CONSERVATION AGREEMENT

for

Upper McCloud River Redband Trout

Oncorhynchus mykiss stonei

February 2017

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I. PURPOSE

This McCloud River Redband Trout Conservation Agreement (CA) has been prepared to provide for the conservation and long-term viability of the McCloud River redband trout (McCloud redband*, *Oncorhynchus mykiss stonei*) in the upper McCloud River while respecting existing land uses, resource uses, and private property rights. Protective measures are intended to allow continued angling and other recreational opportunities, where biologically justified. The purpose of this CA is to provide specific direction that will conserve this species and minimize or remove threats and promote long-term sustainability of McCloud redband trout. This will be accomplished through implementation of the conservation plans described herein and utilization of an adaptive management process of implementing, monitoring and adjusting conservation measures by the Upper McCloud River Redband Trout Core Group (Redband Core Group), or parties thereof.

The Redband Core Group is a collection of agency and private landowner representatives committed to the management and protection of McCloud redband, and members of the public who have dedicated their time to actively participate in developing this CA. This Redband Core Group was established in 1994 when the McCloud redband was recommended for elevated listing status. The goal of the Redband Core Group is to minimize or remove threats in order to promote the recovery of the McCloud redband trout. Further, actions identified in this CA parallel those likely to be pursued if the species were listed under the ESA or CESA. Signatories to this CA agree to coordinate and work cooperatively in implementing the conservation and monitoring actions specified herein. The threats listed in this CA do not necessarily reflect the views of all signatories to this CA, but the protections offered within this agreement are unaffected by these differences.

* For the purposes of this CA, McCloud River redband trout are considered to be indigenous trout in the upper McCloud River watershed that are genetically distinct from and non-introgressed with coastal rainbow trout (*Oncorhynchus mykiss irideus*) unless otherwise noted.

II. INVOLVED PARTIES/SIGNATORIES TO THIS CONSERVATION AGREEMENT

United States Department of the Interior
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III. AUTHORITY

The original Redband Trout Conservation Agreement was developed and signed in 1998 (1998 CA) under authority of a National Memorandum of Understanding (MOU) which existed between the United States Forest Service (USFS), the United States Department of the Interior Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), National Park Service (NPS), and the United States Department of Commerce National Marine Fisheries Service (NMFS). The National MOU (#94-SMU-058) was created in furtherance of conservation of species tending toward Federal listing as threatened or endangered under the ESA (Section 2; Section 4(a)(1)).

Implementation of this CA will be through existing Federal and State authorities such as the Clean Water Act, California Forest Practices Act, National Forest Management Act of 1976 as amended (NFMA), the Fish and Wildlife Coordination Act, Federal Land Policy and Management Act (FLPMA) and National Environmental Policy Act (NEPA).

The authority for federal and state agencies to enter into this voluntary McCloud Redband Trout CA derives from statutory, regulatory, and policy driven responsibilities that cannot be delegated, particularly with respect to the management and conservation of wildlife, its habitat and management, and the resources they depend on.

This CA supersedes the 1998 CA and is guided by the USFWS “Policy for Evaluation of Conservation Efforts when making listing decisions” (68 FR 15100; March 28, 2003).

The resource agencies, entities and private timber company landowners that are signatory to this Agreement have legal authorities for management of the species and/or its habitat. Participation by these resource agencies, entities and landowners in this Agreement in no way impinges upon or diminishes established and ongoing management authorities and regulatory responsibilities. Federal and State agencies understand that this CA incorporates commitments and responsibilities under the Rangewide Conservation Agreement for the Conservation and Management of Interior Redband Trout (2014). All legal authorities and regulatory status of the participating agencies as identified in the Rangewide CA are incorporated into this document by reference. The Interior Redband Trout Rangewide Conservation Agreement (2014) can be found at the following link: http://www.fs.fed.us/r6/sfpnw/issssp/documents3/cag-fn-interior-redband-trout-2014.pdf.

It is understood by and between the parties that as per U.S. Forest Service Handbook 1509.11, Chapter 60, section 60.1 - Authorities: There are no specific legal authorities that dictate the contents or circumstances for using Memorandums of Understandings (MOUs). However, the underlying activity covered by an MOU must be authorized by laws or regulations governing Forest Service Programs".

IV. EXPLICIT OBJECTIVES AND ACHIEVEMENT GOALS

A. To maintain and enhance habitat for the McCloud redband.

B. To maintain genetic integrity of the McCloud redband.

C. To provide specific guidance for how each of the involved parties can contribute to the above.

D. To gain the mutual cooperation and commitment of all parties involved for the protection and conservation of the McCloud redband.

E. To minimize or remove threats and promote the long-term sustainability of McCloud redband trout.

V. DURATION OF THIS AGREEMENT

The duration of this CA (U.S. Forest Service Agreement number: 15-MU-11051400-0)(Appendix A) is for ten years following the date of the last signature. Annually, the parties' signatory to this CA will review the CA and its effectiveness to determine whether it should be revised. By the tenth year, the CA must be reviewed and either modified, renewed or terminated.

In February of every year for the duration of this CA, the CDFW will convene a meeting of representatives of each signatory to this CA for an annual review of this CA.

In cooperation with and approval by all involved parties, the CDFW will record and distribute an annual report that consists of:

1. The minutes of the annual meeting encompassing the discussion regarding status of the species, actions accomplished and objectives for the next field season.
2. An updated Summary of Activities table (Appendix B) showing the past year's accomplishments.

Additional meetings may be called as necessary to fulfill the commitments of this CA.

VI. BACKGROUND

A. Area Description and Land Use

The upper McCloud River watershed encompasses approximately 574 square miles and is characterized by a mix of relatively flat to mountainous terrain. The basin lies mostly within Siskiyou County, California (Figure 1). The upper river flows generally westerly for approximately 24 miles from its origin near Colby Meadows to Middle Falls (believed to be the historical natural barrier to anadromous fishes). Elevations range from 6,224 feet at Mushroom Rock to 3,360 feet at Middle Falls. Landownership is approximately 40 percent private and 60 percent Federal. Timber is managed on many of the lands within the area. The vegetation type is primarily second growth mixed-conifer and white fir-ponderosa pine forests. Portions of the upper river basin are grazed on an annual basis. There are many recreational uses in the area including fishing, camping, hunting, hiking, mountain biking, mushroom picking, snowmobiling, and cross-country skiing.

B. Soils and Geology

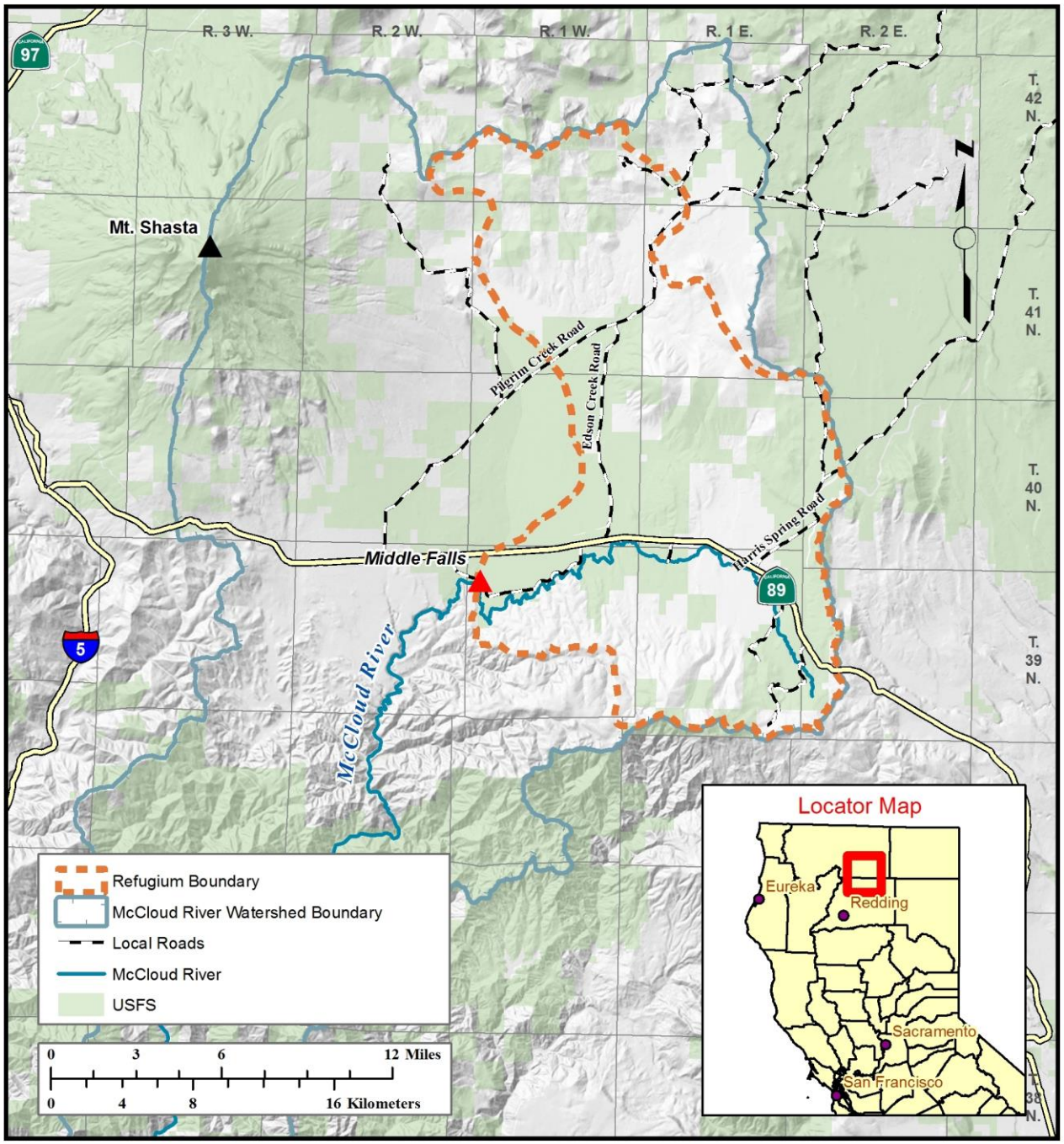
The majority of the land area lies north of the McCloud River and consists of very gently sloping, recent lava flows and outwash deposits from Mt. Shasta and the Medicine Lake Volcano. The southern portion of the drainage is smaller in surface area but contributes most of the surface flows into the river.

