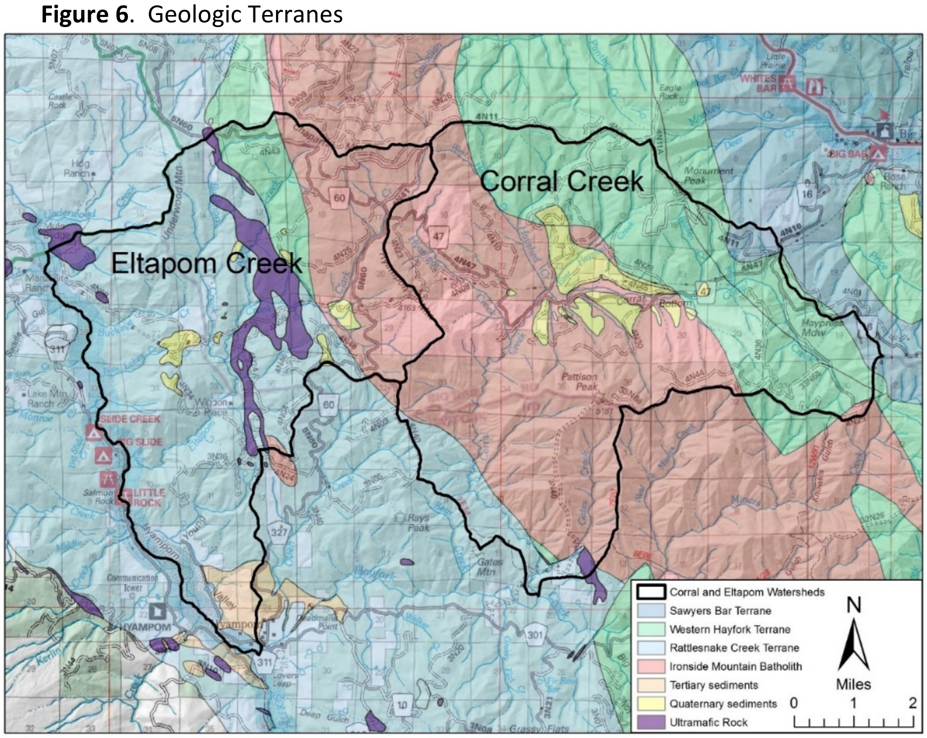
3.1 EROSION PROCESSES

GEOLOGY

Over the past 500 million years, tectonic processes accreted numerous terranes onto the western margin of North America and three of these occur within the watersheds: the Sawyers Bar, Western Hayfork, and Rattlesnake Creek Terranes. Terranes are fault-bounded blocks of crustal material with distinctive stratigraphy, structure, and geological history that have been broken off from one tectonic plate and accreted or "sutured" to crust lying on another plate.

During the Jurassic Period, these terranes were intruded by granitic plutons, notably the Ironside Mountain Batholith in this area. Small outcrops of younger sedimentary rock occur primarily in the Hyampom Valley and Corral Bottom along with scattered patches of topographically-high land surfaces left over from the Pleistocene (Figure 6).

Figure 6. Geologic Terranes



Most of the bedrock that makes up the terrain in the study area has been cracked, broken and sheared by tectonic forces and therefore is prone to natural surficial processes, such as weathering from rain, ice and wind. Combined with the ruggedness and steepness of the terrain, many slopes in this area are subject to a high amount of mass wasting such as shallow slope failures, rock fall, and rock slides. Mass wasting contributes to sediment movement into local waterways and has played a role in reduced water quality in the South Fork Trinity River. It is also a natural activity has occurred in the past and will continue in the future.

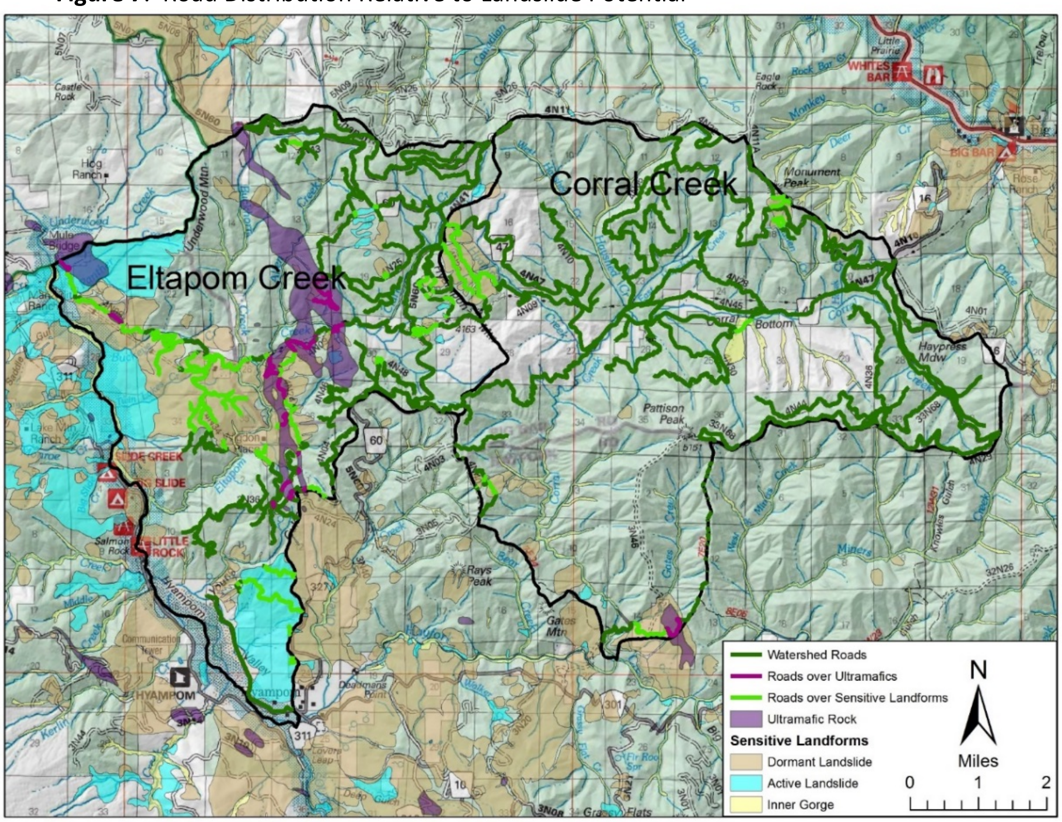
The granite that makes up the Ironside Mountain Batholith, which extends from Pattison Peak in the southeast of the study area to Chaparral Mountain in the north (Figure 6), typically forms sandy soils and can be particularly prone to shallow debris slides and debris flows in steeper watersheds after wildfire.

Wildland fire also has an effect on the landscape as it can cause additional landslides or reactivation of dormant ones. When trees are killed by fire, their roots no longer provide support to rock and soil on hillslopes. The buffering effect of brush and other ground cover from wind and rain is also lost during a fire. Some dormant landslides are located in the watersheds which might be re-activated during future storms as a result of the 2015 fires.

Of the approximately 165 miles of Forest roads within the two watersheds, 95.3 of those cross over potentially unstable terrain (i.e., inner gorge, active and dormant landslides) (Figure 7). Landslides and debris flows can alter hydrologic function of the watershed, another potential source of contributed sediment and reduced water quality into the South Fork Trinity River.

Ultramafic rock, such as serpentinite, peridotite and amphibolite, also exist within the watersheds, primarily in the Rattlesnake Terrane. Naturally occurring asbestos (NOA), mostly in the form of chrysotile and actinolite, may be present in bodies of ultramafic rock. The presence of NOA can be elevated by ground- disturbing human activities, such as the use of roads and mechanized equipment

Figure 7. Road Distribution Relative to Landslide Potential



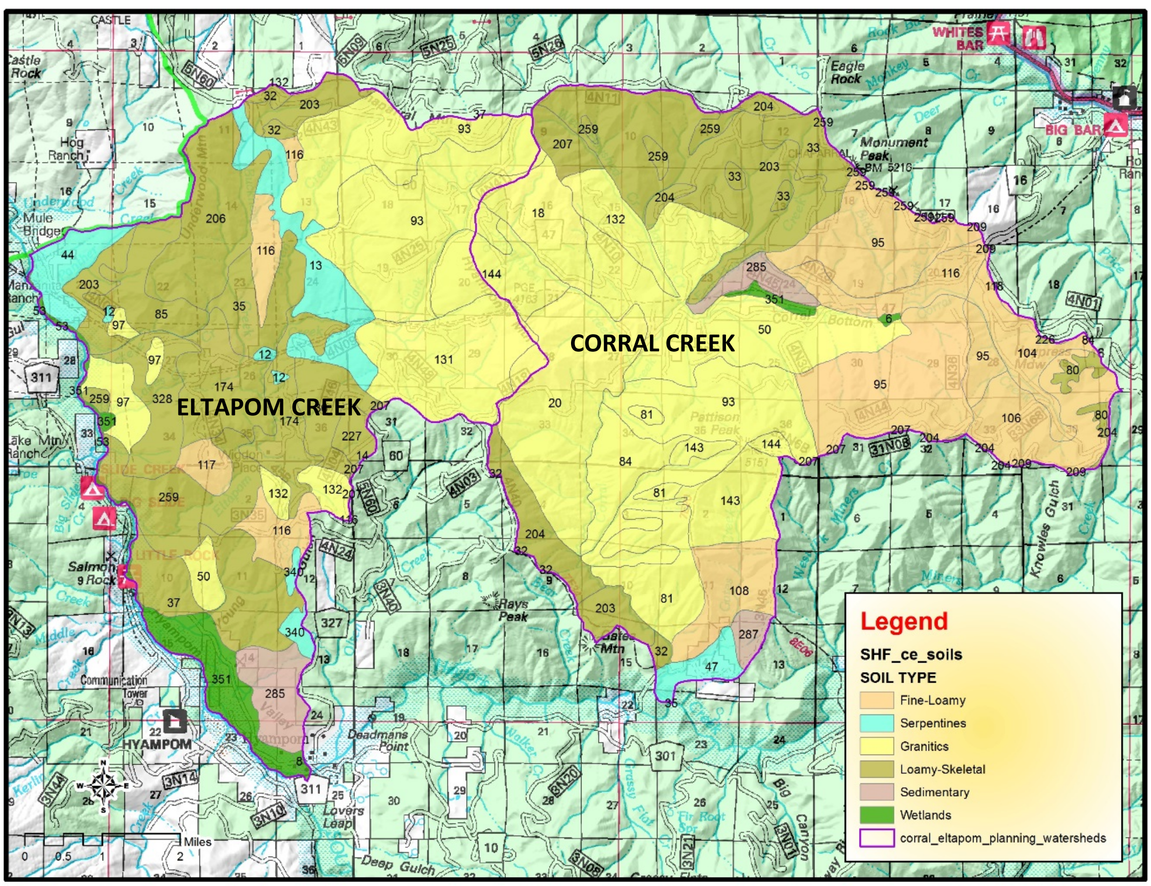
off-road that cross outcrops soils derived from ultramafic rock. Currently, 5.7 miles of roads cross ultramafic rock bodies that potentially contain NOA.

Soils

Soil Types

Moderately to highly erodible granitic soils are present in the upper third of the Eltapom Creek watershed, with the remaining area containing a mosaic of finer, but less erodible loamy-skeletal, fine-loamy, sedimentary, and wetland soils. The watershed also has a moderate amount of serpentine soils as would be expected in the Rattlesnake Creek Terrane in which the Eltapom Creek watershed lies. The block of granitics continue into the Corral Creek where they are dominant and are surrounded by a central core of less erodible fine-loamy and loamy-skeletal soils. Of the two watersheds, the majority of natural and human-triggered sediment movement downhill into the South Fork of the Trinity River comes from Corral Creek watershed that contains more erosive diamictite metasedimentary rock formations. Given these types of geology, soils in the Corral Creek watershed are sandy and those in the Eltapom Creek watershed produce gravelly to clay loams with a large

Figure 8. Soil Types



component of serpentine or ultramafic soils. Other types of soil are sedimentary, fine textured loams, and wetland soils (Figure 8). Soil types in the watersheds and their erosion risk are listed in Table 1.

Table 1. Soil Characteristics and Erosion Ratings

Soil Type; Representative Slope Range	Soil Texture	Soil Depth	Erosion Hazard	Burn Damage Potential	Runoff Potential	Infiltration Speed	Drainage
Fine-Loamy							
Dunsmuir Family; 15-20%	Fine-loamy	D	L	M	B	M	W
Dunsmuir Family; 20% or more	Fine-loamy	D	L	H	B	M	W
Holland Family; 20-40%	Fine-loamy	MD	L	L	B	MR	W
Holland Family; 40-60%	Fine-loamy	MD	M	L	B	MR	W
Holland Family; 60%+	Fine-loamy	MD	H	M	B	MR	W
Holland Family, deep; 20-40%	Fine-loamy	D	L	L	B	MR	W
Holland Family, deep; 40-60%	Fine-loamy	D	M	M	B	MR	W
Holland Family, deep; 60%+	Fine-loamy	D	H	H	B	MR	W
Hugo Family; 15-40%	Fine-loamy	D	L	L	B	M	W
Hugo Family; 40-60%	Fine-loamy	D	M	L	B	M	W
Hugo Family, moderately deep:60%+	Fine-loamy	MD	H	M	C	M	W
Serpentines							
Beaughton Family; 20-50%	Clayey-skeletal	S	M	M	D	M	W
Beaughton Family; 50%+	Clayey-skeletal	S	H	H	D	M	W
Dubakella Family;20-40%	Clayey-skeletal	MD	L	M	C	MS	W
Dubakella Family; 40%+	Clayey-skeletal	MD	M	H	C	MS	W
Weitchpec Family; 20%+	Loamy-skeletal	MD	L	M	B	M	W
Granitics							
Chaix Family:40-60%	Coarse-loamy	MD	VH	H	B	MR	W
Chaix Family:60%+	Coarse-loamy	MD	VH	H	B	MR	W
Hohmann Family	Fine-loamy	MD	H	M	B	M	W
Huntmount Family	Fine-loamy	D	M	M	B	M	W
Loamy-Skeltal							
Deadwood Family; 40-60%	Loamy-skeletal	S	M	H	C	M	W
Deadwood Family; 60%+	Loamy-skeletal	S	H	H	C	M	W
Goulding Family; 40-50%	Loamy-skeletal	S	M	H	D	MR	W
Goulding Family; 50-60%	Loamy-skeletal	S	H	H	D	MR	W
Goulding Family; 60%+	Loamy-skeletal	S	H	H	D	MR	W
Marpa Family; 20-40%	Loamy-skeletal	MD	M	L	B	M	W
Neer Family; 40-60%	Medial-skeletal	MD	M	M	B	MR	W
Neuns Family; 40-60%	Loamy-skeletal	MD	M	M	B	M	W
Neuns Family; 60%+	Loamy-skeletal	MD	H	H	B	M	W
Neuns Family, deep	Loamy-skeletal	D	L	L	B	M	W

Soil Type; Representative Slope Range	Soil Texture	Soil Depth	Erosion Hazard	Burn Damage Potential	Runoff Potential	Infiltration Speed	Drainage
Rock Outcrop Complex; 40%+		VS	H	H	D	VS	EX
Typic Xerorthents; 60%+	Loamy-skeletal	D	H	H	B	MR	SX
Sedimentary							
Secca Family; 20-40%	Fine	D	M	L	C	M	MW
Secca Family; 40%+	Fine	D	M	M	C	M	MW
Wetlands:							
Aquolls	Sandy-skeletal	VD	L	L	D	S	P
Atter Family	Sandy-skeletal	D	L	L	A	MR	EX
Xerofluvents	Coarse-loamy	VD	L	L	A	MR	W
Definitions:							
		VS = very shallow	L=low	L=low	A = no runoff	VS=very slow	P=poor
		S = shallow	M=mod	M=mod	B = low runoff	S=slow	M=mod well
		MD = mod deep	H=high	H=high	C = mod runoff	MS=mod slow	W=well
		D = deep	VH=very high		D = high runoff	M=moderate	S=somewhat excessive
		VD = very deep				M=mod rapid	E=excessive

Soil Resilience

Healthy soil performs many functions within the ecosystem, such as clean air and water, bountiful crops and forests, productive rangeland, diverse wildlife, and beautiful landscapes. Soil does this by performing five essential functions; nutrient cycling, water relations, biodiversity and habitat, environmental filtering and buffering, and physical stability and support.

Soil resilience (an index of forest soil health) refers to the ability of a soil to resist or recover in response to destabilizing influences. Soil resiliency indices rate soils on their ability to resist degradation from disturbance, based on response and recovery after seven common disturbance agents. Table 2 show the soil resilience index for soil types within Corral Creek and Eltapom Creek watersheds. In it we see that granitics, which are dominant in the Corral Creek watershed, have the highest erosion hazard, displacement potential, soil burning effects, and adverse response to whole-tree removal. Serpentines have the highest compaction hazard and puddling and churning effects. Loamy-skeletal soils have high soil burning effects and puddling and churning effects. Wetland soils have the highest resilience to disturbance.