The upper McCloud River flows over moderately sloping volcanic terrain from its headwaters near Colby Meadow to its confluence with Cow Creek. From Cow Creek to Upper Falls the river is bounded to the north by gently sloping lava flows and to the south by moderately sloping volcanic terrain. Downstream of Upper Falls the river becomes confined within a steep canyon. Soils on these lava flows are typified by ashy, sandy loams over very gravel-laden sandy clay loams and support Douglas fir/mixed conifer forests. With the unique porous soils north of the Upper Falls, few streams have permanent wetted connections to the upper McCloud River. More perennial and intermittent tributaries drain into the river from the south.

C. Recreational Angling

Many recreationalists come to the upper McCloud River to camp, fish and enjoy the outdoors. In the past, anglers had the opportunity to catch hatchery-stocked trout above Middle Falls. However, due to concerns about the genetic integrity of native McCloud redband trout (primarily due to introgressive hybridization with nonindigenous coastal rainbow trout) stocking of hatchery coastal trout rainbow trout was discontinued above Lakin Dam in 1994. The current fishery is comprised of wild trout of mixed stocks, including McCloud redband, coastal rainbow, coastal rainbow x redband, brook and brown trout in the upper McCloud River and its tributaries.

Figure 1. Upper McCloud River watershed and McCloud redband Refugium Area.



The heaviest angling pressure and focus of recreational fishing activities has been on the main stem of the upper McCloud River, while tributary streams and those isolated from the river have experienced limited angling activities even before hatchery stocking was terminated. The last upper McCloud River tributary to be stocked with hatchery fish was Trout Creek in 1976.

As of 2011, CDFW state hatchery fish stocking allotment for this area included annual stocking of catchable coastal rainbow trout from the main stem McCloud River below Lakin Dam to Lake McCloud Reservoir, located approximately 8.5 miles below Lakin Dam. In addition, stocking of hatchery brook trout (*Salvelinus fontinalis*) occurs at the impoundment behind Lakin Dam (starting in 1998), where the only local fishing access for physically challenged people is located. However stocking of all nonindigenous fishes above Middle Falls was phased out in 2013 in order to protect McCloud redband.

There are growing numbers of anglers interested in and actively pursuing the California Heritage Trout Challenge (CHTC), which is administered by CDFW's Heritage and Wild Trout Program. This challenge requires anglers to catch and document six different species/forms of California's native trout in their historic drainages to receive a CDFW signed certificate acknowledging their accomplishment. Select streams in the upper McCloud River basin qualify for McCloud redband trout, one of eleven recognized native trout that meet the challenge requirement. Approximately 74% of anglers who have completed the CHTC to date (as of 2012) have used the McCloud redband trout as one of the six species required for their application. This popular public outreach effort has increased the public's awareness and understanding of the uniqueness and diversity of California's native trout. CDFW believes that catch and release angling does not negatively affect redband populations in streams open to fishing. The potential harm to individual redband that are caught and released are negligible compared to the opportunity to catch a McCloud redband and the benefits that accompany stakeholder support and awareness. It is the intent of the Heritage and Wild Trout Program to protect and enhance the Upper McCloud River watershed and its fisheries in order to continue to provide opportunities for the public to enjoy and fish for McCloud redband within their native range.

D. Fish and Wildlife Resources

The McCloud River and its associated riparian area provides habitat for over 200 wildlife species. Twenty-seven of these have been identified as species of special status. This designation denotes these species have been placed on one or more of the following lists: Federal or State threatened or endangered species; species that are proposed or are candidates for listing as threatened or endangered; Survey and Manage species as identified by the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, or Northwest Forest Plan Record of Decision (NWFP ROD) ; State Species of Concern; State Board of Forestry Sensitive; or USFS Region 5 Sensitive (Table 1). While these species are not covered in detail under this CA, they may potentially benefit from the proposed actions described within.

Table 1. Wildlife species of special status within the upper McCloud River basin.

Species	Status
Western bumble bee	USFS Sensitive
Black juga	USFS Sensitive
Chace sideband	USFS Survey and Manage
Fluminicola sp.	USFS Survey and Manage
Juga spp.	USFS Survey and Manage
Kneecap lanx	USFS Sensitive
Montane peaclam	USFS Sensitive
Shasta hesperian	USFS Sensitive
McCloud River redband trout	USFS Sensitive; State Species of Special Concern
Cascade frog	USFS Sensitive; State Species of Special Concern
Foothill yellow-legged frog	USFS Sensitive; State Species of Special Concern
Pacific tailed frog	State Species of Special Concern
Western spadefoot toad	State Species of Special Concern
Northwestern pond turtle	USFS Sensitive; State Species of Special Concern
Bald eagle	USFS Sensitive; State: Endangered
Northern goshawk	USFS Sensitive; State Board of Forestry Sensitive
Northern spotted owl	Federally: Threatened
Osprey	State Board of Forestry Sensitive
Willow flycatcher	USFS Sensitive; State: Endangered
Yellow rail	USFS Sensitive
California wolverine	USFS Sensitive; State: Threatened
Fisher	USFS Sensitive; State Species of Special Concern
Pacific marten	USFS Sensitive
Gray wolf	Federally: Endangered; State: Endangered
Fringed myotis	USFS Sensitive
Pacific western big-eared bat	USFS Sensitive; State Species of Special Concern
Pallid bat	USFS Sensitive; State Species of Special Concern

There are four fish species regularly found within the upper river above Middle Falls: McCloud redband, coastal rainbow trout, brown trout (*Salmo trutta*), and brook trout. In addition, a single golden shiner (*Notemigonus crysoleucas*) was found in the impoundment behind Lakin Dam in October 1994.

The McCloud redband is the only native species in the upper McCloud River basin and is presently designated by the state as a “Species of Special Concern”.
The non-native trout in the basin are a result of hatchery introductions that began in the late 1800s.

The native redband trout in the upper McCloud River drainage are thought to be a relict subspecies of nonanadromous rainbow trout adapted to harsh, fragmented environments. The phylogenetic position of the McCloud redband within *Oncorhynchus mykiss* has been the subject of debate for over 70 years. In 1994, due to concerns regarding potential introgressive hybridization with hatchery fish, habitat reduction during an extended drought, and potential hydropower development, the McCloud redband was listed as a Category 1 species under the Federal Endangered Species Act (Federal Register, Vol. 219, Nov. 15, 1994, page 58982). In 1995, Category 1 designation was changed to “Candidate” (Federal Register, Vol. 61, February 28, 1996, page 7596). This change was not a change in status but a change in nomenclature only. Subsequent to the signing of the original Redband Trout Conservation Agreement, the fish was removed from the Candidate list (Federal Register, Vol. 65, October 20, 2000, page 63044). In 2011, genetically distinct McCloud redband trout were restricted to approximately 15 miles of wetted habitat in four small, isolated streams or stream sections in the upper river basin (Simmons et al. 2010; Stephens et al. 2011; CDFW 2011 unpublished data). This represents all known non-introgressed populations and, while the extent of wetted habitat can vary extensively from year to year, it raises concerns about the long-term viability of the species, absent conservation actions to ensure their persistence.

VII. GOVERNING DOCUMENTS AND EXISTING POLICIES

A. Federal Policies and Regulations that Protect Species and Habitat

1. Management Practices on Federal Lands

The Shasta-Trinity National Forest Land and Resource Management Plan (STNF LRMP) and the NWFP ROD (incorporated into the LRMP) govern NFS land management activities. The Aquatic Conservation Strategy (Appendix C) within the NWFP ROD establishes guidelines for management direction regarding riparian areas on Federal lands. The Aquatic Conservation Strategy strives to maintain and restore the ecological health of watersheds and aquatic ecosystems contained within them to protect habitat for fish and riparian dependent species.

2. National Environmental Policy Act (NEPA)

Assures all federal funding and permitting decisions be made with full consideration of the impact to the natural and human environment. Decisions made pursuant to NEPA

will disclose impacts to interested parties and the general public**.**

3. Federal Endangered Species Act (ESA)

Provides protection and recovery measures and funding to benefit imperiled species and the ecosystems upon which they depend. The ESA is administered by two federal agencies, the US Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS). Congress defined species to include subspecies, varieties, and, for vertebrates, distinct population segments.

4. Clean Water Act (CWA)

Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

B. State Policies and Regulations that Protect Fish and Fish Habitat

1. Management Practices on Private Forest Lands

Originally, instituted under the auspices of the Z'berg-Nejedly Forest Practice Act of 1973, the Forest Practice Rules (FPR), in current amended form, are considered the strictest protection measures in the nation governing the management of privately owned forest lands. The FPR have been evolving over time in response to more stringent environmental considerations. This has resulted in numerous rule changes during that time and additional future restrictions are possible if the need is demonstrated. Protection standards embodied in the FPR are designed for all resources at risk related to logging operations. Measures designed to protect (and in some cases "restore" and "enhance") soil productivity, air and water quality, fisheries, wildlife (including rare, threatened and endangered species) long-term timber production, and archaeological and historic sites are all addressed by these rules and the timber harvest plan (THP) review process. Due to the variety of individual circumstances of timber harvesting in California the rules are not strictly prescriptive. Opportunities to increase protection, if necessary, exist based on site-specific circumstances.

Each THP is subject to a pre-harvest inspection during the review process. Reviewing agencies may participate when the harvest has the potential to affect resources for which they are responsible. After the inspection, each attending agency may write a report and, if necessary, ask for mitigation for any activity that threatens to cause a significant effect on any forest resource or would violate any other State or Federal law, such as the California Endangered Species Act or the Porter-Cologne Water Quality Act. The THP is also subject to public review. The California Department of Forestry and Fire Protection (CAL FIRE) must consider all comments by State and Federal agencies, as well as comments from the public, before making a decision on the plan.

The California FPR contain resource protection requirements through a two-step

process. First they set prescriptive standards for minimum protection levels for all activities. These are then used as a floor for additional site-specific mitigations, which the Registered Professional Forester and the multidisciplinary review team must agree will culminate in a project that does not result in a significant adverse impact to any forest resource.

2. Fish Stocking

The California Fish and Game Commission (CFGC) develops policies and adopts regulations that provide guidance to the CDFW regarding fish stocking in waters of the state. One policy of the CFGC states that: "...Hatchery trout shall not be stocked in waters where they may compete or hybridize with trout which are threatened, endangered or species of special concern. Exceptions may be made for stocking waters which are not part of a species recovery program..." This policy was the impetus for the action taken by the CDFW in 1994 to terminate the stocking of hatchery rainbow trout in the upper McCloud River above Lakin Dam.

In 2010, CDFW responded to a legal action challenging its hatchery and stocking program and certified an Environmental Impact Report (2010 EIR) that considers species and habitats affected by hatchery-raised trout species. The McCloud River redband trout was specifically analyzed and addressed in the 2010 EIR. One of the mitigation measures identified in the 2010 EIR was a Pre-Stocking Evaluation Protocol. This evaluation requires CDFW to consider sensitive and/or listed species that could be impacted by a proposed stocking event before CDFW determines whether to proceed with a proposed stocking event in waters of the state, including the potential impacts of altering the genetic makeup of native trout species due to hybridization with hatchery trout.

3. Angling Regulations

Fish and Game Code (FGC) Section 200 empowers the CFGC to regulate the taking or possession of fish in California whether on public or private land through the adoption of state angling regulations. These regulations are reviewed every three years (triennially) to determine if they are providing adequate protection for fishery resources and are changed by the CFGC, when warranted. In addition, the CFGC may also adopt emergency angling regulations at any time for the immediate protection of fish. This authority was used in 1995 to reduce the threat of angling harvest on McCloud redband populations in Moosehead and Sheepheaven creeks, which were believed to be at extremely low numbers following several years of below average precipitation. Under authority of Article 1.5. (FGC Section 240) emergency angling regulations may also be adopted or repealed at any time by the CFGC under either set of the following criteria:

- action is necessary for the immediate conservation, preservation, or protection of fish, including their nests (redds) or eggs; and
- such action is necessary for the immediate preservation of the public peace, health and safety, or general welfare.
- Generally, an emergency regulation only remains in effect for 180 days.

4. Fish Species and Habitat Protection

State law exists which provides for the protection of aquatic organisms including the McCloud redband and their habitats on private lands. Specific FGC sections that deal with stream protection and water quality include:

- Section 1600 *et seq*. - protection for lakes and streams;
- Sections 5650 and 5652 – discharge of prohibited materials into State waterways;
- Section 5901 - maintaining unimpeded stream access for fish;
- Section 5937 - maintaining adequate stream flows for fish below dam structures; and
- Sections 1802 and 711.7(a) CDFW as holding fish and wildlife resources in trust and having jurisdiction over conservation, protection, and management of fish and wildlife and habitats necessary for sustainable populations of those species.

Regional Water Quality Control Board – in addition to implementing sections of the Clean Water Act, the Regional Board also regulates water quality standards through watershed protections (Section 303d).

State Water Resources Control Board – oversees California's water resources including water quality, allocation, and efficient use. California Water Code Sections providing resource protection include: 1243, 7047, and 13000 et seq.

5. California Environmental Quality Act (CEQA)

Is a formal process to inform governmental agencies and the public about the potential significant environmental effects of proposed activities; identify ways that environmental damage can be avoided or significantly reduced; identifies changes in projects through the use of alternatives or mitigation measures when feasible; and disclose to the public the reasons why a project was approved if significant environmental effects are involved.

6. California Endangered Species Act (CESA)

Provides protection for certain native species that are listed as endangered, threatened, or a candidate for listing as endangered or threatened and a process for evaluating a listing a species for CESA protection. Once listed, it is the policy of the state to conserve, protect restore and enhance such listed species and its habitat. Further, a person cannot import, export, take, possess, purchase or sell a listed species unless otherwise authorized under state law. Under CESA, the evaluation and listing of a species is done by the California Fish and Game Commission. CESA administration and enforcement is done by CDFW.

VIII. STATUS AND DISTRIBUTION OF THE SPECIES

A. Origin of the Species Name

In an 1885 report to the US Fish Commissioner of Fish and Fisheries, Deputy United States Fish Commissioner Livingston Stone used the name “red-banded trout” to describe trout of the lower McCloud River. The term “red-banded trout” was also used by trout taxonomist Dr. Robert Behnke of Colorado State University when he originally studied and reported on native trout of the upper McCloud River in 1973. Mr. David Hoopaugh, a former District Fisheries Biologist for the CDFW, is believed to have first used the term “red-band trout” in his 1974 status report on trout native to the upper McCloud River basin (Eric Gerstung, CDFW retired pers. comm.).

B. Systematics: Historical and Current Perspective

In general, redband trout constitute a distinct group of native western North American trout of the genus *Oncorhynchus*. The phylogenetic position of the McCloud redband within *O. mykiss* has been debated for over 70 years, beginning with the first discovery of what was reported by Wales (1939) as a "golden trout" in two headwater tributaries of the McCloud River based upon their external appearance.

Behnke (2002) described Sheepheaven Creek as containing “the most distinctive form of Northern Sacramento River basin redband trout and probably represents the earliest ancestor that invaded the Northern Sacramento basin.” Nielsen (in Moyle 2002) states that “rainbow trout in the upper McCloud watershed are a collection of isolates that deserve special recognition and protection, reflecting evolutionary responses to a complex and changing environment.”