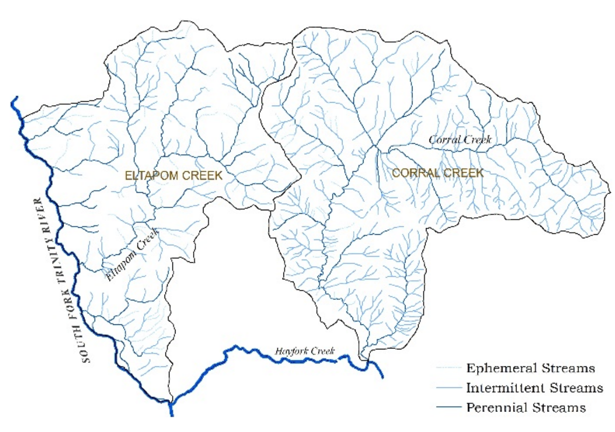
Table 2: Soil Resilience Ratings for Eltapom and Corral Combined based on response to different treatments

Soil	Erosion	Compaction	Displacement	Response to Burning	Puddling	Whole-Tree Removal	Resiliency	RATING
Granitics	74	16	20	17	10	28	166	**Low**
Serpentines	51	21	9	12	13	18	124	**Moderate**
Fine-Loamy	54	13	10	8	8	12	105	**Moderate**
Loamy-Skeletal	62	11	18	17	15	20	143	**Low**
Sedimentary	45	19	6	7	11	9	97	**High**
Wetlands	51	8	9	7	9	13	97	**high**

Hydrology, Stream Channels, Water Quality

There are 98 miles of perennial streams and 199 miles of intermittent and ephemeral streams in the analysis area, including the South Fork Trinity River, shown below in Figure 9. Buckhorn, Allen, and Clark Creeks are the dominant tributaries into Eltapom Creek. East and West Hayshed Creeks, Hyampom Creek, and Gates Creek are the dominant tributaries flowing into Corral Creek. The largest perennials are West and East Hayshed Creeks, Allen Creek, Clark Creek, and Hyampom Creek. Hayfork

Figure 9. Distribution and Flow of Riparian Reserves



Creek is not a part of either watershed, but it provides the spawning connection between the South Fork of the Trinity River and Corral Creek.

The South Fork of the Trinity River is the longest undammed river systems in California and it drains a watershed of about 980 square miles. Historically it sustained an exceptionally large and high quality anadromous fishery, but during the mid-20th century the river channel was heavily damaged by major flooding and other impacts. Runs of Chinook salmon and steelhead trout have declined greatly because of degraded water and habitat quality in the South Fork of the Trinity River.

10,941 acres of Riparian Reserves overlaying the 297 miles of stream are present within both watersheds. There are 5 additional Riparian Reserves that are wetlands; three in Eltapom Creek and 2 in Corral Creek. Reducing sediment delivery to Riparian Reserves as a means of improving water quality in the South Fork of the Trinity River is the focus of this watershed analysis.

Accelerated erosion processes caused by past and present land use practices in the analysis area have resulted in increased sedimentation in the South Fork Trinity River (U.S. EPA, 1998). Sediment levels in the South Fork of the Trinity River, contributed from tributaries throughout the South Fork of the Trinity River Basin exceed existing water quality standards identified in the North Coast Basin Plan (NCRWQCB, 2011). The South Fork Trinity River watershed was included on California's Clean Water Act (CWA) Section 303(d) *Total Maximum Daily Load* (TMDL) list as water quality impaired due to excessive sediment.

One of the consequences of impaired water quality listing in the South Fork of the Trinity River is the TMDL that is in place to restore water quality to bring it into compliance with the Clean Water Act. As a result there is increased oversight of National Forest management actions by the North Coast Regional Water Quality Board. All proposed land management activities are expected to be consistent with attaining the objectives of the TMDL.

The North Coast Waiver addresses this impairment by requiring that legacy sites of erosion and sedimentation are identified, prioritized and scheduled to promote TMDL compliance. In addition there is an expectation for Board involvement in project planning, as well as additional monitoring and annual reporting of land management activities on NFS lands. The additional planning and monitoring the Board requires is a significant workload within an already complex multi-resource objective program of work.

Sedimentation continues to exceed existing water quality standards designed to protect the beneficial uses of the basin, particularly the cold water fishery. Roads carrying high or moderate risk features for sediment movement are shown in red and yellow respectively in Figure 10. Risk features include plugged ditches and culverts, undersized culverts, improperly sloped roadbeds, and others.

Most of the sediment delivery is associated with natural sources in the Upper and Lower South Fork sub-basins, primarily landslides and other mass wasting. It is likely that the quantity of sediment sources associated with management in some locations is underestimated due to cumulative effects, and in other cases some mass wasting due to natural causes may be classified as management-associated. Seventy-eight percent of landslide volumes in the lower South Fork Trinity River (USFS

1996, as modified by Raines 1998) were identified within inner gorge features, and 92% of those landslides were assigned to natural causes. It is likely that some of these were caused by cumulative upstream effects of the 1964 flood, but this was not noted in the analysis. Hayfork Creek, by contrast, produces less sediment overall, and is more influenced by road-related erosion than by mass wasting.

Road-related sediment delivery within the South Fork of the Trinity River Basin has increased overall from 1944 to present and both planning watersheds have historically had moderate overall road density (approximately 2.5 mi/mi^2). Since publication of the Motorized Travel Final Environmental Impact Statement in 2010, numerous roads in both watersheds have been closed (primarily maintenance level 1) and current road density is very low at 1.2 mi/mi^2 in Eltapom Creek watershed and 1.6 mi/mi^2 in Corral Creek watershed. Nevertheless, simply closing roads may eliminate vehicle use that can aggravate road-sourced erosion, but in many instances erosion can continue to occur until the underlying source of erosion is mitigated. Underwood IRA in Eltapom watershed and Pattison IRA in Corral Creek watershed help reduce the amount of overall sediment delivery to the South Fork of the Trinity River.

High water temperature is a second reason the South Fork of the Trinity River was listed as water quality limited. Temperature is too high to fully support aquatic habitat (U.S. EPA, 1998). High temperatures may result from natural conditions, water diversions, loss of riparian vegetation, and excess sedimentation that has resulted in channel widening and decreased water depths. The current TMDL states that an overall 30% improvement in water quality is considered reasonable to achieve target conditions. The natural drought cycles in California play a partial role in high water temperatures.

SEDIMENT SOURCE INVENTORY

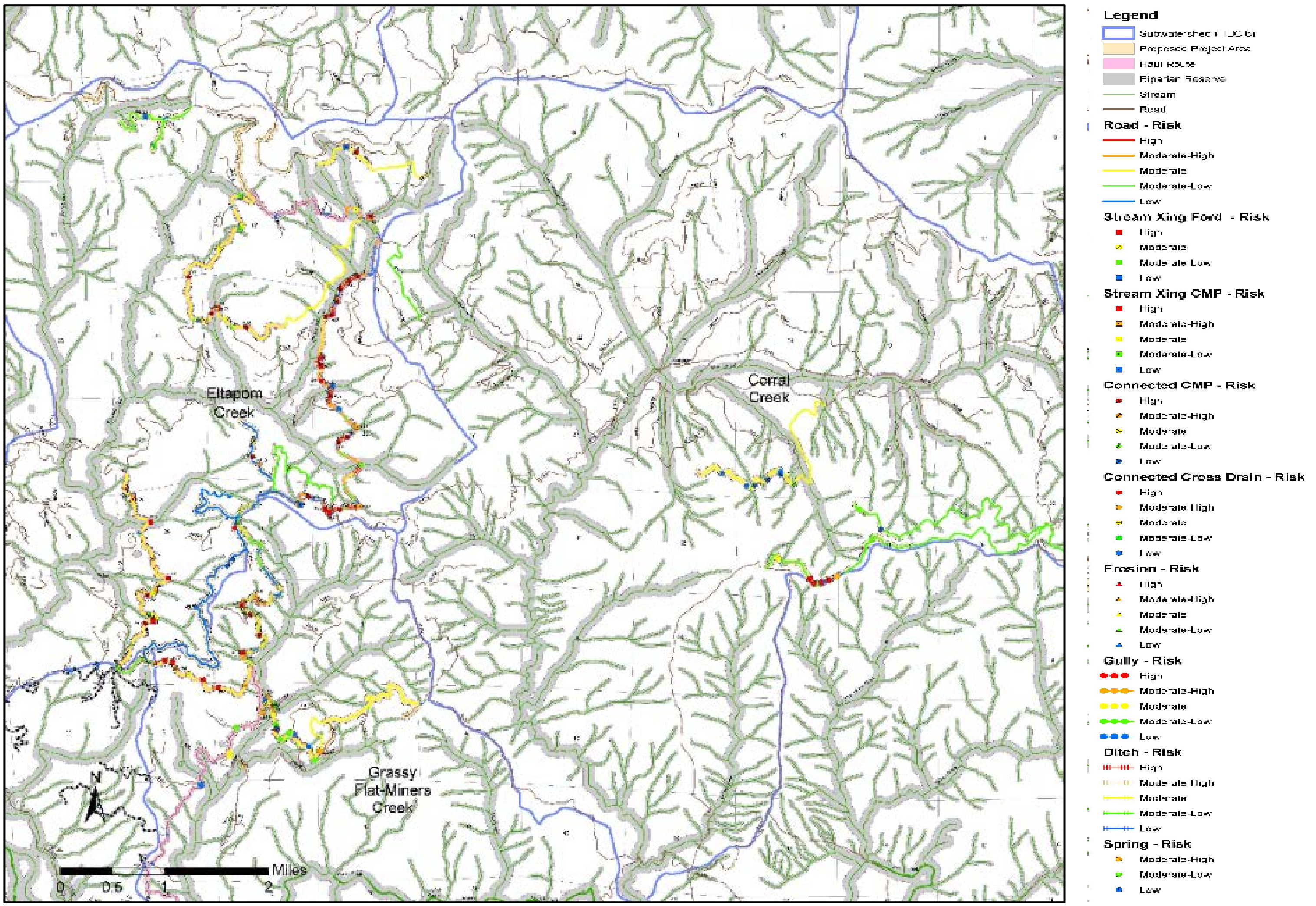
SOUTH FORK TRINITY RIVER SUB-BASIN

Forest Service roads in the South Fork Trinity River Sub-basin were inventoried in 2011 and 2012 by North State Resources, Inc. (NSR, 2011; NSR, 2012). Complete risk ratings and sediment reduction treatments for inventoried roads in the Lower Hayfork Creek and Lower South Fork Trinity River fifth-field watersheds are summarized below.

Roads 4N04, 4N23, and 4N24 originate in the Hyampom sixth-field watershed, but cross over into the Eltapom or Corral Creek watersheds. Two inventoried high risk features are found on 4N24, a connected CMP and a plugged ditch. There are plans to reconstruct this road to remove the high risks.

Some Forest Service roads in the project area in Lower South Fork Trinity River have not been inventoried. Road 4N11 in Eltapom Creek has not been inventoried for sediment sources. No stream crossings are present as high risk features, therefore only routine maintenance will occur on this road.

Figure 10. Moderate to High Risk Erosion Features



LOWER HAYFORK CREEK FIFTH-FIELD HUC

CORRAL CREEK WATERSHED-SIXTH FIELD HUC

Risk ratings of roads in the Lower Hayfork Creek fifth-field watershed were inventoried by NSR in 2012 and that lie within (or partially within) the planning watersheds are shown in Figure 10. High and moderate to high risk features on inventoried roads and recommendations for treatment are described in Tables 3-7**Error! Reference source not found.**. In Corral Creek, there is only one moderate-high to high risk feature, a gully located on road 33N68. The risk was rated high because it compromises access to the route. However, it is not hydrologically connected, so it should not be considered a high risk sediment source to any nearby stream.

Table 3. Risk rating of inventoried roads in the Corral Creek watershed in Lower Hayfork Creek

HUC 6	Route	Risk[4]	Maintenance Level	Miles
Corral Creek	33N68	1.5	High Clearance Vehicles	5.273
	4N23	1.2	High Clearance Vehicles	0.96
	4N30	2.3	High Clearance Vehicles	2.731
	4N44	1.4	High Clearance Vehicles	2.815
	31N48	0.5	High Clearance Vehicles	0.581
	31N48A	0.5	Basic Custodial Care (Closed)	0.154

Table 4. Specific recommendations to address inventoried sediment sources on high and moderate-high risk roads in Corral Creek watershed.

Route ID: 33N68		**Subwatershed: Corral Creek**	
Mile Marker	**Feature Type**	**Problem**	**Recommendation**
4.661 - 4.929	Gully	Long highly erodible gully that forms two erosion features. Not connected but compromises route access.	Install frequent cross-drains with armored outlets.

Table 5. Inventoried moderate-high and high risk features in the Corral Creek Watershed

Route ID: 33N68				**Subwatershed:** Corral Creek	
ID	**Mile Marker**	**Feature Type**	**Fill Vol (cu yd)**	**Problem**	**Recommendation**
H31	4.9	Gully		Surface flow	Install frequent cross drains with armored outlets
A27	4.1	ConnCMP		Combo	Clean inlet/outlet
E32	4.1	StreamXingCMP	11652	Fixed by BAER	None
E33	4.5	StreamXingCMP	2464	Poison oak at inlet causes ponding	Clear inlet
B33	0.8	ConnXDrain		26-75% Aggregation	Clear aggregates
F1	0.6	StreamXingFord		At grade rock ford, poor approaches	Reconstruct
B34	0.6	ConnXDrain		Plugged, non-functioning	Reconstruct
C15	0.3	Erosion		Gully and rill on route surface, high erosion potential	Consider outsloping, rolling dips or cross drains

[4] The risk rating is on a scale of 0 to 5, with 0 being no risk. 3.0 or greater is moderate-high risk, and 4.0 or greater is high risk.

Eltapom Creek Watershed-Sixth Field HUC

In the Eltapom Creek watershed, there are numerous high and moderate-high risk features on roads 4N24, 4N25, 4N41, 4N41A, 4N48A, and 5N50, including ten stream crossing corrugated metal pipes (CMP), 21 connected CMPs, one connected cross drain, 38 ditches, and one erosion feature. BAER funds were used to replace three CMPs and improve three stream crossings on road 4N24, but all other risk features are still in need of repair.

Table 6. Risk rating of inventoried roads in the proposed project area in Lower South Fork Trinity River.

HUC 6	Route	Risk	Maintenance Level	Miles
Eltapom Creek	4N04	0.5	High Clearance Vehicles	2.205
	4N24	2.9	High Clearance Vehicles	2.824
	4N24	0.7	High Clearance Vehicles	0.012
	4N25	2.6	High Clearance Vehicles	4.881
	4N41A	2.3	Basic Custodial Care (Closed) (NSR)	1.415
	4N43	0.4	High Clearance Vehicles	0.102
	4N43	1.0	High Clearance Vehicles	0.583
	4N43A	1.5	High Clearance Vehicles	0.671
	4N46	0.6	High Clearance Vehicles	1.177
	4N48	1.8	High Clearance Vehicles	1.628
	4N48A	0.7	High Clearance Vehicles	0.382
	4N48A	0.8	High Clearance Vehicles	0.375
	5N60	0.5	Moderate Degree of User Comfort	0.436
	5N60	3.9	Moderate Degree of User Comfort	5.285
Hyampom	4N04	0.8	High Clearance Vehicles	0.123
	4N22	0.9	High Clearance Vehicles	0.645
	4N24	1.0	High Clearance Vehicles	0.460

Table 7. Maintenance and upgrade activities for Sims Restoration project #2 for roads in Hyampom.

Road	Location	Activity
4N13	0.0-0.38	Rebuild and rock rolling dips
4N14	0.0-1.94	Rebuild and rock rolling dips
4N31	0.1	Construct critical dip
	0.25	Clear inlet
	0.37	Eliminate road surface sediment delivery
	0.67	Eliminate road surface sediment delivery
	3.13	Eliminate road surface sediment delivery
All	All	Brushing along road

3.2 Vegetation

Plant Communities

Community Composition and Structure

Existing vegetation conditions within the Eltapom and Corral Creek watersheds have been identified using a number of available resources, including the 2007 Existing Vegetation spatial data of the Shasta-Trinity National Forest's corporate database, 2010 NAIP imagery, and field visits. Major vegetation communities and their size are shown in Table 8.

Table 8. Vegetation Communities within the Analysis Area

Life Form	**Acres**	**% of Analysis area**
Conifer	34,285	**81**
Mixed Conifer/Hardwood	3,190	**6**
Hardwood	2,669	**8**
Shrublands	1,086	**2**
Herbacious/non vegetated	1,242	**3**
Total	**42,471**	

Table 9. Species within Conifer Communities

Species	**Acres**	**% of Conifer Class**
Douglas-fir	22,990	67
Mixed Conifer	10,610	31
Pine (PP/KC)	441	1
True Fir	244	1
Total	**34,285**	

The most abundant and connected vegetation type of the watershed is Douglas-fir (*Pseudotsuga menziesii*). The Douglas-fir type occupies over half of the watershed in early to late seral stages. Compositions of the Douglas-fir plant associations include moist Douglas-fir, mesic Douglas-fir and dry Douglas-fir. In addition, Douglas fir is a key component of the mixed conifer type, accounting for an additional quarter of the watershed. Common components of mixed conifer include Douglas-fir, white fir, ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), and incense cedar (*Calocedrus decurrens*).