The interest in and concern for McCloud redband trout prompted various phylogenetic analyses dating back to 1977. The past analyses (as noted in Simmons et al. 2010) looked at marker types such as karyotyping (Gold 1977), allozymes (Berg 1987), mitochondrial DNA and single copy nuclear DNA (Bagley and Gall 1988), morphometrics (Behnke 1992, 2002), microsatellites and mitochondrial DNA (Nielsen et al. 1999), and amplified fragment length polymorphism (Stephens 2007). While the results of some of these studies provided mixed or conflicting patterns regarding the taxonomic standing of McCloud redbands within *O. mykiss*, the findings generally indicated that certain subpopulations in isolated tributary streams in the upper basin (including Sheepheaven Creek) are sufficiently differentiated from coastal rainbow trout to merit their own subspecific status.

Based on genetic analyses (Simmons et al. 2010, Stephens et al. 2011, Stephens et al. 2013) using mitochondrial and nuclear single nucleotide polymorphisms (SNPs) from tissues collected in the upper and lower McCloud River it is apparent that McCloud River redband trout have experienced varying levels of introgression with *O. mykiss* (Figure 2). Four streams (or stream sections) were identified in the upper McCloud River drainage (Edson, Moosehead, Sheepheaven, and Swamp creeks) that contain

non-introgressed (genetically distinct) McCloud redband trout populations (Figure 3). In addition, Stephens et al. (2013) noted other upper McCloud streams that may contain genetically distinct McCloud redband populations. These streams include: Dry, Bull, a tributary to Bull, and Trout creeks but, due to small sample sizes used for analysis, inconsistencies with previous studies, and/or instream variation more samples are needed to confirm the initial findings. Describing levels of introgression can be difficult when there are no known pure populations to reference. Without known pure populations to sample, McCloud redband introgression levels less than 2% generally reflect negligible levels of introgression and populations below this threshold are considered genetically distinct. For the purposes of this document, Edson, Moosehead, Sheepheaven, and Swamp creeks are considered the current range of McCloud redband and represent the Core Conservation Area (Figure 3) for focused restoration and protection activities within the broader McCloud Redband Refugium (Figure 1). If additional distinct McCloud redband populations are confirmed through genetic analyses, these populations/streams will be included in the Core Conservation Area.

Simmons et al. (2010) analyzed samples collected from 2002 through 2007 from 16 sampling locations in the McCloud River (14 upstream and two downstream of Middle Falls). In the upper McCloud River, eight tributary streams and the McCloud River mainstem were sampled. In the lower McCloud River two tributary streams were sampled. In addition, Stephens (2013) followed up with the Simmons et al. (2010) findings by analyzing additional upper McCloud River samples. Sample site selection was based on historic and current knowledge of putative McCloud redband distribution. The results of the study indicated that the non-introgressed McCloud redband distribution is extremely limited, fragmented, and these subpopulations are physically isolated. It is possible that other populations of McCloud redband exist in streams or stream sections yet to be analyzed and/or confirmed.

An important finding from the Simmons et al. (2010) study is that all populations sampled possessed genetic alleles characteristic of the population in Sheepheaven Creek (believed to be the best representative of an ancestral form of McCloud redband). This suggests that the assumption that the Sheepheaven population and its transplants (Swamp and Trout creeks) are an isolated sole representative of an ancestral redband lineage may be inaccurate and that they may, instead, represent what remains of non-introgressed McCloud redbands that were historically more widely distributed across the entire upper McCloud River basin.

Another important finding from the Simmons et al. (2010) study is the fact that a hybridization gradient exists along the mainstem McCloud River. Trout in the uppermost portion of the mainstem exhibit lower levels of introgression with coastal rainbow trout and levels of introgression increase downstream. However, it is unknown whether this gradient is a function of historical stocking activities, natural colonization of coastal rainbow trout and hybridization with redbands prior to stocking, or a combination thereof. It is worth noting that, although portions of the presumed redband population inhabiting the upper McCloud show signs of hybridization with coastal rainbow trout, it is

possible that they still possess redband alleles that may be of conservation value. In particular, they likely possess a higher degree of heterozygosity than the Sheepheaven population, which is known to be genetically bottlenecked.

The McCloud redband have also shown unique traits and a high degree of differentiation from other trout populations found in California. Gall et al. (1981) compared redband trout collected from Tate, Moosehead, Swamp, Trout, Sheepheaven, Raccoon, and Edson creeks along with other California trout populations. The analysis compared meristic, chromosomal, and electrophoretic traits. The report stated that the upper McCloud River populations from each system had many characteristics in common with each other but differed from other redband populations, including those found in Goose Lake and the Pit River, as well as from Little Kern golden trout, Kern River rainbow trout and coastal rainbow trout. Stephens et al. (2011) also found similar results comparing putative redband trout populations (Goose Lake, McCloud River, Surprise Valley, upper Pit River tributaries, and Warner Lakes), coastal rainbow trout, and hatchery coastal rainbow trout populations. Phylogenetic analyses included nuclear and mitochondrial sequence data for comparisons among populations and within populations.

Results indicated the McCloud redband are not only distinct from all other trout populations, but are unique among California redband populations sampled (Goose Lake, Surprise Valley, upper Pit River, and Warner Lakes).

All of these findings support the fact that the remaining populations of McCloud redband are a unique resource that merits protection and conservation measures to ensure their long-term sustainability.

C. Distribution (Historic/Current)

As noted, the “red-banded trout” was first described by Livingston Stone in 1885 from individuals he observed at Baird Hatchery (site now inundated by Shasta Lake) in the lower McCloud River, well below Middle Falls. The genetic relationship and comparative life history attributes of these fishes to those above the falls (what we now refer to as McCloud redband) will never be known, but it is assumed that the historic species composition below the falls included McCloud redband, along with coastal rainbow trout (resident and anadromous life histories), bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawytscha*), Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), and possibly other fishes, based upon the limited information available in Stone’s reports. Wales (1939) reported golden trout (generally believed now to be a reference to McCloud redband) present in the headwaters of Tate Creek and from a short, spring-fed creek on Black Fox Mountain, possibly Edson or Sheepheaven Creek. Redband trout have also been reported in isolated tributaries of Goose Lake and in the headwaters of the Pit and Klamath rivers, California (Moyle 1976). Behnke (1979) suggested that redband trout were originally native throughout much of the interior reaches of the Columbia River basin, in most of

the lakes of the current desert basins of Oregon, in the Upper Klamath Lake region and in the Sacramento River drainage, including the McCloud River.

Figure 2. Sampling sites for McCloud redband genetic tissue collections from the McCloud River basin (2004-2008).

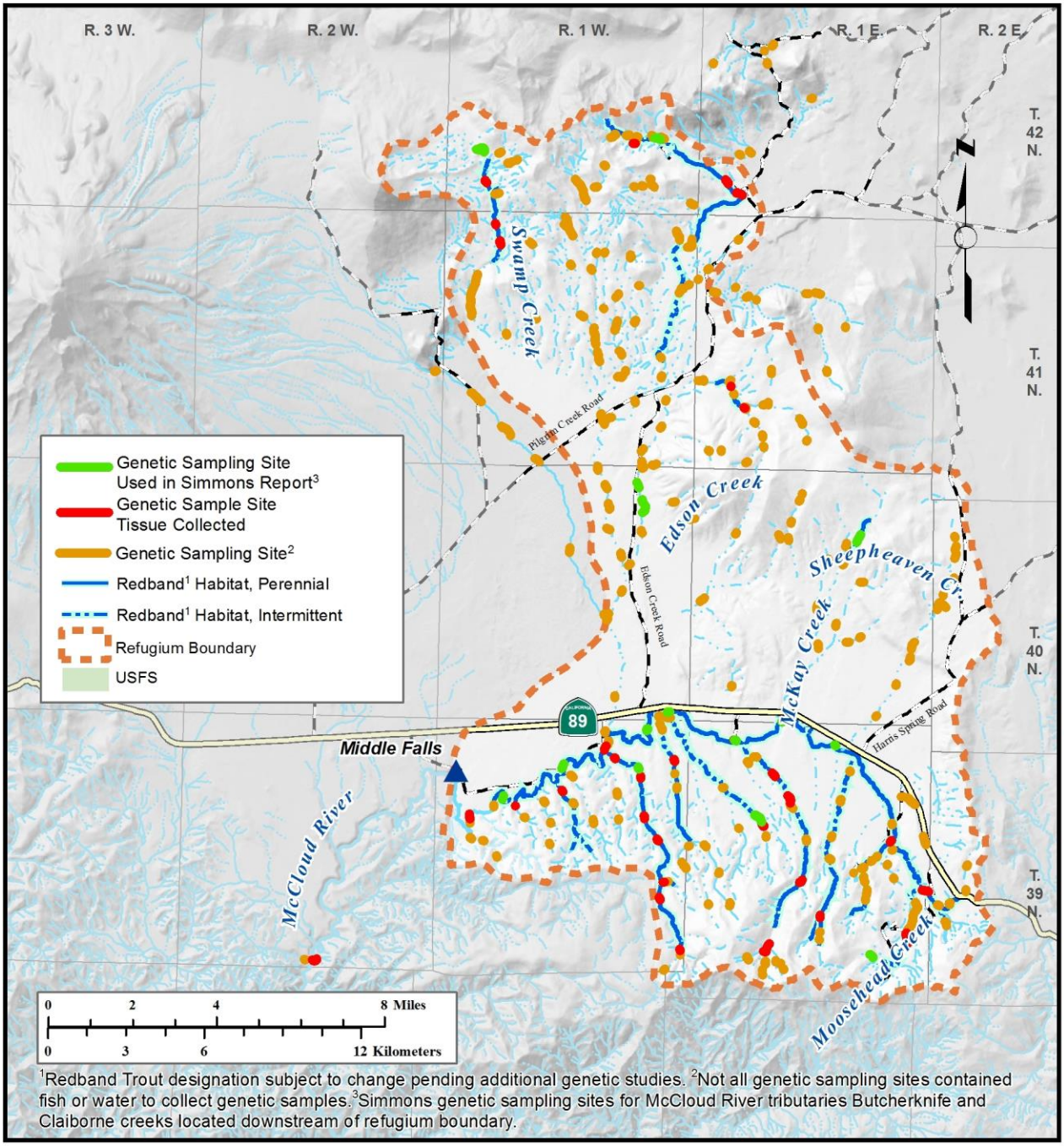
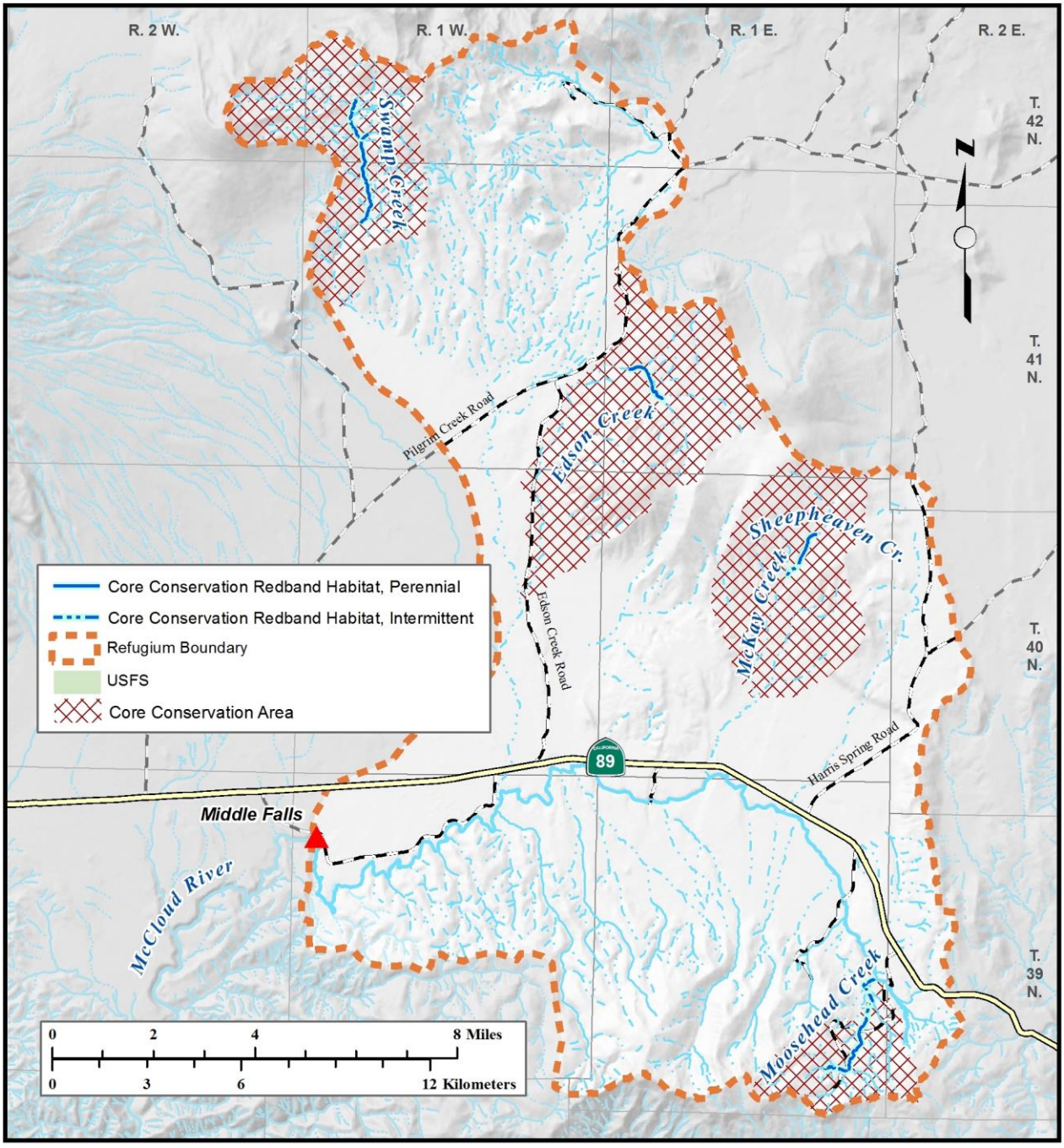


Figure 3. Upper McCloud River redband trout streams including Core Conservation Streams/Catchments.



In response to drought conditions in 1973 and 1974, CDFW introduced a total of 64 McCloud redband from Sheepheaven Creek into Swamp Creek, which was thought to be devoid of fish. In 1977, in response to severe drought conditions that were perceived to threaten the population in Sheepheaven Creek, CDFW chemically treated Trout Creek to remove all fish and restocked it with 123 McCloud redband (63 adults and 60 fingerlings) from Sheepheaven Creek. Trout Creek has not been stocked with hatchery trout since the post-treatment reintroduction of McCloud redband from Sheepheaven Creek. In 2014, in response to severe drought conditions, 77 McCloud redband from Sheepheaven Creek were translocated to unoccupied or low density areas of Swamp Creek. In addition, 224 redband from Edson, 285 redband from Moosehead, and 534 redband from lower Swamp creeks were translocated to the CDFW's Mount Shasta Hatchery until habitat conditions improve for reintroduction. Much of the main stem McCloud River and tributaries from the south have established populations of brook and brown trout, which appear to have displaced McCloud redband in portions of the main stem McCloud River and some south side tributaries.

Within the upper McCloud River drainage, populations in Edson, Moosehead Sheepheaven, Swamp, and Trout creeks are generally isolated from one another and the main stem McCloud River. Moosehead Creek has a physical barrier which was purposefully installed to prevent upstream migration of introgressed rainbow x redband and brook trout. In the infrequent years when Edson, Sheepheaven, Swamp, and Trout creeks have surface flow into the main stem McCloud River, lack of a defined channel makes fish passage improbable and these populations are, therefore, unlikely to have been affected by introgression with hatchery or introgressed fish from the main stem. Although Trout Creek was chemically treated in 1977 to remove hatchery and potentially introgressed fish and subsequently stocked with McCloud redband from Sheepheaven Creek, it is believed the chemical treatment of Trout Creek in 1977 may not have fully eradicated the introgressed population and/or illegal stocking of coastal rainbow trout occurred after chemical treatment. Simmons et al. (2010) described low introgression levels from Trout Creek samples collected downstream, but in a later report by Stephens et al. (2013), described non-introgressed McCloud redband from samples collected at an upstream location, leaving some uncertainty about the genetic status of the Trout Creek population. Swamp Creek was believed to be fishless prior to the introduction of McCloud redband in 1973. If natural circumstances resulted in this fishless condition, the possibility exists that a similar set of circumstances may undermine the long-term persistence of the redband population in Swamp Creek, which is currently one of the larger populations of McCloud redband within the Core Conservation Area. With the uncertainty of Swamp Creek providing long-term habitat for McCloud redband, its value as a refuge/restoration site should be evaluated with other beneficial long-term sites in or outside the basin.

While a Core Conservation Area for McCloud redband has been identified and will be the focus of concerted conservation actions outlined in this CA, other presumed redband populations with varying levels of coastal rainbow trout introgression exist within the broader Refugium Area and may also have conservation value. The extent to which active

conservation measures should be taken to protect other introgressed populations outside of the Core Conservation Area has yet to be determined and will need to be developed on a stream (or stream segment) by stream basis. These populations should be evaluated as they may be critical to long-term persistence of the species in light of the genetic and habitat limitations facing some of the Core Conservation populations.