Non-forested sites include shrub dominated and herb dominated areas. Shrub dominated sites are common in lower elevation areas, especially near South Fork of the Trinity River as well as those experiencing high intensity or frequent fire and include whiteleaf (*Arctostaphylos viscida*) and greenleaf manzanita (*Arctostaphylos patula*), as well as deer brush (*Ceanothus intergerrimus*) and whitethorne ceanothus (*Ceanothus cordulatus*). Herbaceous communities occur as small wet meadows throughout the watershed.

Table 10. Seral Stages within Conifer Class[5]

Size Class	Conifer Crown Diameter (feet)	DBH (inches)	Acres	Percent of Conifer Forest Communities
Seedling	n/a	<1.0"	660	2%
Sapling tree	n/a	1.0" - 5.9"	2,454	6%
Pole tree	<12.0'	6.0" - 10.9"	6,570	15%
Small tree	12.0' - 23.9'	11.0" - 23.9"	18,552	44%
Medium/large tree	≥24.0'	≥24.0"	10,401	24%
Unclassified	Data doesn’t exist or is not available		1,501	4%
Non-forest	Non-forested, but capable		2,328	5%

Table 10 displays current size classes of the most abundant trees across the Eltapom and Corral Creek watersheds. This can loosely be attributed to successional stages, indicating nearly half of the area is in mid-successional condition, nearly a quarter is in a late successional condition, and the remaining quarter is either early successional (seedlings or sapling/pole) or not forested.

As about half of the area is Adaptive Management Area, and the other half is Late Successional Reserve and Administratively Withdrawn (Inventoried Roadless Area), it is appropriate to utilize the Forestwide Late Successional Reserve Assessment (1999) for guidance on desired conditions within these watersheds. The desired condition within the Corral LSR (RC332) is to maintain the highest level sustainable of late successional forest habitat. Overall within the LSR, late successional forest accounts for only 30% of the level considered sustainable. Due to the high value of this area to late-successional dependent species such as the northern spotted owl, maintenance of habitat is of high importance.

Previous Management

Approximately 4,900 acres of forested land has been managed within this watershed assessment area from 1958 through 1992, primarily utilizing small patch clearcuts as a tool for regeneration harvests. Most of management occurred in the 1970s and early 1980s and there has been very little active vegetation management in this watershed assessment area since 1992.

Forest Health

The Eltapom and Corral Creek watersheds are experiencing elevated levels of mortality. Aerial surveys conducted annually by the Forest Health and Protection indicate recent mortality across a total of 6,450 acres (or 15% of the watershed assessment area) from 2014-2016. Approximately 2,066 acres is from 2016 alone, and takes into account post-fire secondary mortality following the South Complex (2015). Bark beetles are the primary source of elevated tree mortality. Typically, they attack weakened, mature trees and are indicators of poor stand health. Poor stand health is usually attributed to overstocking (i.e. the number of trees exceed the limited amount of resources resulting in weakened trees) and is compounded by drought conditions.

[5] Data does not incorporate updates following 2008 or 2015 wildfires. Last revision to the Existing Vegetation layer was 2007.

FUELS

CURRENT FUEL CONDITIONS AND POTENTIAL FIRE BEHAVIOR

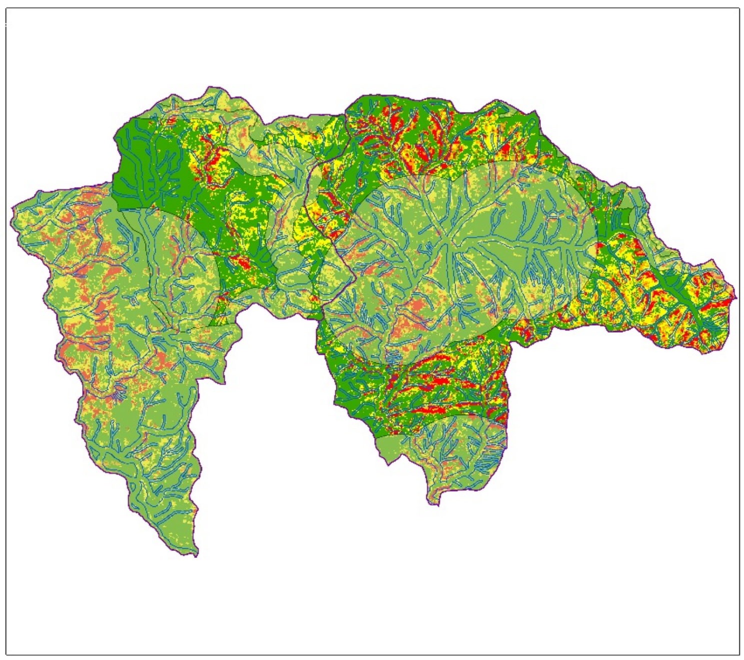
Fuel types generally describe the primary carrier of fire through an area. Table 11 lists the burnable fuel types in the planning watersheds. As expected, multi-story conifer forest communities with shrubs and small trees in the understory are found on the greatest number of acres.

Table 11. Primary burnable fire behavior fuel Types in Eltapom and Corral Creek watersheds

Fuel Type	Approximate Acres	Percent
Grass	2841	6.7
Grass & Shrub	7735	18.2
Shrub	2294	5.5
Timber Litter	12618	29.8
Timber Litter with Understory of Small Trees and/or Shrubs	16162	37.9

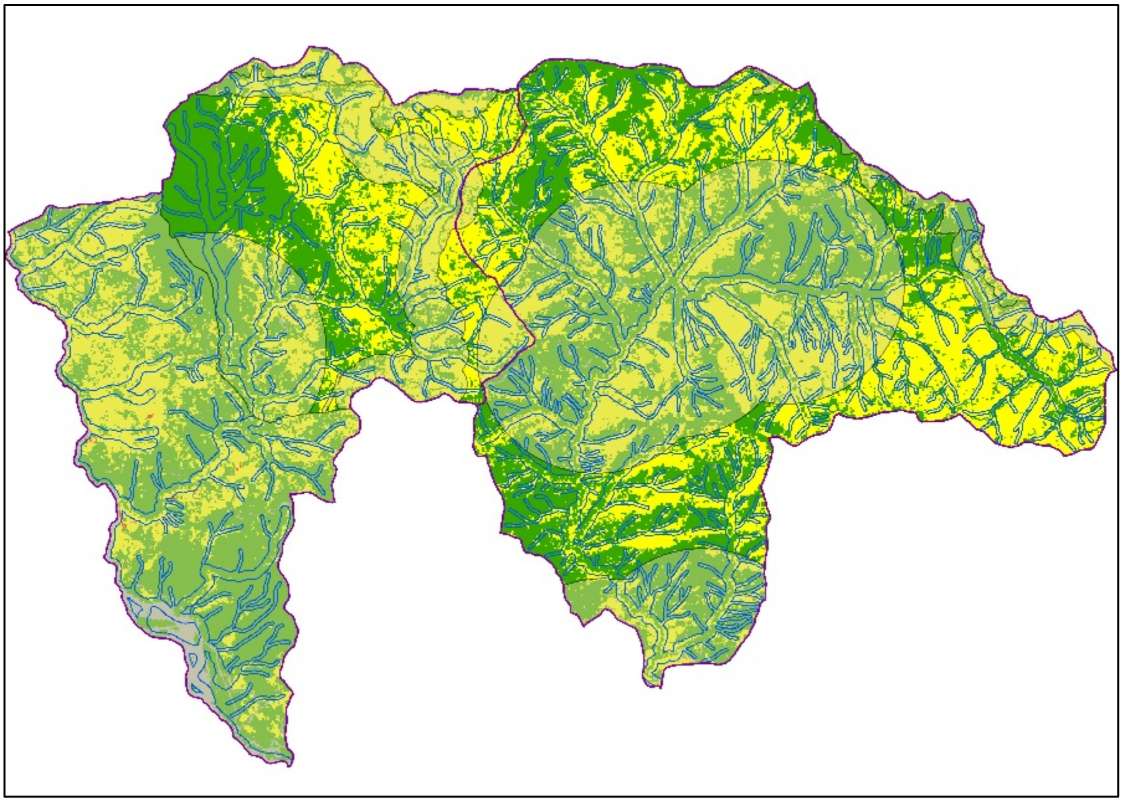
FlamMap (Finney, 2006), a fire behavior mapping and analysis tool, was used to calculate potential flame length and crown fire activity under 90th percentile weather and fuel moisture conditions within the two watersheds. Overall, flame lengths would generally be less than 4 feet and both surface fire and passive crown fire (torching) would be common (Figure 11). Torching and higher flame lengths will be more common where slopes are steep, surface fuel loading is high, and ladder fuels such as shrubs and young conifers in the understory are present.

Figure 11. Potential Flame Lengths and Wildland Urban Interface



Flame lengths over 4 feet will exceed the holding capacity of firelines constructed by crews with hand tools. Flame lengths over 8 feet will exceed the capabilities of engines, dozers, and aircraft and will likely require an indirect attack strategy. Figures 11 and 12 display the distribution of predicted flame lengths and crown fire intensity throughout the two planning watersheds. Areas in green represent predicted flame lengths of 4 feet or less, yellow indicates flame lengths between 4 and 8 feet, orange between 8 and 11 feet and red indicates flame lengths 11 feet or higher. Wildland Urban Interface zones are shown as transparent overlays in both watersheds.

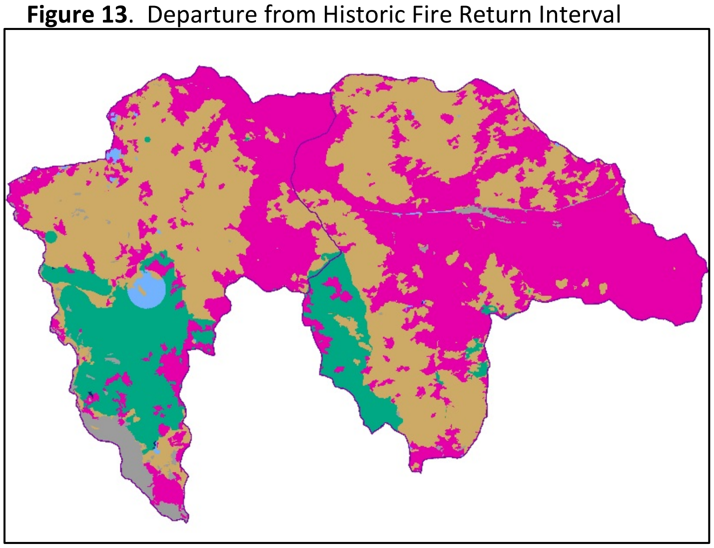
Figure 12. Potential Crown Fire in Riparian Reserves and WUI



CHANGES IN FIRE RETURN INTERVAL

Recent fire history demonstrates the effects of roughly a century of fire suppression on stand composition and fuel loading in the Eltapom Creek and Corral Creek watersheds. In general, throughout the Klamath Mountains, managed fire suppression began in the early to mid-20th century. Fire suppression efforts were so effective that, 100 years later, large landscapes adapted to regular and periodic fire didn't experience the ecological benefits of fire. Woody fuels that would normally be kept at low amounts with regular wildfire have built up to high enough levels that fires burn with greater intensity and severity. The result has been fires that differ from historic patterns in that they burn with less spatial complexity, cover a greater extent, and contain more area burned at high intensity and severity (Skinner et al 2006).

Figure 13. Departure from Historic Fire Return Interval



Most of the acreage within the Eltapom Creek and Corral Creek watersheds has burned within the last 30 years. However, for the most part, most locations have burned no more than once since records began to be kept on wildfire occurrence in the early 20th century.

Figure 2 in Step 1 shows wildfires greater than one acre documented since about 1910. Additional fires have occurred, but rapid suppression efforts have kept them from growing bigger than an acre. As a result of the low number of fires over 1 acre, fuels have accumulated and fuel loading within these areas is higher than would have been common in the historic fire regime.

Figure 13 illustrates the amount that the current fire return interval has changed (departed) from historical in the Eltapom Creek and Corral Creek planning watersheds (Safford and Van de Water, 2014). Areas in pink and sienna (pink represents the most departure) have burned less frequently than seen prior to European settlement. Green areas are the least departed and are close to the historic fire return interval. Areas in blue have burned more often than the pre-settlement fire return interval but also represent a low degree of departure. Areas in gray represent non-burnable acreage and areas of herbaceous fuels for which the fire return interval is not fully understood.

Research indicates the mean historic fire return interval for the majority of both watersheds is 11 – 29 years between fires, depending on the vegetation type. Areas showing multiple fires in Figure 2 (Step 1) generally align with those representing the lowest amount of departure in Figure 13. But for the majority of the planning watersheds, no more than one wildfire event has occurred, resulting in an average fire return interval of higher than the reference interval of 11 – 29 years.

Fire Risk

Lightning accounts for roughly 60% of all fire ignitions with an average of 2 lightning ignited fires per year. However, lightning ignitions tend to occur in clusters during lightning events that can last one to several days. Notable lightning events that resulted in several fires in a one- to two-day period occurred in July of 1992, September of 2003, August of 2004, June of 2006, June of 2008, and July of 2015, although not all lightning ignited fires grow large enough to be documented. Historically, both watersheds have been affected by lightning fires that originate in neighboring watersheds. Campfires and debris burning are the most common human-caused ignition sources in the two planning watersheds.

Table 12. Ignition Sources in the planning watersheds, 1992-2013

Number of Ignitions	Cause
4	Arson
7	Campfire
5	Debris Burning
4	Equipment Use
39	Lightning
4	Miscellaneous
1	Smoking
64	**Total**

Burn Severity and Intensity

Wildfires within the past 30 years in the Eltapom Creek and Corral Creek watersheds have burned a greater number of acres than seen historically, but the mix of low/moderate/high severity has reflected what is normally experienced in wildfires in the Klamath Mountains. High severity fire has occurred on about 10-15% of acres burned, with the remainder of the area being split between moderate and low severity, or very low/unburned. The 2015 South Fire Complex, which burned through most of Eltapom Creek and about one-third of the Corral Creek watershed (22,247 acres in the watersheds), deviated somewhat from this trend by experiencing relatively little moderate severity burn, yet high severity burn was fairly typical at 16% (3,560 acres overall high severity). What was notable about this fire is that just over half of the high severity fire burn was concentrated in a roughly 2000-acre patch along and across the Buckhorn Creek and Allen Creek drainages. Riparian areas are sometimes less impacted by wildfire because of high moisture levels and cooler temperatures. This patch of high severity effects may be an indication of higher fuel accumulations in riparian areas today, or it may be due to other factors such as prolonged drought, low fuel moistures, or high winds at the time of the fire.

Regardless, riparian areas and adjacent areas higher on the slope that burned at high severity experienced an associated short-term benefit of reducing fuel accumulations at the expense of overstory tree mortality. Fire behavior will be temporarily limited in these areas. However, over the next 5 to 15 years, grass and shrubs will become reestablished, and the high severity areas will generate increased fuel loading and will burn with higher intensity. Within 15 years, the bulk of the fire-killed trees will have fallen, and the high load of coarse woody debris will increase a subsequent fire's resistance to control. It is possible that the potential for a cycle of high severity fire, similar to what occurred when the Saddle Fire (2015) burned within the footprint of the Sims Fire (2004) in the neighboring Hyampom watershed, could become established in these areas.

Future fire behavior throughout the watersheds reflects the burn severity seen after the 2015 fires. In general, pre-fire fuel accumulations were reduced in proportion to fire severity, with the highest reductions seen after moderate and high severity burns and lowest following low severity fire. In contrast, areas that didn't burn or burned at very low severity provided no benefits toward reduction of hazardous fuel reductions. That said, previous burn severity is not always a predictor of future fire behavior or resulting severity in any one area. Topography, weather, and moisture have a dynamic relationship that doesn't allow for accurate prediction of future fire behavior 100% of the time. Although fire modelling has been refined to provide overall reliable trend predictions, factors such as unexpected high winds or unusually extended drought can contribute to resulting fire behavior that is different than expected.

Riparian Reserves

Riparian reserves account for approximately 11,000 acres of the combined watersheds. Common fuel types within the riparian reserves are timber-understory and timber litter. Riparian reserves that burned with high severity in 2015 were primarily of the timber-understory fuel type. Timber litter fuel types in riparian areas also burned with high severity, though to a lesser extent. These formerly timbered areas are expected to be dominated by shrubs and a high loading of coarse woody debris over the next 10 to 15 years as fire-killed trees fall. As noted above, future fire suppression efforts may be challenging in these areas. Table 13 demonstrates that, overall, riparian reserve acres burned with a distribution of severity classes that was very similar to the two watersheds as a whole. Riparian reserves had a slightly higher percentage of acreage unburned or burned at very low severity. Riparian reserves currently reflect the range of potential fire behavior demonstrated in Figures 11 and 12.

Some Riparian Reserve areas would burn with low intensity and severity under 90th percentile conditions; some of these areas would likely see a beneficial reduction of fuel. Other Riparian Reserve areas, under current and expected fuel loadings into the future, could burn at high fire intensity and severity with more significant impacts to riparian associated resources.

Table 13. Fire severity in Riparian Reserves within Portions of the 2015 South Complex in the Eltapom and Corral Creek watersheds

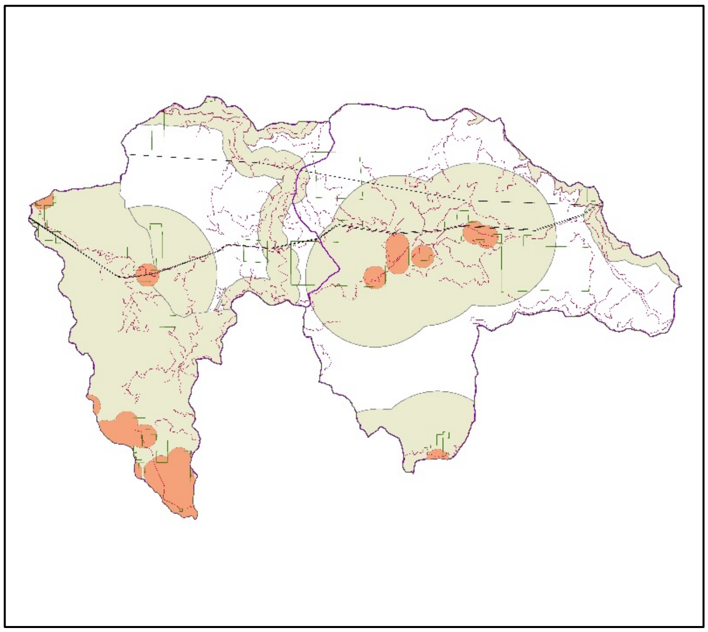
Fire Severity	Total Acres	Percent of Watershed	Riparian Reserve Acres	Percent of Riparian Reserves
Very Low/Unburned (0%)	11794	52	3273	60
Low (0 - 25%)	5226	23	1099	20
Moderate (25 - 75%)	1876	8	317	6
High (≥ 75%)	3666	16	751	14
Total	**22562**	**100**	**5440**	**100**

Wildland Urban Interface and Other Values

The Wildland Urban Interface (WUI), "where humans and their development meet or intermix with wildland fuel," comprises approximately 26,362 acres (62%) of the combined area of both watersheds (Federal Register 2001). Communities are clustered in the Hyampom and Corral Bottom areas, with residential inholdings scattered throughout both watersheds. Designation of WUIs acknowledges the increased wildfire risk within National Forests and provides a gateway for development of plans and strategies for protecting lives, residential structures, and infrastructure developments in and around remote communities.

In general, the WUI encompasses the land within 1.5 miles of each structure. The WUI also includes a buffer along major arterial roads, such as the Underwood Mtn Rd (FA60), which function as primary ingress routes for responding fire resources and egress routes for the public. Protection of structures was a key objective during management of the 2008 and 2015 fires.

Figure 14. Wildland Urban Interface Zones within the Watersheds



The Shasta-Trinity National Forest has identified WUI zones and developed fuels treatment goals for each WUI zone. The defense zone, which forms a ¼ mile radius around each structure, has a post-treatment fire behavior goal of flame lengths under 4 feet in 90th percentile conditions. The threat zone, which includes a 1.5 mile radius around each structure, has a fire behavior goal of flame lengths under 8 feet in 90th percentile conditions. Figures 11 and 12 demonstrate that potential flame lengths and crown fire activity in some areas exceed the fire behavior goals that have been identified, which could make fire suppression actions difficult in portions of the WUI.

The Trinity County Fire Safe Council has completed a Community Wildfire Protection Plan (CWPP) that outlines a plan to reduce the risk of wildfire. The plan was developed through collaboration with federal, state, and local entities, and identifies potential fuels treatments within the analysis area. The most recent revision of the CWPP was completed in 2010, and another revision is currently underway.

Two powerlines, including the Pacific Gas & Electric Humboldt-Trinity 115 kV line pass through the northern third of the analysis area.

Fire-killed trees can create hazards along roads and powerlines and in places frequented by the public. Those along roads pose a significant hazard to forest visitors. Trees that fall on powerlines disrupt the power supply and can start wildfires. Away from roads they can contribute to excessive fuel loading and almost always require management efforts to mitigate hazards.

Plantations within both watersheds are at risk of damage or loss from wildfire due to fuel conditions within and adjacent to the stands (Weatherspoon and Skinner 1995). Fuel characteristics that affect fire behavior in plantations are low canopy base height and high canopy bulk density which promote passive or active crown fire. Brush encroachment and dead woody surface fuels in the understory increase flame length which aids in the initiation of crown fire and kills or damages trees by scorching crowns. If plantations burned in 2015 are not managed, brush, grasses, forbs, and hardwoods will occupy the site. Dead tree stems will fall and increase surface fuel loading. Over time, this will create conditions that are conducive for fire spread, increased fire intensity, and resistance to control.

A progeny site is located in the Corral Bottom area.

3.3 Species and Habitats

Wildlife

Threatened and Endangered Wildlife Species

The northern spotted owl (*Strix occidentalis*) is federally listed Threatened on the Shasta-Trinity National Forest. All but 1200 acres at the south end of the Corral Creek watershed are within designated critical habitat for northern spotted owl. A large portion of the northern half of the Eltapom Creek watershed is within designated northern spotted owl Critical Habitat as well.

Forest Service Sensitive Species

Fourteen wildlife species are on the Regional Forester's Sensitive Species List and have potential to be found on the South Fork and Trinity River Management Units. These include birds, mammals (including bats), amphibians, reptiles, insects, and snails.

Table 14. Forest Service Sensitive Wildlife, Mammal, Bird, Insect, Amphibian, and Mollusk Species

Species	Scientific Name	Wildlife Group
Northern goshawk	*Accipiter gentilis*	Bird
Willow flycatcher	*Empidonax traillii*	Bird
Bald eagle	*Haliaeetus leucocephalus*	Bird
Pallid bat	*Antrozous pallidus*	Bat
Townsend’s big-eared bat	*Corynorhinus townsendii*	Bat
Fringed myotis	*Myotis thysanodes*	Bat
Pacific marten	*Martes caurina*	Mammal
Fisher	*Martes pennanti pacifica*	Mammal
Western pond turtle	*Clemmys marmorata marmorata*	Reptile
Foothill yellow-legged frog	*Rana boylii*	amphibian
Cascades frog	*Rana cascadae*	Amphibian
Southern torrent salamander	*Rhyacotriton variegatus*	Amphibian
Western bumble bee	*Bombus occidentalis*	Insect
Big Bar Hesperian snail	*Vespericola pressleyi*	Mollusk

NORTHWEST FOREST PLAN SURVEY AND MANAGE SPECIES

Klamath shoulderband snail (*Helminthoglypta talmadgei)* and Pressley (Big Bar) Hesperian snail (*Vespericola pressleyi*) are Survey and Manage Category D and Category A species respectively.

The current extent of NSO presence in these watersheds is unknown because comprehensive surveys have not been completed, and much of the historical NSO data in these watersheds is outdated. However, habitat conditions and land management prescriptions are good indicators of the current and future potential to support viable NSO populations. Suitable NSO nesting/roosting and foraging habitat consists of mature, late successional and old-growth conifer forest. These habitats currently comprise 44% of the Eltapom watershed, and 43% of the Corral Creek watershed. Suitable habitats are most concentrated in the Corral Bottom area of the Corral Creek watershed, and south of Chaparral Mountain in the northeast portion of the Eltapom watershed.

The Late Successional Reserve (LSR) and Wilderness network is the foundation for maintaining viable populations of species associated with these habitats such as NSO, Pacific fisher, American marten and northern goshawk. Although there is no Wilderness in either watershed, the majority of the Corral Creek watershed (56%) is LSR, primarily in the northeast portion of the watershed. The remainder is mostly within the Hayfork Adaptive Management Area in the west and Administratively Withdrawn Area (Pattison IRA) in the south. The majority of the Eltapom Creek watershed has a Matrix land management prescription, and only 5% is LSR. The Matrix prescription allows more intensive management and timber harvest than other prescriptions and does not emphasize development of late successional habitats. As a result, the Corral Creek watershed is more likely to support viable populations of LSOG species in the future.

Early-seral forest communities and non-forested vegetation types provide habitat in the planning watersheds for selected wildlife species and are not limited at this time. Past wildfires, including the

2015 South fire, moved mid and late-seral forested communities back to earlier seral stages, increasing the amounts of grass, shrub, and hardwood habitats. Intact habitat corridors for movement of late-seral old growth associated wildlife species between patches of late-seral forest are provided primarily in the 90 miles of perennial riparian corridors in the planning watersheds.

FISHERIES

SPECIES DIVERSITY

Six known stocks and runs of anadromous fish utilize the South Fork Trinity River watershed. The most abundant historically is the spring-run Chinook salmon (*Oncorhyncus tshawytscha*). The second most abundant, historically and currently, is the fall-run chinook, which is also a significant indicator of the fish population in the basin. Other cold-water species include winter and summer steelhead (*O. mykiss*), coho salmon (*O. kisutch*), and pacific lamprey (*Lampetra pacifica*). Chum salmon (*O. keta)* have been infrequently observed in the watershed (Brown et al., 1994).

Approximately 297 miles of mapped streams are located in the Eltapom Creek and Corral Creek watersheds; 88 miles are classified as perennial, 168 miles as intermittent, and 31 miles as ephemeral. Within Eltapom Creek there are approximately 1.8 miles of anadromous and 13.6 miles of resident only fish habitat. In Corral Creek there are approximately 5 miles of anadromous and 19 miles of resident only fish habitat. The South Fork Trinity River forms the western boundary of the watershed analysis area and provides approximately 9.4 miles of anadromous fish habitat. The anadromous stretches of streams also contain resident species.

Special status fish species within this analysis watershed include the Southern Oregon/Northern California Coast (SONCC) Coho salmon Evolutionary Significant Unit (ESU), Upper Klamath-Trinity River (UKTR) Chinook salmon ESU, both winter- and summer-run races of the Klamath Mountain Province (KMP) steelhead ESU. The SONCC coho salmon are listed as Threatened under the Endangered Species Act (ESA) (listed in 1997), Chinook salmon and steelhead are on the Regional Sensitive Species list. In addition to being on the Sensitive Species list, Chinook and steelhead are also designated Management Indicator Species (MIS) in the Shasta-Trinity National Forest Land and Resource Management Plan (LRMP).

SONCC ESU was federally listed the in 1997 by the National Marine Fisheries Service (NMFS), based on decreased abundance, reduced distribution, and degraded habitat. Far fewer streams and rivers are capable of supporting coho salmon in this ESU compared to historical conditions and numerous basin-specific extirpations of coho salmon have been documented (Brown et al. 1994, CDFG 2004a, Good et al. 2005). Major factors in the decline of the species were thought to originate from long-standing, human induced actions (e.g., habitat degradation, harvest, water diversions, and artificial propagation), combined with natural environmental variability. In 2002, the California Fish and Game Commission designated coho salmon as State-threatened from the Oregon border to Punta Gorda and State-endangered from Punta Gorda south to the southern edge of San Francisco Bay.

Critical Habitat (CH) is designated for SONCC coho salmon and is essentially all accessible habitat. To be conservative the Forest uses the steelhead distribution extent as the distribution of CH. In addition, Essential

Fish Habitat (EFH) is designated for Chinook and coho salmon (Federal Register, Vol. 67, No. 12). The Magnuson-Stevens Fishery Conservation and Management Act (MSA), in concordance with the Sustainable Fisheries Act of 1996[6]. The MSA defined EFH as "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". EFH for Coho and Chinook salmon in the Eltapom and Corral Creeks watershed is identical to SONCC coho salmon Critical Habitat.

EFH is defined by those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity for species managed in Fishery Management Plans under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). EFH is the habitat necessary for managed fish to complete their life cycle, thus contributing to a fishery that can be harvested sustainably. Different life stages of the same species often use different habitats. NMFS has interpreted through regulation that EFH must be described and identified for each federally managed species at all life stages for which information is available.

Species Distribution, Migration, and anadromy

All fish species are found in the South Fork Trinity River and Hayfork Creek, either as a year-round resident (rainbow trout) or further upstream for spawning purposes (anadromous species). Hayfork Creek provides a migratory connection between the South Fork of the Trinity River and Corral Creek. Spring-run Chinook and summer-run steelhead don't spawn up Eltapom Creek or Corral Creek due to lack of adequate cold water during spawning season. Fall run Chinook migrate approximately 1.8 miles up Eltapom Creek to the first natural barrier and winter run steelhead migrate the same distance up Eltapom Creek and to the first natural barrier on Corral Creek (approximately 5 miles). Adult lamprey migrate upstream during the spring and complete spawning by early summer.

Coho salmon inhabit the South Fork Trinity River up to the Hyampom Gorge. The Hyampom Gorge forms a barrier to coho migration due to low flows inhibiting passage in the fall. NMFS (2014) reported that coho salmon have limited distribution in the South Fork Trinity River basin, occurring only in the mainstem up to Butter Creek, including Butter Creek. It is likely that habitat conditions in the mainstem, such as high summer water temperatures and low dissolved oxygen are currently limiting the spatial structure. Past documentation has them in Eltapom, however none have been observed for several years in this stream (Garwood 2012).

Spring-run ESUs of both species spawn in the South Fork of the Trinity River where there are sufficient deep, cold, holding pools during the summer. Winter-run ESUs of the two species spawn higher in the Eltapom Creek and Corral Creek watersheds during fall, winter, and early spring. The anadromous portion of Eltapom is used by winter steelhead for spawning and is recognized by California Department of Fish and Wildlife as a valuable spawning reach for winter steelhead. Juvenile fish of all species can be observed at any time throughout the limit of anadromy within the planning watersheds, including in the South Fork Trinity River depending on water year and strength of the runs. Steelhead are the most abundant juveniles observed.

Resident trout are currently documented throughout Eltapom Creek and Corral Creek and most major tributaries to each. Resident rainbow trout are found in Eltapom and Corral Creeks above the barriers

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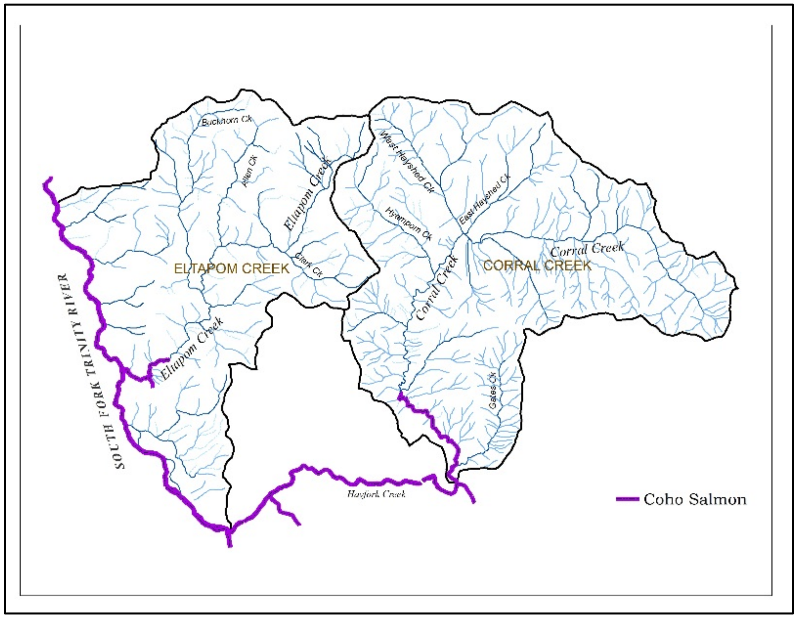
[6] Public Law 104-267

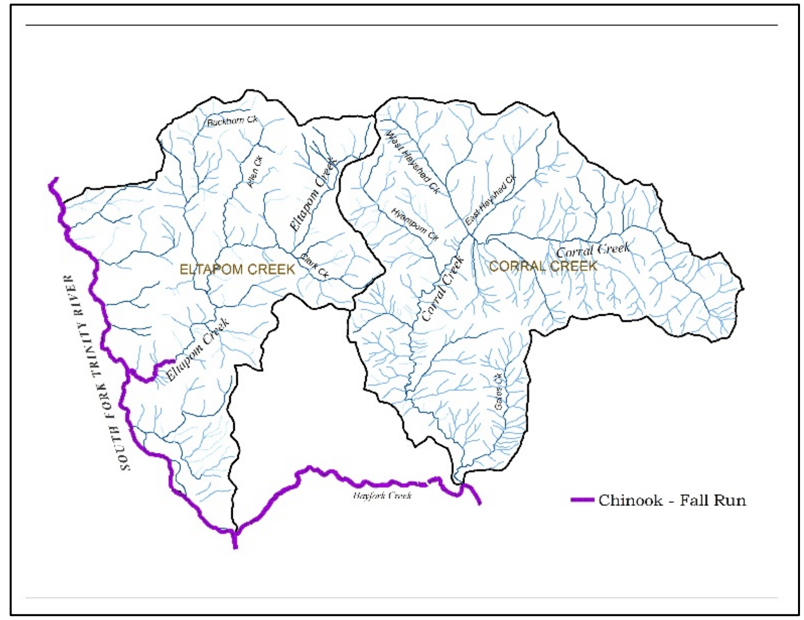
to anadromy. Eltapom was stocked with rainbow trout in 1947 and 1949 (1952 stream survey), and Corral Creek was stocked with rainbow trout from the Mount Shasta Hatchery from 1940 to 1959 (1980 stream survey).