D. Habitat and Life History

No formal biological study has yet been undertaken regarding the life history or ecology of the McCloud redband. However, numerous field investigations provide insights into their general life history patterns.

1. Habitat

The following habitat information is based on stream habitat typing data collected by the CDFW and USFS between 1990 and 1995. These data were collected from selected sites (stations) on a number of streams and may not reflect the entire range of habitat variability that exists within the upper McCloud River basin. In addition, the years in which these data were collected included several years of below average precipitation and may not reflect typical habitat conditions (Figure 4).

The upper McCloud River habitat data collected between 1990 and 1995 indicated many of the smaller headwater streams tend to provide limited habitat for trout. Qualitative findings included:

- streams were small in size, exhibited steep gradients and/or low stream flows, riffles and flatwater habitats such as glides and runs were the most abundant habitat types, pools were uncommon and usually shallow, and often less than a foot in depth;

- fish habitat associated with large woody debris was uncommon although, when present, provided good cover, and stream depth; and

- stream substrates were dominated by gravel, cobble and fine sediments, and bedrock was usually absent; gravel was abundant, yet suitable spawning habitat was uncommon and generally contained a significant amount of fines.

Overall, fish habitat condition in first- and second-order headwater tributaries was considered poor to fair based on generally accepted standards used to describe rainbow trout habitat. However, habitat data collected by CDFW in association with multiple-pass electrofishing sites on Edson, Moosehead, Sheepheaven, and Swamp creeks in August 2011 (wet water year) generally showed favorable small stream habitat characteristics for trout including: good stream flow and water temperatures, dense sections of overhead canopy, stream channel complexity, minimal active erosion, woody debris, and a mix of gravel to boulder stream substrate composition, with multiple areas containing suitable spawning gravels. It is important to note, however,

that the availability of wetted habitats can be highly variable year to year which maybe the most influential factor controlling redband population sizes.

Within medium-sized and larger streams such as Tate Creek, Trout Creek, and the upper McCloud River main stem, there was a good mix of pools, riffles, and flatwater habitat types. Pools were common and averaged more than a meter in depth. Cover was generally good throughout the range of habitat types. Spawning habitat was common; however, the percent fines and embeddedness levels were highly variable. Habitats associated with large woody debris (such as plunge or scour pools) were more abundant than in smaller streams and generally provided the best fish habitat. Stream substrates were dominated by cobble, gravel, and boulders. Bedrock was common in the McCloud River. Fish habitat condition was generally characterized as good.

Temperature data collected in 1978 from eight upper McCloud River basin streams ranged from 45-50°F (7-10°C) and is reported in Bacon et al. (1980). Average daily water temperatures during June and July of 1994 and 1995 on three streams (Trout, Swamp and Sheepheaven creeks) ranged from 41-57°F (5.0-13.9°C; SPI file data). Water temperatures collected in June, 2011 from Sheepheaven Creek ranged from 44.6-46.4°F (7.0-8.0°C) and those collected in August, 2011 from Swamp, Moosehead, and Edson creeks ranged from 43.3-50.9°F (6.3-10.5°C). In 2013-14, annual water temperature profiles (recorded hourly over a year duration) for Edson, Moosehead, Sheepheaven, and Swamp creeks indicated water temperatures ranged between 32.1-56.4°F (0.06-13.6°C). Spring source water temperatures for all sampled creeks appear to be in the low to mid 40's°F (4-7°C), but can show delayed seasonal fluctuations (CDFW file data).

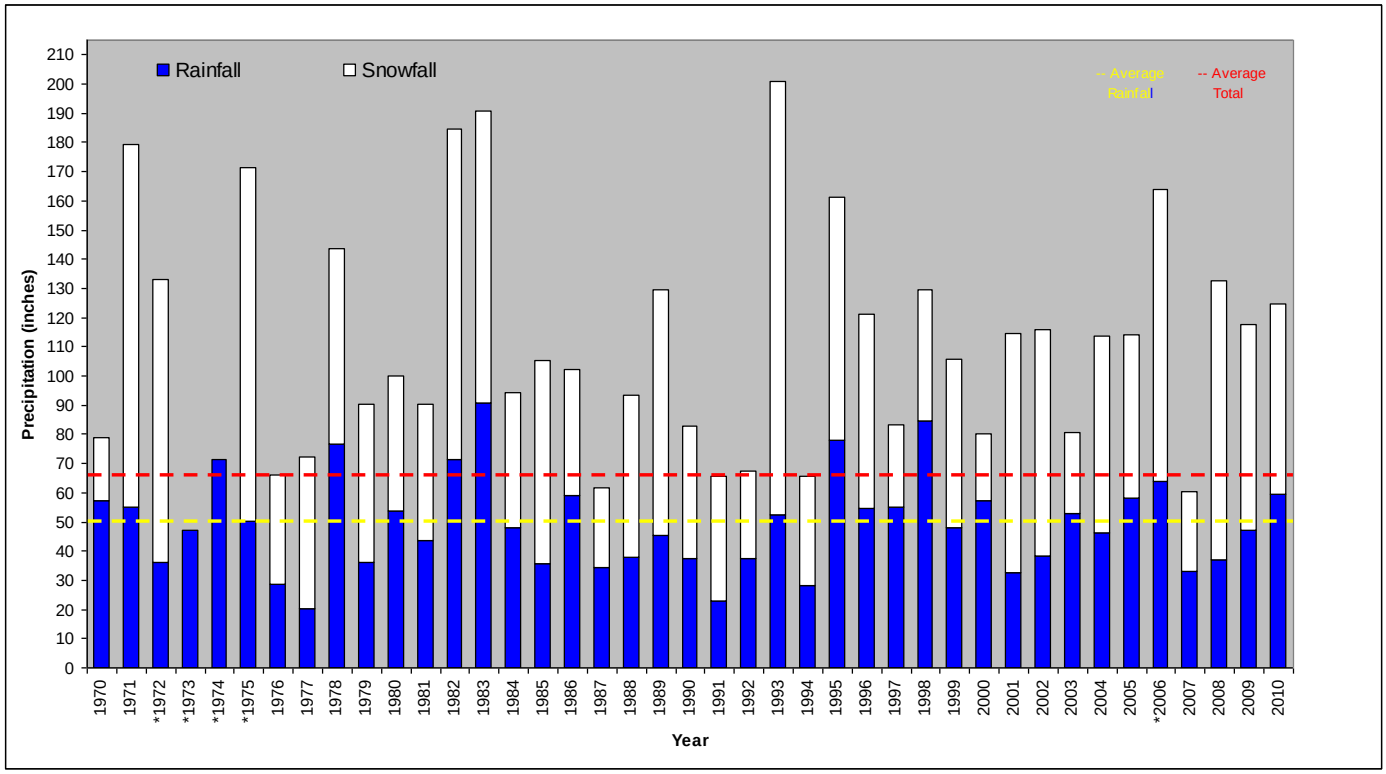
2. Reproduction

Like coastal rainbow trout, McCloud redband are spring spawners requiring riffles or runs with gravel substrate in which to spawn (Hoopaugh, 1974). McCloud redband in the range of 4-7 inches (100-180 mm) were observed spawning in a run pool habitat complex at the head of a small gravel bar in Edson Creek in early June with females observed excavating their redds in clean pea-sized and finer gravel (Bacon et al. 1980). A redd located in pea-size and smaller gravels was also noted in Sheepheaven Creek on June 15, 1994, during a field trip involving members of the Redband Core Group (J. Kelley, pers. comm.). In addition, spawning and recently excavated redds in Sheepheaven and Swamp creeks occurred during late May and early June, 2013-14. Redds were located at the tail end of run-pool habitat complexes in medium (0.31-0.63 in, 8-16 mm) to very course (1.26-2.50 in, 32-64 mm) gravel (CDFW staff, personal observation).

3. Rearing and Cover

Newly emerged fry and juveniles appear to prefer low velocity, protected and shallow margins of streams. Juveniles, believed to be young-of-the-year ranging in size from 2-2.3 inches (50-58 mm) fork length, were electroshocked from stream margins in Trout Creek in 1978.

Figure 4. Water year (1970-2010) precipitation trends measured at the town of McCloud, Siskiyou County (data from NOAA National Climatic Data Center).



* Snowfall data not available or incomplete.