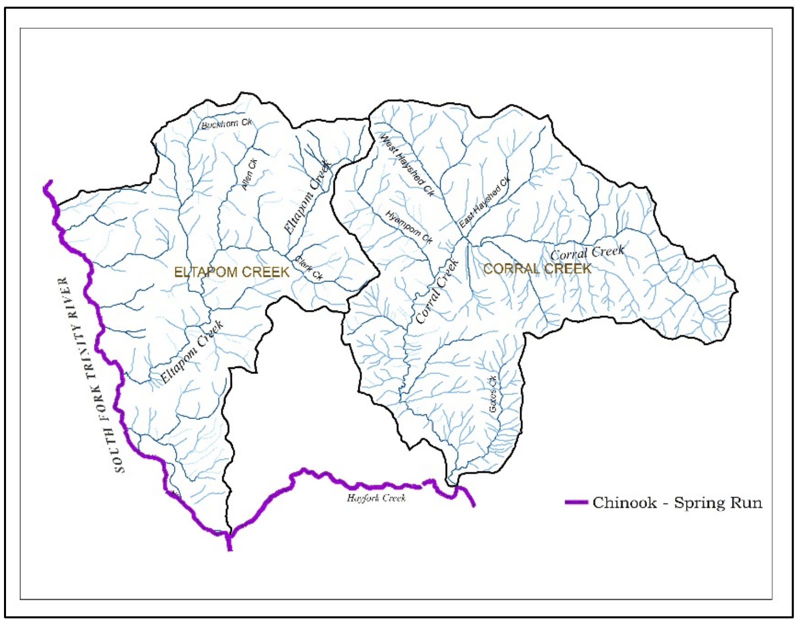
The fishery in the South Fork Trinity River has declined dramatically since the flood of December 1964. Unstable geology and erosion-producing land use practices have been blamed for the many mass wasting events triggered by that flood. The flood produced dramatic instream changes including channel widening, aggradation, and loss of pool depth, all of which adversely affected the fishery. Since that time, further channel changes have mitigated degradation in some locations, while continued, chronic sediment inputs are thought to be hindering a more complete or faster recovery overall. Chinook salmon spawning runs have increased slightly in the last several years, and large sediment inputs from the 1964 flood continue to move downstream.

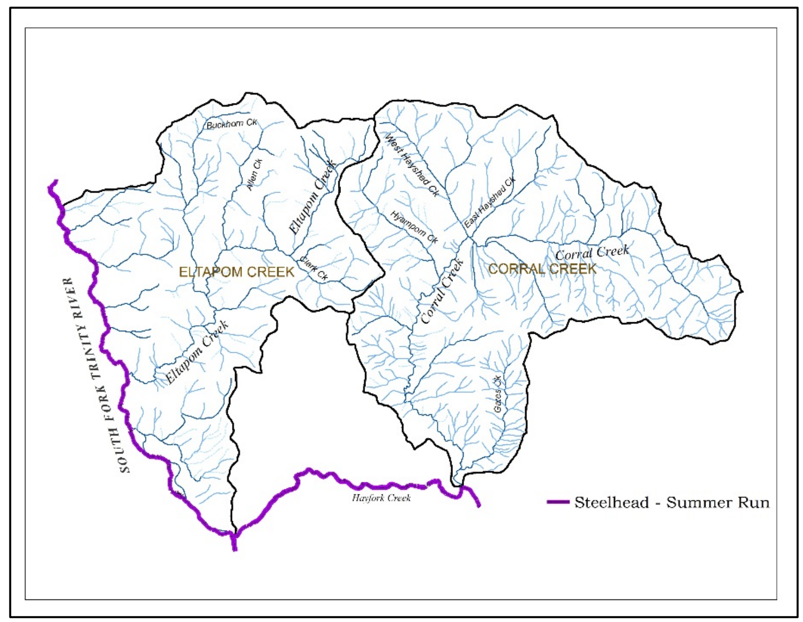
Based on data from Forest Service and other interagency spawning surveys as far back as mid-1980s (DFG, 2009), annual Coho, Chinook, and steelhead numbers have declined. Coho counts have decreased significantly since the 1960s and few, if any, have been documented in their historic range

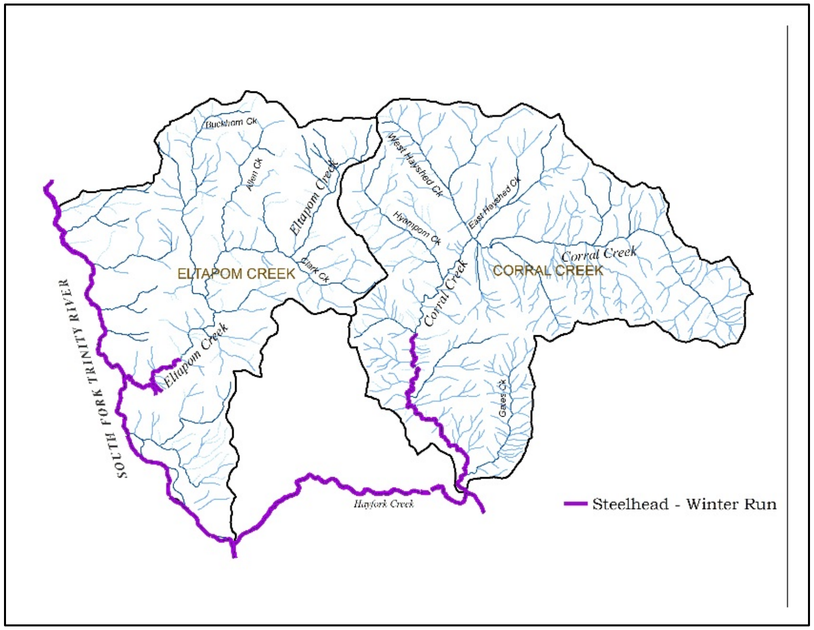
***Figures 15-20**. Anadromous Fish Distribution*

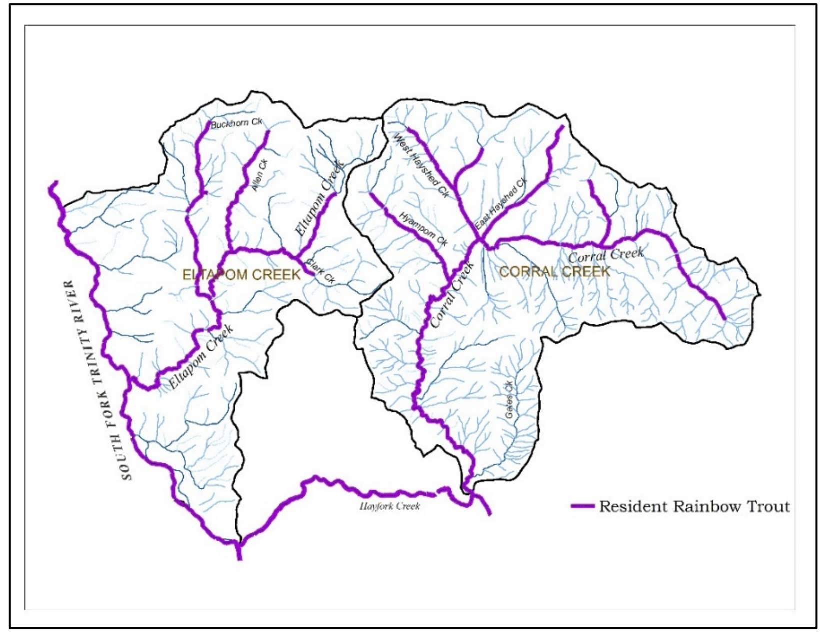









Buckhorn Ck
Allen Ck
Eltapom Creek
West Hayshed Ck
East Hayshed Ck
Hyampom Ck
ELTAPOM CREEK
Clark Ck
Corral Creek
CORRAL CREEK
SOUTH FORK TRINITY RIVER
Eltapom Creek
Gates Ck
Hayfork Creek
Steelhead - Winter Run


Buckhorn Ck
Allen Ck
Eltapom Creek
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East Hayshed Ck
Hyampom Ck
ELTAPOM CREEK
Clark Ck
Corral Creek
CORRAL CREEK
SOUTH FORK TRINITY RIVER
Eltapom Creek
Gates Ck
Hayfork Creek
Resident Rainbow Trout

above Panther Creek since 2010. Individuals farther upstream and into Hayfork Creek are stopped at the Hyampom Gorge. Lower numbers may be due to safety hazards associated with snorkel surveys during the dominant Coho spawning time. Chinook and steelhead numbers have decreased as well in the same timeframe, but somewhat higher numbers have been documented during surveys.

Stream Habitat Conditions

Eltapom Creek Watershed

Eltapom Creek poses the greatest risk to aquatic values within the South Fire Complex (USFS, 2015a). Only 2.6% of the Complex burned at high intensity, mainly in the Lower Eltapom Creek 7th-field, particularly Buckhorn Creek. For the modeled 2-year storm event, post-fire flow response in Eltapom Creek increased by a factor of 1.35, however Buckhorn Creek increased by a factor of 2.2. The increase in Eltapom Creek is explained by the Buckhorn Creek response. Some headwaters of Eltapom, Buckhorn, and others are loaded with unsorted, unconsolidated materials that are available for transport. The cumulative risk of various types of slope instability, sediment bulking, channel flushing, and deposition was expected to be moderate to high however would likely only initiate from the upper section of Buckhorn Creek that burned at high intensity. The average sediment delivery potential to the fluvial system over the South Complex was modeled at the 2-year storm event. It was estimated that in year one, 4.2 tons/acre would be delivered and in year two, under the same conditions, 2.6 tons/acre would be delivered. (USFS, 2015b)

Table 15. Lower South Fork Trinity River HUC 5 Risk Ratings

HUC			Risk Ratio by Year			Risk
5	6	7	2016	2018	2020	
Lower South Fork Trinity River			0.56	0.53	0.5	Moderate
	Eltapom Creek		0.54	0.46	0.41	Moderate
		Lower Eltapom Creek	0.64	0.46	0.37	Moderate to Low
		Upper Eltapom Creek	0.46	0.45	0.43	Moderate

Potential threats from the fires include short- and long-term changes to aquatic habitat and riparian areas resulting from increased stream sediment and ash delivery, debris flows, reduction in streamside vegetation, and potential increased water temperature due to reduction in stream shading. For both Eltapom Creek and South Fork Trinity River, impacts would likely be short-term as vegetation is expected to recover within 3-5 years and initial deposits of stream sediments would be flushed out during subsequent storms. Short-term increases in both stream temperature and stream sediment concentrations are likely to occur as a result of the fires. However, the increases would likely be negligible as both stream temperature and sediment concentrations are relatively high before the fire began (Hydrologist, Soils, and Geology BAER Reports 2015).

Water Quality

Water temperatures for the Lower South Fork Trinity River HUC 5 are classified as functioning-at-risk, are within the natural range of variability but can exceed reference temperatures of 16.78-22.44 °C. Few tributaries have temperatures outside the natural range of variability within the South Fork Trinity River.

Table 16 displays water temperatures for Eltapom Creek and Lower South Fork Trinity River HUC 5. Water temperatures remain below thermal thresholds for anadromous fish throughout the critical summer period in most of the tributary streams. The tributary streams share characteristics of relatively short, steep profiles and groundwater sources that maintain cool summer stream temperatures. In contrast, the South Fork Trinity River is above temperature thresholds for adult salmonids for most of the summer and early fall. Cold water tributaries that enter the South Fork Trinity River downstream of the Hyampom Valley provide critical thermal refugia for migrating adult and juvenile salmonids in the South Fork Trinity River. This occurs in areas where deep water is maintained by channel confinement and large landslide boulders in the channel. Long-term monitoring of response reaches in the watershed demonstrates channel recovery in a downstream direction as sediments continue to move through the mainstem South Fork Trinity River.

Table 16. Lower South Fork Trinity River HUC 5 - Water Temperatures.

Location	Year	Maximum Weekly Maximum Temp °C (MWMT)	Maximum Weekly Average Temp °C (MWAT)	Maximum Daily Maximum Temp °C (MDMT)
Upper Eltapom Creek	2013	15.33	14.00	15.8
	2014	17.15	15.44	17.82
	2015	16.92	15.38	17.51
Lower Eltapom Creek	2013	18.84	18.29	19.32
	2014	18.17	17.93	18.37
	2015	19.79	18.88	20.17
South Fork Trinity River downstream of Eltapom Creek confluence	2011	24.32	21.57	24.85
	2013	25.84	23.10	26.43

Riparian Function

Riparian Function at the HUC 5 scale is considered functioning-at-risk. Mainly the headwater ephemeral and intermittent channels burnt within the two fire complexes and the Saddle Fire within the Lower South Fork Trinity River HUC 5 watershed. Coarse woody debris in these channel types should increase. Riparian vegetation along perennial streams is still intact and considered functioning at-risk based on prior assessments.

Corral Creek Watershed

Corral Creek watershed is within the Pattison Fire of the South Complex. Only small portions of Upper and Middle Corral Creek 7th-field drainages were burned, the majority of Lower Corral was within the fire perimeter. Thirty-three percent of the Corral Creek 6th-field watershed burned with 14%

moderate severity and < 1% high severity. In high and moderate soil burn severity areas it is highly likely that increased rates of soil erosion and sediment delivery to stream channels will occur in the first and second year following the fire, particularly on steep slopes. In Corral Creek the portions of high and moderate burn severities are patchy and spread throughout the drainage. Riparian vegetation along perennial channels was left intact with the high and moderate soil burn intensity occurring on ridges and headwater intermittent and ephemeral streams.

Table 17. Lower Hayfork Creek HUC 5 CWE Model Results Summary.

HUC			Risk Ratio by Year			Risk
5	6	7	2016	2018	2020	
Lower Hayfork Creek			0.42	0.39	0.38	Moderate to Low
	Corral Creek		0.50	0.47	0.46	Moderate
		Lower Corral Creek	0.34	0.30	0.28	Low
		Middle Corral Creek	0.58	0.57	0.56	Moderate
		Upper Corral Creek	0.51	0.49	0.48	Moderate

Water Quality

Water temperatures for the Lower Hayfork Creek HUC 5 are classified as functioning-at-risk, but not-properly functioning in the lower reaches. Elevated water temperatures are known to be a limiting factor for both the resident and anadromous fishery in lower Hayfork Creek. Temperatures in excess of 21.1 °C are typical during the summer months with a high temperature of 29.44 °C recorded in July of 2014. Base flows during these periods are extremely low and are largely responsible for the documented high temperatures. A report from 1994 stated that in September of that year Hayfork Creek was flowing intermittently. (Kearney, 1994, USFS 1996). Table 20 displays recent temperature monitoring within the Lower Hayfork HUC 5.

Table 28. Lower Hayfork Creek HUC 5 - Water Temperatures.

Location	Year	Maximum Weekly Maximum Temp °C (MWMT)	Maximum Weekly Average Temp °C (MWAT)	Maximum Daily Maximum Temp °C (MDMT)
Lower Hayfork Creek @ Hyampom Bar	2011	23.42	21.94	23.98
	2013	28.72	25.35	29.57
	2014	28.93	25.49	29.77
Upper Corral Creek	2014	16.78	15.16	17.37
	2015	16.82	15.19	17.30

Riparian Function

Riparian Function at the HUC 5 scale is considered not functioning due to historic mining, fires, road building, and current agricultural practices on private lands in the lower reaches of streams and particularly in the Hayfork Valley.

Mainly the headwater ephemeral and intermittent channels burnt within the three fire complexes overlapping into the Middle South Fork Trinity River HUC 5 watershed. Coarse woody debris in these channel types should increase. Riparian vegetation along perennial streams is still intact and considered functioning at-risk based on prior assessments.

BOTANY

THREATENED AND ENDANGERED PLANT SPECIES

No federally-listed plant species are known to exist on the west side of the Shasta-Trinity National Forest.

FOREST SERVICE SENSITIVE AND FOREST PLAN ENDEMIC SPECIES

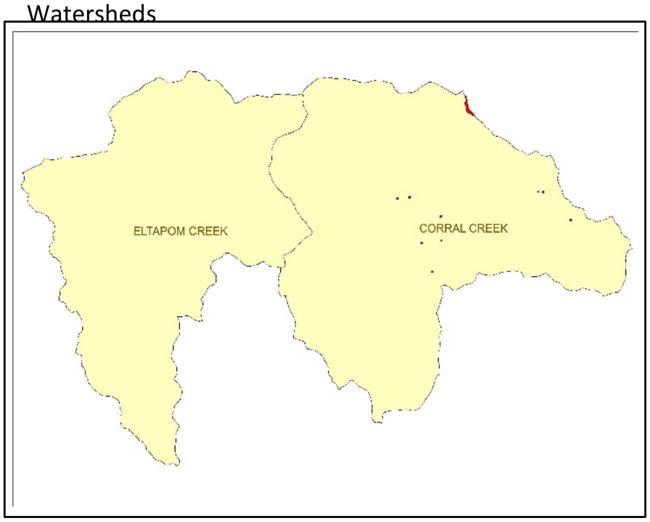
Habitat for twenty-six botanical species can be found within the Eltapom Creek and Corral Creek watersheds, including vascular plants, non-vascular bryophytes and lichens, and fungi.

Table 19. Forest Service Sensitive and Forest Plan Endemic Species

Species	Scientific Name	Plant Group
Moonworts	*Botrychium ssp sub. botrychium*	Vascular plant
Shasta pincushion	*Chaenactis suffrutescens*	Vascular plant
Brownie lady's slipper	*Cypripedium fasciculatum*	Vascular plant
Mountain lady's slipper	*Cypripedium montanum*	Vascular plant
Oregon willow herb	*Epilobium oreganum*	Vascular plant
Tracy's wooly-stars	*Eriastrum tracyi*	Vascular plant
Blushing wild buckwheat	*Eriogonum ursinum var. urebescens*	Vascular plant
Wayside aster	*Eucephalus vialis*	Vascular plant
Niles' harmonia	*Harmonia doris-nilesiae*	Vascular plant
Stebbins' harmonia	*Harmonia stebbinsii*	Vascular plant
California globe mallow	*Iliamna latibracteata*	Vascular plant
Peanut sandwort	*Minuartia rosei*	Vascular plant
Northern adder's tongue	*Ophioglossum pusillum*	Vascular plant
Canyon Creek stonecrop	*Sedum obtusatum ssp paradisum*	Vascular plant
Klamath Mountains catchfly	*Silene salmonacea*	Vascular plant
Serpentine goldenbush	*Ericameria ophitidis*	Vascular plant
Dubakella Mountain buckwheat	*Eriogonum libertini*	Vascular plant
Bug-on-a-stick	*Buxbaumia viridis*	Non-vascular, bryophyte
Copper moss	*Mielichhoferia elongate*	Non-vascular, bryophyte
Pacific fuzzwort	*Ptilidium californicum*	Non-vascular, bryophyte
Red-pored bolete	*Boletus pulcherrimus*	Fungus
Branched collybia	*Dendrocollybia racemose*	Fungus
Olive phaeocollybia	*Phaeocollybia olivacea*	Fungus

Existing Forest Service Sensitive Botanical Populations. Populations of five Forest Service Sensitive botanical species have been documented in the two watersheds, mountain lady's-slipper orchid (4 populations), Brownie lady's-slipper orchid (3 populations), Canyon Creek stonecrop (1 population), olive phaeocollybia (1 populations), and red-pored bolete (1 population). All of these species except Canyon Creek stonecrop are associated with late-seral conifer forest exclusively. Points representing the populations are shown in Figure 21 below. The point at the northern end of Corral Creek watershed represents the single population of Canyon Creek stonecrop on Monument Peak, the

Figure 21. Forest Service Sensitive Species within the Watersheds



remainder of the points are clustered in and around Corral Bottom which carries a large amount of late-seral forest habitat and is within the Corral Late-Successional Reserve, as is expected for these species.

Outside of riparian areas, water has historically been limited in the watersheds. Lack of water has encouraged wildlife and permitted livestock to concentrate foraging at seeps and springs where localized heavy ground disturbance has degraded habitat for some Sensitive species. Numerous roads were built through fragile serpentine habitats in the 1970s and 1980s to access mining and timber harvest areas because they are gently sloped and lack vegetation. This resulted in loss of numerous serpentine endemic species populations that were eventually added to the Sensitive species list because of reduced population numbers.

Northwest Forest Plan Survey and Manage Plant Species

Seven Survey and Manage plant species associated with the Klamath California province could be expected to be within the planning watersheds. These species are considered to be rare or uncommon and associated with late-successional forests.

Table 20. Survey and Manage Botanical Species

Species	Common Name	Life Form	Management Category
Ptilidium californicum	Pacific fuzzwort	non-vascular/liverwort	A
Cypripedium montanum	mountain lady's-slipper	vascular plant	C
Cypripedium fasciculatum	fascicled lady's-slipper	vascular plant	C
Botrychium minganense	Mingan moonwort	vascular plant	A
Botrychium montanum	mountain moonwort	vascular plant	A
Buxbaumia viridis	bug-on-a-stick	non-vascular/moss	E
Eucephalus vialis	wayside aster	vascular plant	A

Serpentine Endemic Species

The Rattlesnake Creek Terrane runs through most of the Eltapom watershed north to south, plus a much smaller portion of the Corral Creek watershed (Figure 6, Step 3). The geologic area supports a wide number and diversity of plant species adapted to ultramafic/serpentine soils that are high in heavy metals (i.e. nickel, chromium) and very low in calcium. The greatest concentration of rare serpentine species are found in the fifth-field watershed south of Eltapom Creek, but similar soils and habitats are present as are many of the more common serpentine endemic species. Lack of documented populations could be due to a lack of field surveys.

Many serpentine habitats in the watersheds are in degraded condition because of impacts received from past mining, timber harvest, and road construction. Serpentine habitats are often very gently sloped and naturally bare of vegetation, making them attractive for landings and access work sites. They are also very sensitive to ground disturbance recover much more slowly than non-serpentine soils. Numerous roads were built in the 1970s and 1980s to gain access to mining operations and timber sales. Few, if any new roads have been built since the late 1980s. Off-road vehicle (OHV) use has grown in popularity in the past decade and user-created OHV trails have replaced mining and timber sale harvest access roads as the biggest source of degradation to serpentine habitats. Publication of the Shasta-Trinity National Forest Motorized Travel Management Final Environmental Impact Statement in 2010, passage of the 2005 Travel Management Rule, and issuance of the 2012 and 2014 Motorized Vehicle Use Maps (MVUM) has all helped reduce disturbance to serpentine habitats by reducing off-road vehicle travel on the Forest.

Invasive Plant Species

Existing Weed Infestations

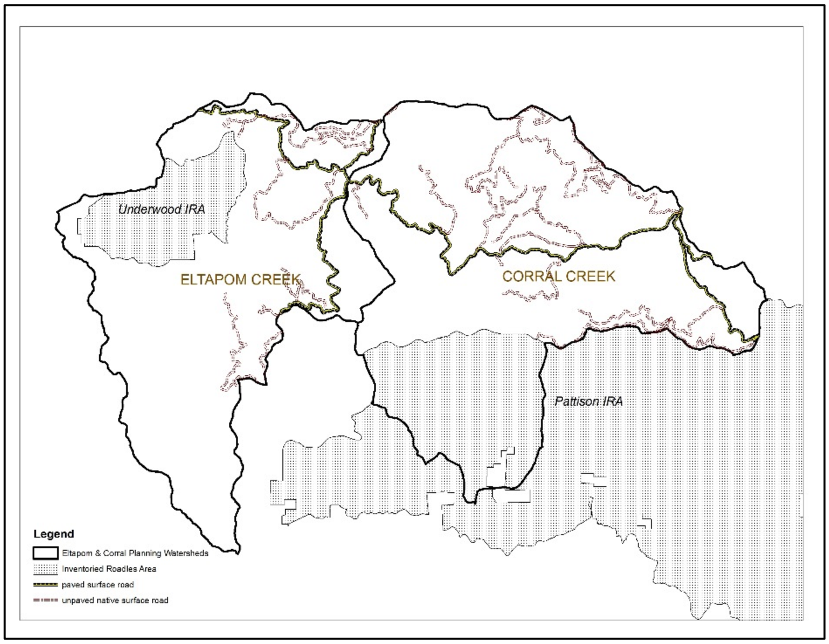
Almost no weed surveys have been documented within the planning watersheds, but this may be more of an artifact of the absence of field surveys related to proposed projects or strategic weed inventories, than a lack of weeds. The only documented weed populations are a single population of scotch broom (*Cytisus scoparius*) in the Corral Creek watershed and single populations of Canada thistle (*Cirsium arvense*) in each of the watersheds. Informal observations while driving through each watershed over the past 20 years have shown Klamath weed (*Hypericum perforatum*), non-native annual grasses, and non-native grasses intentionally seeded for roadside erosion control are common and widespread, as are as any number of less invasive non-native plant species. Less common but still commonly seen are patches of bull thistle (*Cirsium vulgare*) and Armenian blackberry (*Rubus armeniacus*). Yellow star-thistle (*Centaurea solstitialis*), although highly invasive and widespread in more developed parts of Trinity County, is seen only in small, isolated disturbed openings such as old landings or log decks. An inventory of invasive weeds was performed in 2014 on roads in the Sims Fire area, just west of Eltapom Creek watershed in habitat similar to that seen in the southern half of that watershed. A similar list of weed species was observed. With the exception of scotch broom and Canada thistle, none of these weeds is regularly managed because of their widespread nature.

Several populations of diffuse knapweed (*Centaurea diffusa*) exist along roadsides at the highest elevations on South Fork Mountain and along the South Fork Trinity River from about Hidden Ranch downstream to at least the area of Slide Rock Campground north of Hyampom. Diffuse knapweed has been a high priority weed species for the Shasta-Trinity National Forest because of its highly invasive nature, potential for rapid and extensive spread, and ability to manage somewhat effectively with manual removal. Diffuse knapweed sites between Hyampom (on the river at Lovers Leap) and across the river from Slide Rock campground are on the west boundary of Eltapom Creek watershed. Although it’s possible for the species to expand farther into Eltapom Creek watershed, it is more likely to continue downstream in sandy gravel bars than uphill into uplands above the river because of the more suitable soil characteristics. Nevertheless expansion into either watershed is still a concern.

Potential for Invasive Weed Growth and Expansion

Compared to watersheds on the Forest that have hosted more management actions and user-created disturbances, Eltapom Creek and Corral Creek watersheds have fewer weed infestations overall, although the lack of surveys in the field must be acknowledged. The most reasonable explanation for this is the lower road density in the two watersheds. Motor vehicles are the greatest source of weed introduction and spread in wildlands, so road density provides a good measure of the potential for weed presence. Steep topography discouraged timber harvest in the 20th century in both which eliminated the most common rationale for building new roads. Underwood and Pattison IRAs, which occupy 16% and 22% of the Eltapom Creek and Corral Creek watersheds respectively, providing additional unroaded area. Road density is low at 1.2 miles/mi^2 in Eltapom Creek watershed and 1.6 miles/mi^2 in Corral Creek watershed. Most of the roads are concentrated in the upper 1/3 of the combined watersheds, with the southern 2/3 substantially unroaded with low potential for invasive weed movement or establishment. Eltapom Creek and Corral Creek watersheds have steep topography overall and carry some of the lowest road densities on the west side of the Forest outside of wilderness and IRAs; this is the most likely reason invasive weed density is so low.

Figure 22. Distribution of Main Roads and Unroaded Areas in the Watersheds



3.4 Human Uses

Roads

164 miles of roads are present within the Corral Creek and Eltapom Creek watersheds, mostly on National Forest System administration but a small number crossing private lands. About 42% of the Forest roads are closed and the rest are operational maintenance levels 2, 3, and 4. Only about 24.4 miles of road are paved or have a bituminous surface. The rest are either rocked or native surface material. The road density of Corral Bottom and Eltapom Creek Watershed is about 2.5 miles per square mile. Some of the main roads include 5N60 - Underwood Mtn (Forest Highway), 4N47 - Corral Bottom and small portions of County Roads 301 and 311. These roads serve as access to residences in the Hyampom area, fire suppression activities, logging, service work, and Forest Service recreation sites (Infra 2017). Most of the area is within Wildland-Urban Interface (WUI) and roads play a critical

role in community wildfire protection. The planning watersheds are within a Forest Service Direct Protection Area.

Although open roads in Maintenance Levels 2, 3, and 4 comprise a low road density currently within the planning watersheds, impacts to water quality in the South Fork Trinity River from road-related sediment movement continue to occur. Some roads have been decommissioned to reduce sediment movement into streams under the past watershed restoration efforts, but additional Level 1 and other roads closed under the 2010 Motorized Travel Management decision await funding and environmental review of impacts to other resources before being able to implement sediment reduction treatments. Road-related sediment movement represents one of the most significant contributions to impaired water quality status and TMDL listing of the South Fork Trinity River in 1998.

About half of Corral Bottom watershed is within the Hayfork Adaptive Management Area and more than half of that is managed under Roaded Recreation and Commercial Wood Products Prescriptions. Roads are critical to meeting the objectives of this management prescription for recreation, commercial wood product uses, wildfire management, and access to private lands near or adjacent to private inholdings. Roaded access is crucial to maintenance of the Humboldt-Trinity and Trinity-Maple Creek transmission lines that carry power from Redding to Humboldt Bay.

Routine road maintenance has decreased on all roads due to lack of funding. Maintenance is typically done when there is a specific problem such as a big slide or extreme rutting effecting road use and public safety. In general, all open roads require maintenance which includes roadside brushing, ditch cleaning, and grading for public safety and reduction of sediment delivery to watersheds. Forest roads 5N60 and 4N47 are particularly important to continue maintaining as an alternate route from Big Bar to Burnt Ranch since the main road, State Highway 299, is often being closed due to rock fall/landslides.

The original use for these roads was timber harvest and mining access. Timber harvest declined with publication of the Northwest Forest Plan in 1994, and with this has come a reduction in funding for road maintenance. Reductions in funding have also shifted the focus from a comprehensive annual maintenance program to a priority on public safety, fire suppression access, and response to emergencies road actions. Highway 299, the primary travel route between Interstate 5 and the Coast, commonly experiences large landslides because of seismic activity and inconsistent weather patterns. Forest Roads 47 and 60 are commonly relied on to provide an alternate route to Highway 299 during these events and maintenance of alternative routes such as these is critical for public travel.

Maintenance is also critical for maintaining water quality by preventing sediment delivery to streams. Culverts and ditches filled with woody debris that prevents water passage can facilitate road blowouts and rutting, all of which can move small to large amounts of sediment into streams.

HERITAGE

Within these two watersheds are 34 recorded archaeological sites and 35 ethnographic place name locations associated with Wintu and Chimariko people. Some, but not all members of both tribes live in the local area and continue to practice cultural traditions, such as ceremonial gatherings. Incense cedar, redbud, and willow boughs are occasionally collected for basket weaving by the Wintu and Chimariko people. Members of other tribes, including the Nor-el-Muk, have been known to visit the watersheds to collect materials for traditional practices as well.

The Forest Service has the responsibility to identify possible conflicts and impacts to heritage resources from future proposed actions within the watersheds, including consulting with local tribes in the planning process. All proposed actions are designed to be consistent with the Federal government's legal responsibility under the National Historic Preservation Act and National Environmental Policy Act.

Step 4: Reference Conditions

The purpose of this chapter is to explain how ecological conditions have changed over time as a result of human influence and natural disturbances. A reference condition for natural features and processes is developed for comparison with current conditions. Changes from reference conditions to current conditions are summarized below.

4.1 Erosion Processes

Geology

Prior to the mid-1800s, there were no roads within the two watersheds and natural surficial processes dominated the landscape. With the onset of mining, logging and other human activities after the mid-1800s, numerous roads were constructed to access private inholdings and resources in the area. Roads built on unstable terrane (inner gorges, active or dormant landslide zones) have been responsible for mass wasting, landslides, and debris flows that can contribute sediment to streams and reduce water quality.

Soils

Forest soils developed over thousands of years and are generally considered nonrenewable resources with an average formation rate of 0.1 inch/100 years. Recovery time frames for the various components of the soil ecosystem vary from a few years to a 1000 years depending on the intensity and type of disturbance. Compaction associated with landing and road construction can be reversed occasionally with ripping treatments, and soil and water Best Management Practices (BMP) put into practice in the by the early 1970s have reduced damage to soils from management actions and subsequent potential for sediment movement into riparian areas. Funding levels only allow for repair of earlier compacted soils with the highest need. A partnerships with the Trinity County Resource Conservation District using non-Forest Service funding has been successful in reducing or eliminating sediment sources by decommissioning several hundred miles of roads on the Trinity River and South Fork Management Units. Roads have been decommissioned and culverts and ditches cleaned to prevent storm damage in both Eltapom Creek and Corral Creek watersheds.