** Average rain and snow values based on data compiled from 1931-2010.

Data from - http://www.ncdc.noaa.gov/oa/ncdc.html

The stream substrate composition noted in these margin areas was fine gravel. During tissue collection sampling on the upper McCloud River, near Tate Creek during late summer, 1997, juvenile and adult putative McCloud redband were also found primarily in shallow margin areas dominated by small gravel substrate (D. Maria, CDFW, personal observation).

4. Age and Growth

Redband trout ranging in age from 1 to 4 years were captured from five upper McCloud River tributary streams during August 1975 (Bacon et al. 1980). Mean standard lengths versus age class data taken from 222 McCloud redband captured from five of the six streams surveyed (Tate, Trout, Sheepheaven, Moosehead, Edson, and Swamp creeks) are presented in Table 2.

5. Population Information

In the upper McCloud River drainage above Middle Falls, up to 61.41 miles (98.8 km) of habitat in the main stem McCloud River and 16 tributaries may be suitable for McCloud

redband, although much of this available habitat is currently occupied or, in some cases, dominated by non-native trout species or introgressed trout. During dry periods, the amount of perennial stream habitat in the upper McCloud River basin significantly decreases as major reaches of the river main stem and lower reaches of most tributaries become intermittent or dry, with only subsurface flow (Table 3). For example, during the 1987 through 1992 drought, the amount of flowing stream habitat in the upper McCloud River drainage decreased from an estimated 59.7 miles (96 km) to 23 miles (37 km) (E. Gerstung, pers. comm.).

Table 2. Age class composition of McCloud redband from five upper McCloud River tributaries data from Bacon et al. (1980).

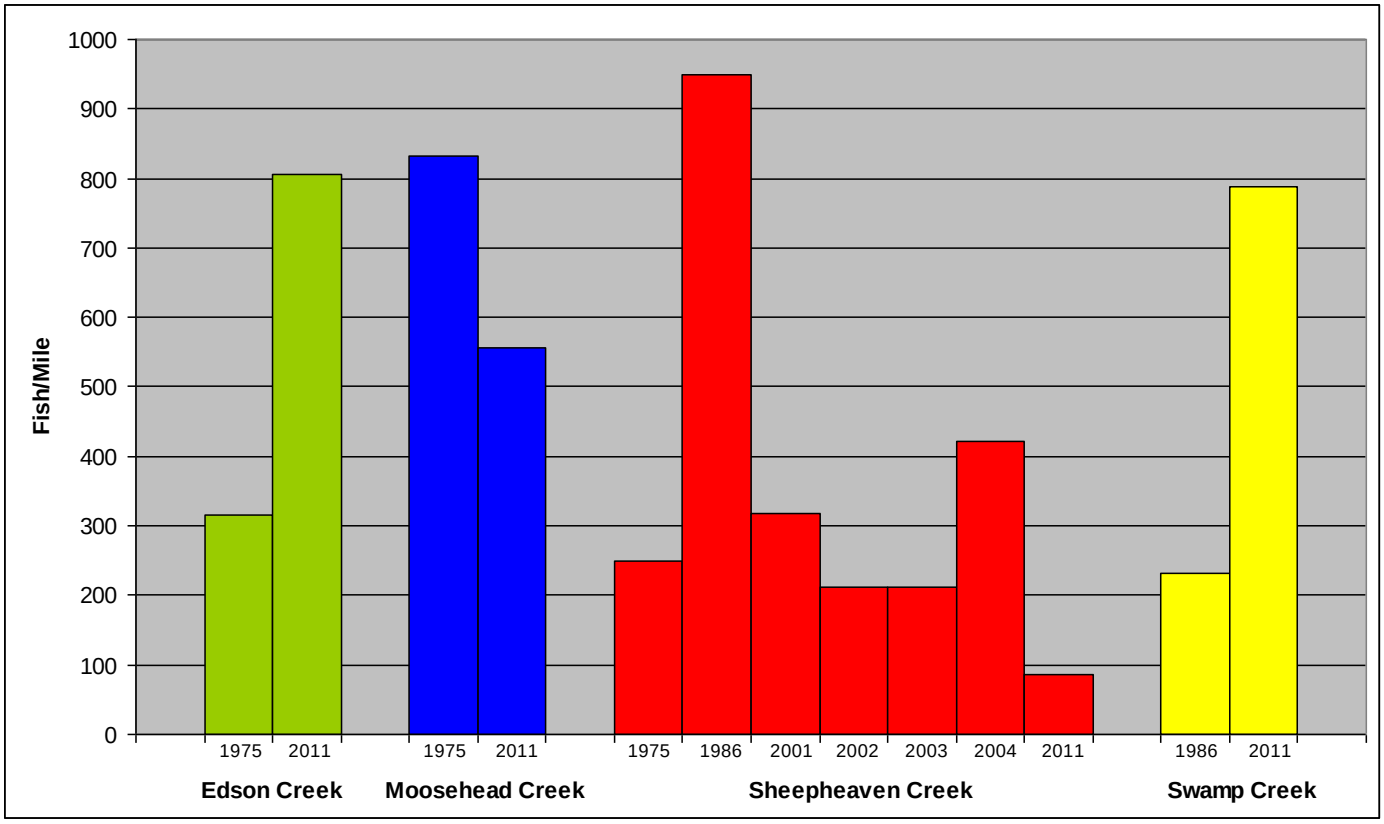
Age (Years)	Mean Standard Length (Range)
I	97 – 138 mm (3.9 – 5.5 in)
II	123 – 166 mm (4.9 – 6.6 in)
III	134 – 194 mm (5.3 – 7.8 in)
IV	140 – 222 mm (5.6 – 8.9 in)

Estimates of redband trout density (fish per mile) from the core conservation streams were generated from mark-recapture and multiple-pass electrofishing surveys performed in 1975, 1986, 2001-2004, and 2011 (Figure 5). Density estimates ranged from a low of 86 fish per mile (53 per km) in a section of Sheepheaven Creek (2011) to a high of 9,768 fish per mile (6,067 per km) in a section of Trout Creek (2001). Determining population abundance in the core streams can be problematic due to seasonal and annual variability of the wetted habitat. Wetted habitat availability has been noted as a strong factor shaping the population size of the core conservation streams. Although these populations can fluctuate greatly within or between years due to wetted habitat limitations, abundance estimates should be compared with other population level parameters (condition factor, year-class strength/structure, competition, etc.) to evaluate overall health of the population. Standardization of sampling locations, time of year, and methods should help reduce biases associated with seasonal and annual variation.

The four streams within the Core Conservation Area (Edson, Moosehead, Sheepheaven, and Swamp creeks) had a combined total of approximately 13.9 linear miles (22.4 km) of wetted stream habitat in August, 2011 (wet water year classification). However, McCloud redband trout occupied only 5.5 miles (8.9 km) of this available habitat.

Small population sizes and relatively low densities in each stream may explain limited distribution in each core conservation stream. Limited habitat and seasonal habitat variation (regular drying of certain portions of streams) may play a big part in controlling population size and distribution from year to year (Table 3). Inbreeding depression in

Figure 5. McCloud redband density (fish per mile) estimates from Core Conservation Area streams in the upper McCloud River basin (1975, 1986, 2001-2004, and 2011).



* Data were compiled from mark-recapture and multiple pass electrofishing surveys and, in years with more than one sampling site, data were averaged.

the Sheepheaven Creek population may also be a contributing factor to their extremely limited distribution and low population size. It is important to note that, in the case of the Sheepheaven Creek population, although the 2011 density estimate was 86 fish per mile (53 per km), the actual occupied habitat was 0.5 miles (0.8 km). Therefore, the estimated population for Sheepheaven Creek in 2011 was 43 fish (it should be noted that random sub-sampling protocols and a fragmented population likely underestimated the population). Overall, the estimated McCloud redband populations ranged from less than 100 fish (Sheepheaven Creek) to over 1,700 fish (Swamp Creek) for a total estimate of 3,400 McCloud redband in the Core Conservation Area (CDFW 2011, unpublished data).

Figure 5 and Appendix F provide details for population observations conducted to date for McCloud redband streams. Abundance estimates are based on various sampling techniques, with some providing more precise estimates than others. Continued monitoring is needed to determine population trends.

IX. NATURE AND EXTENT OF THREATS

In January 1994, the USFWS initiated administrative action to advance McCloud redband from Category 2 to Category 1 status under the federal ESA. In the candidate category assignment form, the USFWS implicated grazing practices, logging practices, introduction of exotic trout species, and the potential for hydropower project development as threats to McCloud redband trout.

In October 2000, the USFWS removed the McCloud River redband trout from its list of candidate species, pursuant to the signing of the 1998 CA.

Many of the concerns listed in the USFWS Candidate Category Assignment Form have been addressed since implementation of the 1998 CA, while others require additional or continuation of measures. The following discussion summarizes threats to the continued persistence of McCloud redband, as well as measures that have been taken to reduce or eliminate factors that potentially threaten the continued existence of McCloud redband.