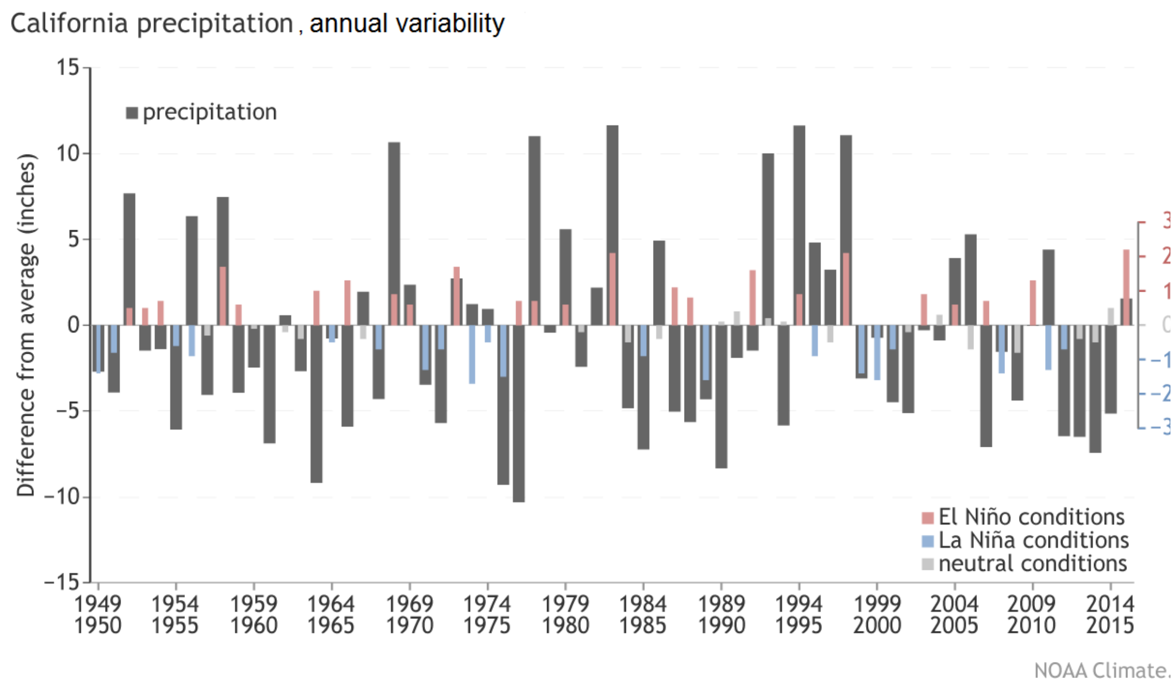
Areas that are old stable dormant landslides in metavolcanic and metasedimentary rock on slopes less than 40% tend to have more weathered soils that are fine textured, high available water, and are deep productive soils (Hohmann, Holland, and Hugo series). Steep mountain slopes in these metamorphic rocks are moderately deep to deep gravelly loams on forested north and east facing slopes and shallow to moderately deep gravelly loams on brushy south and west facing slopes.

Hydrology, Stream Conditions, and Water Quality

Eltapom Creek and Corral Creek watersheds have always received the majority of their water inputs through rainfall rather than snowpack, so there have been few, if any, opportunities to replenish local streams once winter and spring rains are over. Because of this, surface flows within the South Fork Trinity River and streams in the two watersheds naturally reflect annual precipitation amounts and water quality and quantity has always been subject to fluctuations in flow and temperature. Figure

22 demonstrates the high degree of variability in annual precipitation in California, which is heavily influenced by El Nino and La Nina cycles.

Figure 23. Annual Variability in Rain and Snow

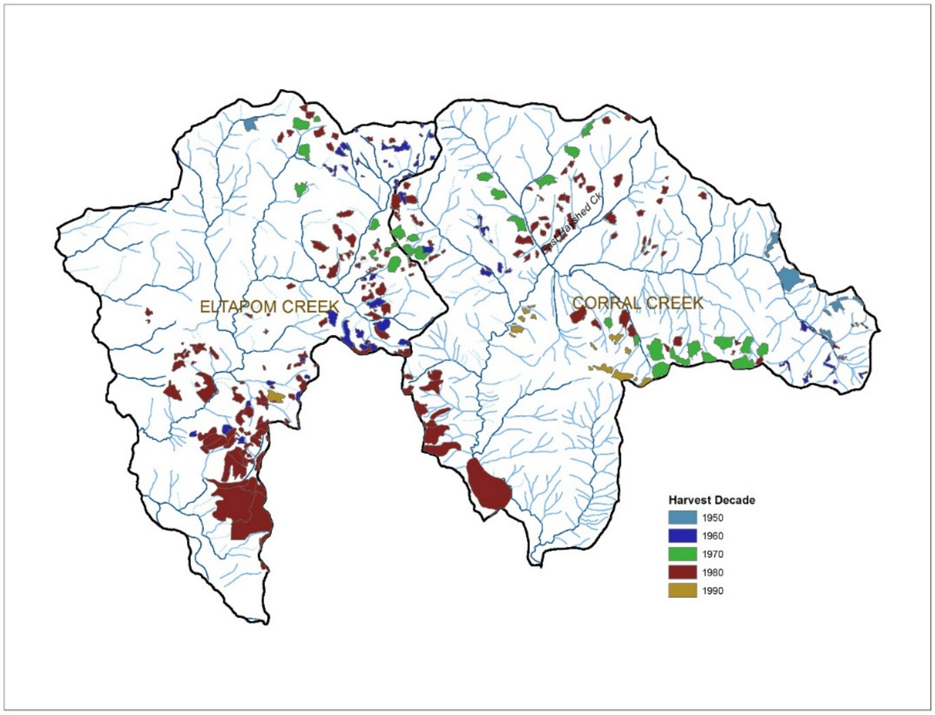


Amount of rain and snow (as water equivalent) for the state of California over December – March each year since 1948, shown as the departure from the 1981-2010 average (dark gray bars; scale on left). Pink bars = El Niño conditions, blue bars = La Niña, light gray = neutral.

Precipitation levels in northern California have always experienced wide swings between drought and above normal precipitation. Prior to more active forest management in the mid-twentieth century (timber harvest, mining, etc.) salmon and steelhead runs were among the highest in California; an indicator of fairly consistent healthy water quality. Historically, the two watersheds were able to recover from natural extreme environmental events over time. The 1964 flood of the South Fork Trinity caused a significant amount of damage to the South Fork of the Trinity River and all its tributaries. Timber harvest and road construction introduced in the two decades prior to the flood combined with damage from the flood exceeded the capability of the two watersheds to recover completely in the past 50 years, as evidenced by continued periodic sediment flushes and continuing TMDL listing for the South Fork of the Trinity River.

As can be seen in Figure 24, the greatest amount of timber harvest activity occurred in the 1970s and 1980's (shown in green and red). Publication of the 1994 Northwest Forest Plan significantly reduced timber harvest volumes in the 1990s, shown in gold. Despite fewer impacts to the watersheds, considerable work to eliminate sediment sources caused by past actions is still needed.

Figure 24. Timber Harvest Activities between 1950 and 1990[7].



4.2 Vegetation

Plant Communities

Historically, forest vegetation condition within the watershed analysis area was primarily dominated by larger diameter pine, Douglas-fir, and true fir stands. Late seral stands probably dominated most of the watershed areas, with patches of younger stands established following fire events or landslides. Periodic surface fires would have burned the understory of many stands, thinning out some stems and clearing accumulating fuel, thus preventing a large fuels buildup.

Changes to structure of the vegetation in the analysis areas can be attributed to two main factors: timber harvesting, and high intensity stand replacing fires. About 100 years ago, the policy toward fire suppression began to change forest conditions by allowing development of an understory of smaller trees and brush to become established in many areas due to the absence of the periodic fires that had previously kept such growth in check. This allowed the buildup of smaller understory fuels, setting the stage for the larger and higher intensity fires that have taken place over the last few decades. On the north and east portion of the watershed, high intensity burn areas suitable to support conifer stands are now dominated by brush. Fire suppression efforts also allow the buildup of weaker, damaged, diseased and insect-infested trees that the periodic fires would have helped eliminate.

[7] Data from FACTS [Forest activity tracking database]

Fuels

Fire history studies suggest that the pre-suppression period fire regime in the Klamath Mountains was generally one of frequent, low- to moderate-intensity fires (Skinner et al 2006). One study on the Klamath National Forest determined a mean fire return interval of 10 – 17 years (Wills and Stuart 1994). Forest Service data indicates that the mean fire return interval in the majority of the Eltapom Creek and Corral Creek watersheds is between 11 and 29 years, depending on the vegetation type. There are small areas of chaparral and serotinous species that had a mean fire return interval of 55 years. In the pre-settlement period, lightning and Native American ignitions were responsible for maintaining the short return interval. European settlement of the area did not significantly alter the fire regime.

Wildfire risk is the potential for an ignition source to be present and most commonly occurs as lightning in the Klamath Mountains. Wildfire risk isn't influenced by human actions and there is no difference between historical and current amounts. What has changed are the conditions on the ground that influence the response to wildfire ignitions. European settlement introduced utility powerlines that can spark wildfires, a transportation system that brings motor vehicles in contact with flammable materials, and fire suppression policies that have allowed woody fuels to accumulate and forest stand densities to increase and increase the intensity of fires.

The fire suppression period which began in the early 1900s has significantly altered the historic fire regime. Studies have documented increased fire rotation (the amount of time it takes for an area or landscape to burn) as fire suppression became more effective (Taylor and Skinner, 1998; Taylor and Skinner, 2003). As noted above, fire return interval departure analysis for the Eltapom Creek and Corral Creek watersheds demonstrates that, since the onset of the fire suppression period, the majority of the area has burned less often than the pre-settlement fire return interval. Fire suppression became effective in the accessible portions of the Klamath Mountain by the 1920s; by mid-century, suppression became more effective in remote areas, especially with the increased suppression capability of aerially-delivered firefighters (Skinner et al 2006).

4.3 Species and Habitats

Wildlife

Historical conditions likely included a greater quantity and quality of habitat for northern spotted owls and other old-growth forest species, with old-growth forest habitats more widespread and a much higher density of very large trees. These conditions likely supported higher populations of NSO's and other old-growth species, and the riparian habitats within these watersheds likely supported much healthier populations of aquatic and riparian-dependent wildlife species.

The main natural and human causes of change in these watersheds have been logging, mining, and fire suppression. The activities have greatly reduced the extent and quality of LSOG forest habitats, and the quality of riparian habitats. These activities have created a mosaic of primarily young forest habitats with a canopy much lower in average tree size, and riparian corridors in a much less healthy and productive condition. Mining has been particularly impactful to habitats for wildlife species that are dependent on riparian habitats, especially aquatic wildlife species.

FISHERIES

Relatively little data exist to document historical fish populations, but there are many accounts of an abundant fishery. A 1936 edition of the Trinity Journal (as reported in Brown et al, 1994) stated that "a local fisherman reports that the South Fork of the Trinity River is full of salmon and small trout….and there is one hole in which there is at least 1,000 salmon." Fish counts declined dramatically following the December 1964 flood. The spawning spring chinook population was estimated at 10,000 or more fish in 1963 and 1964. Although official surveys were not completed immediately after the flood event, estimates in the period that followed were as low as a dozen in some years during the 1970s and 1980s. Fall-run spawning chinook were estimated at 3,300 in 1963 but 500 or fewer fish in the late 1980s. Somewhat higher numbers, as high as 1,835 in 1996, has been documented in recent years. Other species, such as steelhead, have also declined in number, although data are scarcer (EPA, 1998).

Prior to European impact, streams in the Eltapom Creek and Corral Creek watersheds were functioning in dynamic equilibrium. Both watersheds were resilient to periodic impacts from drought, floods, wildfires and fires intentionally set by local tribes, and other naturally occurring disturbances. More impactful practices such as mining, logging, fire exclusion, and grazing that were introduced with European settlement and increased in frequency into the 20th century have exceeded the ability of the watersheds to absorb. Based on data from annual spawning surveys in the two watersheds, logging, grazing, and more recently marijuana cultivation, have been the most impactful activities. Poor resilience has expressed itself in degradation to the fisheries in South Fork Trinity River and Eltapom and Corral Creeks, primarily in poor water quality from excessive sediment deposition and resulting loss of spawning habitats.

PLANTS

Fire exclusion, timber harvest, and road construction have contributed most to loss of suitable habitat within the two watersheds.

The watersheds are within the Klamath Mountains and experience Mediterranean weather patterns, both of which are adapted to low to moderate intensity fire every 25 to 30 years on average, with a small component of high intensity fire. Except for plant species in unique microsites, wildfires serve to regenerate plants and sustain them in the landscape and historically native and rare plants recovered easily from periodic wildfire, usually from residual roots or seed in the soil.

Fire exclusion over the past 100+ years has modified specialized habitat that Sensitive plant species require. Litter and duff layers that provide moisture and nutrients to forest species but suppress seed germination needed to sustain rare plant populations have built up far in excess of historical depths. Shade tolerant species have expanded population size where periodic fire regularly created openings in the canopy, but the amount of open canopy has decreased, as has the habitat for early seral species such as California globemallow. Over the long term, suppressing fires over large areas the size of 6th field watersheds allows extraneous woody fuels to accumulate, tree canopies to come in contact with each other and ladder fuels to build up. In combination, wildfire intensity can be very high and result in impacts on soil and plant communities so severe that roots and seeds in the soil are killed and can't recover. A significant amount of the two planning watersheds have burned in the past 30 years, some places multiple times, and effects of fire exclusion have been low. One notable exception is the larger than usual amount of high intensity burn in Buckhorn Creek drainage in the Eltapom watershed; typically riparian areas carry enough soil moisture to reduce fire intensity.

The amount of harvested timber in the two watersheds is relatively low in comparison with other watersheds on the west side of the Forest; even lower in the Eltapom Creek watershed that is steep and relatively unroaded.

Timber harvest locations follow the main roads. Prior to the 1970s and 1980s when environmental laws dictated more sensitive project designs to protect natural resources, the magnitude of impacts to Sensitive plants presumably greater. Only anecdotal evidence exists to support this, but it's reasonable to assume accelerated shifts from late-seral to early-seral habitat (overstory removal) and significant disturbance to root tissues from machine piling activity-generated fuels were not beneficial to species viability. Few, if any field inventories have occurred to identify potential changes or trends in species abundance or distribution.

Road construction in the 1970's and 1980's to access timber sales and mine has had a notable impact on serpentine-adapted species in the Eltapom Creek watershed within the Rattlesnake Creek terrain. Serpentine habitats have been favored for road construction and landing locations because they naturally contain little vegetation and are often flat or only gently-sloped. Again, no hard data is available, but there are many serpentine openings bisected by roads with population remnants directly adjacent. It is reasonable to assume populations of serpentine-endemic species have been lost over time in the Eltapom Creek watershed.

4.4 Human Uses

Roads

Native Americans established the first routes to move around Trinity County seasonally. The first routes that resembled two-track roads were established in the 1850's with the discovery of gold; roads served to access to the mines and ferry provisions back and forth to towns (USDA, 1994 Butter CK WA). Once placer became exhausted roads were used to service farming and ranching, as well as for resupplying the remaining miners. Road building started up again to facilitate firefighting and connect Hayfork to Hyampom and Forest Glen and South Fork of the Trinity areas. But it really ramped up in the 1930s when the Civilian Conservation Corps funded infrastructure projects to employ men, and during World War II when minerals of all kinds were needed to support the war effort. At this time the Forest Service began development of a system of roads to expand the timber industry, which expanded rapidly between 1940 and 1950, and which comprises many of the National Forest System roads in use today.

Eltapom Creek watershed hasn't experienced the same magnitude of road construction as seen in the Corral Creek watershed because of steep topography that limits economical timber harvest. Corral Creek watershed is less steep and contains approximately 58 miles of maintenance level 2-4 roads as compared to about 36 miles of the same level of roads in Eltapom Creek watershed.

HERITAGE

The human history of the Hyampom Creek and Corral Creek Watershed reaches back some 7,000 to 9,000 years. The alpine glaciers were still present in the higher realms of the Trinity Alps and the Yolla Bolla Mountains. Big game hunters and gatherers moved into these mountain areas at the end of the Pleistocene age. It has been inferred that these people were drawn to the mountains because of the changing climate at the end of the Ice Age. During this time many of the mega fauna species were becoming extinct due to human pressure and changing vegetation and habitat. Plants that animals and humans relied upon were shifting upward into the mountains. The planning watershed was one of the key areas that drew these early residents.

Based on linguistic studies, the first known tribe in these watersheds was the Chimariko. Their territory originally extended from Hayfork Valley to Hyampom Valley down river along the South Fork Trinity River to the main stem of the Trinity River. Their presence in the area goes back at least 3000 years if not longer. In the last 2000 to 1000 years Before Present (BP), Wintu peoples moved into the northern Sacramento Valley and the surrounding mountains. The local Wintu tribe is the Nor-Rel-Muk band. Both groups lived in the Hyampom and Hayfork valleys. However, the Nor-Rel-Muk slowly took over the original Chimariko territory. By what means is not known. Many prominent geographic points within the Watershed have both Chimariko and Wintu place names. South Fork Mountain is known in Chimariko as *hatcim tceyta* (great ridge) and Wintu as *tororkhelas* (long ridge). Hyampom Valley was called *maytsa* (flat) in Chimariko and *xayinpom* in Wintu (Bauman, 1980).

Within Hyampom and Corral Creek Watershed there are 35 Wintu and Chimariko placename sites. Some of the prominent geographic features within Hyampom Creek watershed are shown in Table 21.

Table 21. Wintu and Chimariko Placenames in Eltapom Creek Watershed

Euro-American Name	Chimariko	Wintu
Hinckley Flat	*maytca tcewu*	*bohem ts'sraw* (big flat)
Buckeye Creek	*phaqtun's hitutami*	
Eltapom Creek Area	*numna 'ama* (back country)	*'eltipom'* (back country)
Eltapom Creek		*teleq 'ilay waywaqat* (little basket type north creek)
Confluence of Hayfork Creek and South Fork Trinity	*hatsukhitsi*	*kholup' uri'*
Underwood Mountain	*sasatcin* (storage basket place)	*t'atas phuyuq* (storage basket mountain

Table 22. Wintu and Chimariko Placenames in Corral Creek Watershed

Euro-American Name	Chimariko	Wintu
Hyampom Mountain		*phay phuyuq*
Ridgeline Dividing Hyampom from Corral Bottom	*photc'imi* (bearskin)	*tc'ilp'aqas* (stretched bear skin)
Corral Bottom	*wits'atman 'ama* (on top land)	*pantiłok pom* (flat on top ground)
Haypress Meadow sacred water spot		*puy tc'ohi'* (east running)
Gates Creek/Place (eastern limit of Chimariko territory	*maytra hita* (lots of flats)	*tc'araw' buyaspom'* lots of flats

(Bauman, 1980)

The main area of prehistoric focus for these two watersheds is Hyampom Valley, which is one of the major prehistoric habitation centers between the Sacramento Valley and the North Coast. Several thousand Chimariko and Wintu people resided in this Valley year round. The South Fork was the principal provider of sustenance, producing rich runs of salmon, steelhead, and lampreys. Terrestrial species pursued also for protein included deer, elk, black and grizzly bear, and beaver. There are five recorded sites in association with the river. The sites located here indicate year round habitations, evidenced by large semi subterranean house pits and smaller summer/fall house pit bark shelters (Heizer, 1978).

Artifacts found at these sites indicate a later period of prehistoric use going back no later than 4000 years BP. The milder climate at this lower elevation, along with the readily available fisheries and other gathering crops, enticed people to reside in the area year round.

Within the valley and surrounding hillsides regular burning by Chimariko and Wintu peoples was done prior to 1850. This management tool helped control fuels, the distribution and age of plant communities in these watersheds. Burning promoted good crops of plants used for food and living materials. Examples, would be black and white oak acorns a key food crop, red bud and hazel shoots for basketry. Burning also helped provide better habitat for deer and other game species. This regular burning kept the valley and surrounding area open, with the riparian areas having the greatest stand densities.

The first Euro-Americans documented to have seen this area was the Jedediah Smith fur trapping party in April and May of 1828. However, there may have been earlier passage of Europeans into Trinity County in the early 1820's. These may have been Russian explorers from Fort Ross. The next groups to enter this country may have been small parties of Hudson Bay Company trappers working their way westward from the Upper Sacramento River Valley near Redding (Morgan, 1953).

The major influx of Euro-Americans came in the 1850's following the discovery of gold near Junction City. The Hyampom area did not attract the gold miners, but was soon settled and used for grazing and agriculture starting in the 1860's. This was largely the main economic activity up through the early 20th-century, with limited timber harvesting mainly for local use.

Early in the 20th century, the US Forest Service came into the area managing the area for timber, grazing, and small recreation use. This economy, with a small amount of timber harvesting lasted up to 1945. After World War II the local economy became mainly centered on the timber industry. Several sawmills were established in Hyampom Valley that employed several hundred people along with the local logging operations on private and public lands. Better technology and roads into the area helped this along. Hyampom valley did not get full telephone coverage or electrification until after the war.

Forest Service Heritage Management has surveyed approximately 60% of the Federal land within the watershed. Private timber lands have also been surveyed as part of the State of California's timber harvest plan process. Since these private lands have had timber management done on the majority of the acreage, archaeological survey coverage is at least 80%.

STEP 5: SYNTHESIS

In this step the interaction of physical, biological, and social processes is summarized and integrated with the changes between current and reference conditions.

In this step, physical, biological, and social processes in the Eltapom Creek and Corral Creek watersheds are integrated. This provides the basis for a landscape comparison of the health of the two watersheds and provides the context for evaluating the capability of the system to achieve key management plan objectives. Integration and comparison is used to address the issue and key questions provided in Step 2.

This step will also summarize how ecosystem processes in the watersheds are meeting or work progressing toward meeting nine objectives of the Aquatic Conservation Strategy. The topics of botany and heritage (addressed in Steps 3 and 4) are not carried into this step because management of these resources does not have the ability to effect changes that will lead to attainment of ACS objectives, and they have not been responsible for historic actions that led to loss or degradation of ecosystem function.

ISSUE AND KEY QUESTIONS

Issue: Watershed Recovery in Riparian Reserves within Eltapom and Corral Creek Watersheds
Ecosystem processes in the two watershed are operating at less than their potential due to a number of environmental and managed disturbance events over time.

KEY QUESTIONS

1. What is the current status of water quality and hydrologic function?

2. What is the array of plant communities and how does that array contribute to meeting ecosystem needs?

3. Do current ecosystem processes allow for providing public safety?

Settlement in northern California, watersheds within the Klamath Basin and the Lower South Fork sub-basin were ecologically sustainable; they maintained viable and diverse populations of biological resources, were resilient to wildfire and large-scale environmental events, and generally sustained the tribes that lived within them and depended on their resources for survival. Soil erosion and sediment movement into riparian areas occurred, but was kept at a minimum because natural disturbances were generally small and occurred infrequently enough to allow for recovery. The Gold Rush in the 1840s initiated a long series of changes to northern California that gradually compromised the balance and stability of the ecosystem in the Eltapom Creek and Corral Creek watersheds. Those changes were a combination of individual and repeated perturbations and uncontrollable features of the natural landscape. Wildfires, roads, and timber harvest have been the greatest drivers of change from historical conditions that led to reduced water quality and degradation of fisheries habitat in the South Fork of Trinity River.

WILDFIRE AND HAZARDOUS FUEL ACCUMULATIONS

Historically, the majority of the Eltapom Creek and Corral Creek watersheds has experienced frequent mixed-severity fires with a smaller component of high severity burn on an interval of 0 – 35 years, as is seen throughout similar landscapes in the Klamath Mountains. This fire regime kept conifer and shrub densities at a sustainable level and reduced ladder fuels that can facilitate damaging crown fires. The 2015 South Fire Complex, which burned about 75% of the Eltapom Creek watershed and about 33% of the Corral Creek watershed, burned at 16% (2000 acres) high severity and the remainder at a combination of moderate or low severity or not burned. However, more than half of the high severity burn was concentrated in a roughly 2000-acre patch along and across the Buckhorn Creek and Allen Creek drainages, something that is not typical in riparian areas because of higher humidity and lower temperatures. A similar outcome was seen in the 2004 Sims Fire, directly west of Eltapom Creek watershed, where 86% of riparian reserves in the Grapevine Creek drainage burned at high severity.

Fire played an important ecological role in riparian areas within the high-frequency, low- to mixed-severity historic fire regime. Fire exclusion during the fire-suppression period has resulted in increased fuel loading within the forest's identified Riparian Reserve buffers, just as it has in the adjacent upland areas. Recent fires have demonstrated that the fuel loading, especially when combined with low fuel moisture and severe weather, can result in undesirable high-severity fire effects within the Riparian Reserves. Modification of the current fuel loading and stand structure, which are a result of fire exclusion, may improve a stand's resiliency to future wildfire. Potential treatments could vary widely depending on the characteristics of each Riparian Reserve area. Treatment prescriptions, whether for mechanical or prescribed fire, can be directed toward the reduction or retention of different vegetation types and sizes as well as the various size classes of down woody debris. The ultimate goal of treatment would be to restore or replicate fires ecological role in the Riparian Reserves.

Contributing to the trend of higher burn severities in riparian areas is widespread live and dead fuel accumulations and over 100 years of active fire suppression. Changes in stand structure have gradually occurred over the past 70 years from timber harvest and high intensity stand replacing fires. Active fire suppression in response to a perceived need to protect forests from fires in the past 100 years has allowed development of an unsustainably dense understory of smaller trees in some areas and large brush stands that inhibit recovery of conifer forest in others.

FOREST HEALTH AND MANAGEMENT

Clearcuts and other forms of complete overstory removal were considered the most efficient way to harvest timber starting in the 1940s with the need to supply lumber for the war effort. This continued until the 1970's when several environmental regulations were enacted to better manage non-timber resources, including the National Environmental Policy Act. Publication of the Northwest Forest Plan for protection of the northern spotted owl, reduced the volume of timber harvest even more. If fire had not been actively excluded in the two watersheds it would have periodically reduced ladder fuels and excess small trees, as well as accumulations forest floor duff thick enough to kill otherwise fire-resistant species. Periodic surface fires would have cleared out the understory of many stands, thinning out a portion of small trees and clearing accumulating fuel, and ultimately preventing large fuel buildups.

The Eltapom and Corral Creek watersheds are experiencing elevated levels of mortality. Aerial surveys indicate recent mortality in the planning watersheds between 2014 and 2016, primarily from bark beetle infestations of conifer stands previously weakened by multi-year drought in overstocked stands. Resources available to support fire-maintained forest communities are no longer enough to support the additional trees and vegetation in overstocked communities where fire has been excluded for decades. Although laws, regulations, and policy has been put into place to minimize and restore healthy forest stands, only a small fraction of restoration needs have been met. Until then, overstocked stands and excessive hazardous fuel accumulations continue to put remaining forest stands at risk for high intensity wildfire.

Roads

Roads are another significant source of sediment in the Eltapom Creek and Corral Creek watersheds. Roads are critical for access to remote communities and were originally constructed to facilitate removal of minerals and timber products essential to public needs. Most communities in Trinity County established where roads were built. Native surface and gravel roads have the capacity for soil movement when they are constructed and can continue to erode until overgrown with trees if they aren't maintained. Road density in the two watersheds is moderate to low, but design standards to reduce erosion were not in place or widely applied to most roads built between 1940 and 1980 to access timber harvest or mining sites. Figure 7 in Step 3 shows the extent of roads built within close proximity of riparian areas; a practice that has been prohibited since water and soil BMPs have been put into practice.

Available funds for maintenance and restoration have been limited in the past 15-20 years. This, in combination with a growing amount of unmanaged off-road vehicle use in National Forests, triggered the 2005 Travel Management Rule and closure of many Level 1 roads. The Forest has benefited from partnerships with local resource management organizations such as the Trinity County Resource Conservation District, who has completed road decommissioning and other restoration treatments using competitive external funding, but much more work is needed to reduce erosion generated from roads.

Natural Disturbance Factors

Variable weather patterns that swing widely between drought and excessive rainfall have added a natural source of stress to forest communities in the watersheds that are no longer sustainable and resilient to wildfire. Northern California is currently experiencing additional and record-setting amounts of rainfall after 3-5 years of extreme drought. The two watersheds, like all of northwestern

California, regularly experiences ground-shifting and other disturbances from tectonic forces. Combined with steep topography throughout, the watersheds contain a high amount of cracked, broken, and sheared bedrock that erodes on the surface and moves downhill easily.

The watersheds have always experienced a component of natural erosion and sediment movement, but historically accumulated sediment would be kept in balance by flushes from periodic storm and flood events. It is often presumed that watersheds maintained a regular balance of sediment inputs and outputs into riparian reserves prior to European settlement. But extreme environmental events occurred periodically that caused drastic changes to riparian reserves and stream courses, some that took decades or hundreds of years to "recover" from. The 1964 flood in northwest California is proof of the damage and ecosystem changes that extreme environmental events can trigger.

There has been a change in the watersheds in the length of time between events and the shift from infrequent, extreme events to more frequent but less extreme, repeated, disturbances to the ecosystem. More frequent but less extreme disturbances do not allow adequate time for sediment to flush in streams. Accumulated sediment degrades fishery spawning habitat at the point of entry, but also continues downstream until fully dissipated. Topography in the Eltapom Creek and Corral Creek watersheds is steep and granitic soils in Corral Creek watershed are moderately to highly erosive. Even if disturbances caused by timber harvest, mining, and road construction hadn't occurred, there would likely still be periodic flushes of trapped sediment from the flood fifty years later. But disturbances in the mid-20th century, extended the time needed for the river to heal and stabilize.

Outcomes of Alterations in the Eltapom Creek and Corral Creek Planning Watersheds

Sediment inputs triggered from timber harvest and wildfires between 1940 and the mid-1990's and additional inputs from high severity fires since that time travel down the Eltapom and Corral Creeks drainages along a 4-10% gradient. Once water reaches the South Fork Trinity River, the gradient quickly drops to less than 5% and sediment deposits in place. Sediment deposition is one of two primary factors responsible for State TMDL listing on South Fork of the Trinity River, highly degraded fishery habitat, and federal listing of SONCC Coho salmon (US EPA, 1998). The other is high water temperature primarily from periodic drought. Current regulations and policies are designed to prevent or minimize new sediment movement from management actions, but do little to mitigate natural sources of movement or historic sediment accumulations; restoration treatments are required to mitigate past environmental damage.

Little can be or should be done to remove natural barriers in Eltapom and Corral Creeks to extend the spawning reach and spawning below barriers was highly successful prior to National Forest management mid-century. The Forest Service has an obligation under the Clean Water Act (water quality), Endangered Species Act (Coho salmon recovery), and Aquatic Conservation Strategy (riparian reserves as indicators of ecological health) to manage new sediment sources into South Fork of the Trinity River caused by past management actions, with the goal of elimination if possible.

State Water Quality Board defined beneficial uses for the South Fork Trinity River, specifically preservation and enhancement of fish, recreation, and domestic water supply, are degraded as a result of past management actions prior to widespread awareness of the impacts of excessive sediment in riparian areas. Laws, regulations, and policies are now in place to minimize additional sediment contributions from management actions, but many previously established sediment sources can only be eliminated through active restoration treatments.

Step 6: Recommendations

Recommendations for the Eltapom Creek and Corral Creek planning watersheds are derived from the analysis of the character and changes in ecosystem processes in the watersheds over time, described in the previous steps. Recommendations are intended to address the Issue and Key Questions from Step 2 and provide a suggested set of actions for moving forward to watershed restoration goals. Recommendations are focused on fuel reduction, forest health improvement, road density reduction and road maintenance, and water quality and fish habitat improvement.

Water Quality, Reduction of Sediment Sources

- Prioritize road maintenance on roads with moderate and high risk features
- Focus on upgrading undersized culverts, eliminating stream crossings where possible, and cleaning culverts and ditches.
- Reduce fuels in and around overstocked riparian reserves to reduce the potential for high severity fire

Roads

- Maintain primary access routes for residents in Hyampom and within the watersheds
- Maintain roads with highest priority for wildfire response
- Monitor and maintain roads in landslide prone areas to prevent sediment movement due to mass wasting
- Continue to repair roads where necessary and as funding allows to mitigate sediment sources. Prioritize treatments on roads where active sediment sources are currently present.
- Perform all road maintenance and repair treatments to meet agency and other federal safety standards. Standards are identified in a number of agency sources including FSM 7700, FSM 7733, and FSH 7709.59.

Forest Health

- Manage forest stand densities at levels that will maintain and enhance growth and yield, protect forest health, and increase stand vigor, with recognition of the natural role of fire, insects and disease and other components that have a key role in the ecosystem
- Prioritize thinning in stand treatments to increase stand resilience and promote development of late-successional forest characteristics in developing mid-successional and dense late-successional forest stands.
- Follow thinning treatments with prescribed burning to work toward returning stands to more natural reference conditions and reduce the potential for mortality of large diameter trees from high severity fire.
- Implement salvage and sanitation stand treatments where needed to improve resilience to fire and disease throughout the watersheds. Within the Corral LSR, treatments should be consistent with the Forest-wide Late-Successional Reserve Assessment (LSRA).

- Increase forest management (thinning, timber harvest, fuels reduction, etc.) in densely populated stands to reduce inter-tree competition and increase stand vigor
- Reforest conifer sites that don't currently meet stocking standards. Utilize natural regeneration where a suitable seed source is present and viable and plant trees where one is not. Apply site preparation and intermediate vegetation management treatments to increase the potential of a sustainable level of late-successional habitat into the future. When planting trees, use a species mix that is suitable to encourage historic levels of biodiversity into the future.

Hazardous Fuel Reduction

- With a focus on protection of values at risk, develop fuelbreaks, thin wild stands and plantations, utilize fire, and create roadside buffers to reduce fuel loading and enhance fire protection capability
- With a focus on values at risk, consider the full range of fire management strategies available under the Land and Resource Management Plan and Fire Management Reference System, when making incident management decisions
- Consider landscape-scale treatments, including prescribed fire, that restore and/or replicate fire's role in the ecosystem while enhancing fire protection capability
- Consider the recommendations of the CWPP in planning fuels treatments
- Consider fuel treatments in Riparian Reserves to reduce fuel loading and meet fire protection and ecological restoration goals. Utilize site preparation activities that reduce fuel loading and/or moderate fire behavior prior to re-establishing plantations lost in previous wildfires
- Treat plantations that are currently overstocked, losing vigor, and at increased risk of loss due to wildfire to maintain plantation health, reduce the risk of adverse effects from insect and disease, and minimize or reduce the potential for stand-replacing wildfires
- Prioritize community protection in short and long term fuel reduction action plans
- Reduce wildfire severity and its effects to Forest visitors and remote communities by managing fuels near existing roads

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Appendix A: Aquatic Conservation Strategy Objectives

Aquatic Conservation Strategy Objectives

Forest Service and BLM-administered lands within the range of the northern spotted owl will be managed to:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

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