A. Present or Threatened Destruction, Adverse Modification or Curtailment of the Species Habitat or Range

Habitat quantity and quality may be affected by anthropogenic factors such as land use, resource extraction, road construction and maintenance, and recreation.

1. Range Animals (Grazing)

Grazing has been a historic and ongoing land use activity in the upper McCloud River basin since the mid-1800s. Grazing peaked during World War I, and, again from the late 1920's through World War II, when 100 to 1,000 cattle and 10,000 to 17,000 sheep grazed on the McCloud Ranger District (which encompasses a larger area than the upper McCloud river basin) per year (USFS files). Potential impacts from uncontrolled grazing consist of: removal of streamside vegetation and associated shading, bank trampling, meadow headcutting, adverse changes to channel profile, loss of instream cover, increased sedimentation and turbidity, loss of pool volume and spawning habitat, increased water temperatures and increased nutrient loads.

When properly managed, grazing has a minimal impact on aquatic resources. Problems may occur when fences are not maintained and range animals have uncontrolled access into riparian exclosures or when range use conditions are exceeded.

Table 3. Estimated miles of suitable McCloud redband habitat in the upper McCloud River drainage during different water-year classifications (intermittent and perennial sections combined).

Stream	Estimated Habitat (miles) [1]			
	Wet Year Habitat [2]	Normal Year Habitat [2]	Dry Year Habitat [2]	Unknown Habitat [3]
Blue Heron Creek		1.9	1.0	0.0
Bull Creek		6.2	1.5	0.6
Cow Creek		2.5	0.0	0.0
Dry Creek		5.2	0.1	0.0
Edson Creek	**4.0**	**1.1**	**0.3**	**0.0**
McCloud River (above Tate Creek)		14.9	2.0	0.0
McCloud River (below Tate Creek)		5.3	5.3	0.0
Moosehead Creek (lower)		1.4	0.2	0.0
Moosehead Creek (upper)	**1.7**	**1.5**	**0.2**	**0.0**
Raccoon Creek		4.0	0.0	0.5
Shady Gulch Creek		3.3	1.0	0.0
Sheepheaven/McKay Creek	**1.6**	**1.1**	**0.4**	**0.0**
Swamp Creek	**2.7**	**2.7**	**2.0**	**0.5**
Tate Creek		6.2	5.0	1.3
Trout Creek		9.6	3.5	0.0
Whiskey Creek		0.01	0.0	0.0
Total		66.9	22.5	4.7

1. Includes McCloud redband Core Conservation Area streams (blue font) and introgressed McCloud redband streams (black font). Core Conservation Area is subject to change pending results from additional genetic studies.
2. Wet, normal, and dry year water classifications based on above normal, normal, or below normal precipitation, respectively (NOAA National Climatic Data Center)
3. Unknown reaches require further investigation to determine suitable habitat.

The Shasta-Trinity National Forest currently administers one active (Bartle) and one vacant grazing allotment (Toad Mountain) in the upper McCloud River basin, which is governed by USFS standards and guidelines established in the STNF LRMP and particularly the Aquatic Conservation Strategy (Appendix C). The season of use for the allotments begins in early June and runs through the end of October. The USFS monitors grazing activities and makes adjustments in use in order to maintain proper range conditions and to protect riparian areas. Due to range improvements, proactive livestock management by the permittee, and improved USFS monitoring, damage to redband trout habitat has been minimized. Compliance with allotment restrictions is enforced through regular field inspections during the grazing season. Furthermore, permittee compliance with USFS allotment management plans and strict adherence to the standards and guidelines established within the STNF LRMP will ensure that grazing does not pose a threat to McCloud redband or their habitat on USFS administered allotments.

When the 1998 CA was adopted, Trout Creek, Edson Creek, and Sheepheaven Creek lay within grazing allotment boundaries. As of 2006, all fish-bearing reaches on Trout and Sheepheaven creeks lie outside of grazing allotment boundaries, as well as a significant portion of Edson Creek.

Over time, various management practices have been incorporated into the allotment use conditions to minimize the effects of grazing on habitat. These efforts have included more intensive riding and herd control, reduction of total numbers, and direct exclosure fencing around segments of Trout and Sheepheaven creeks, with active fence maintenance on the part of the permittee, USFS and other partners to ensure compliance and effectiveness.

2. Logging (Timber Harvest)

Small sawmills were operated in the upper McCloud River watershed starting in the late 1800s. At the turn of the century, railroads facilitated expansion of sawmill capacity by allowing access to timber on steeper slopes, untapped by the previous horse/oxen era. Railroad-style logging predominated through World War II when truck and tractor operations replaced Shay locomotives and steam donkeys.

Forest management activities on private land were less stringently regulated before 1973 than they are currently. Past logging practices were not conducted under today's standards but were conducted according to the law and the accepted standards of the time.

Potential impacts to McCloud redband and their habitat from logging practices starting after World War II up to approximately the 1980s included: loss of shade canopy, increased water temperatures, increased sedimentation, reduced recruitment of large woody debris, loss of fish habitat diversity, and increased peak storm flows.

The STNF LRMP regulates current practices on NFS lands. Current practices on private lands are regulated by the California Forest Practices Act. Conscientious implementation of the STNF LRMP on federal lands and the Forest Practices Act on private lands provide significant protection measures for McCloud redband and their habitats.

It should be noted that, since the initial CA was signed in 1998, local private timberland owners have provided watershed protection above and beyond the basic protection levels stated in the FPR. Some of this work was not strictly harvest plan related but was done as part of conscientious land management practices. Protection measures benefiting habitat for McCloud redband and completed during the 1998 CA include, but are not limited to, the following:

- realignment of road segments away from sensitive sites;
- Proactive road maintenance, including surfacing with rock, cinders, dust abatement oils and other improvements for erosion control in critical or sensitive areas;
- multiple stream crossings upgraded, including installation of adequately sized culverts;
- numerous stream crossings eliminated;
- changing water drafting schedules to minimize effects on low or critical flow conditions;
- providing equipment and personnel for in-stream restoration work for habitat improvement, e.g., riparian and channel restoration in Edson Creek;
- relocation and removal of old road sections and roadbed gullies;
- collection of stream specific information on water temperature, flow rates, stream habitat and morphology, aquatic biology, etc;
- providing long-term monitoring of land management activities and effects on certain critically important streams;
- maintenance of fencing around critically important stream reaches to prevent stream bank degradation by range animals (see Figure 3);
- habitat restoration projects, channel realignment and riparian planting efforts; and
- adjustment of allotment boundaries to protect stream sections in lower Edson Creek, and the removal of upper Edson, Trout and Sheepheaven creeks from existing allotments.

A detailed list of all actions completed can be found in the Compliance Monitoring section and Appendix B.

3. Hydropower Development

No hydroelectric projects have been developed in the upper McCloud River basin above Middle Falls and none are currently proposed. Due to the generally very low summer and fall flows in the upper main stem and its tributary streams, hydroelectric power projects in the upper McCloud River basin would probably not be cost effective and, therefore, are not likely to be developed in the foreseeable future (D. Hoopaugh, CDFW, pers. comm.).

B. Overutilization for Commercial, Recreational, Scientific or Educational Purposes

The collection of McCloud redband for commercial, recreational, scientific or educational purposes could pose a serious threat to the few small and isolated populations remaining.

1. Commercial Take

There are currently no fish species harvested commercially within the McCloud River drainage and no change in this situation is expected to occur in the foreseeable future.

2. Recreational Take

Recreational fishing in most streams of the upper McCloud River drainage is presently allowed from the last Saturday in April through November 15 (general trout season) with a 5 fish daily bag and 10 fish in possession limit. Special fishing regulations are in place for Edson, Moosehead, and Sheepheaven creeks which are closed to all fishing all year and Swamp Creek, which is restricted to the use of artificial lures with barbless hooks and a zero bag limit during the general trout season. These special fishing regulations were adopted and implemented in order to better protect McCloud redband populations.

Recreational fishing impacts to populations in most McCloud River tributary streams are substantially less than in the McCloud River itself for the following reasons: the streams are remote in nature and lack access infrastructure; access is limited to mostly off-highway roads; the upper basin consists of a complex mosaic of mixed private and public land ownership; and trout remain relatively small, even as adults, in these headwater streams. Angling impacts are most likely to have significant impacts on populations when they are limited in numbers and/or distribution by environmental conditions (such as reduced available habitat due to drought) or other stressors. If drought or other circumstances dictate, the CFGC can adjust fishing regulations on an emergency basis, as appropriate, almost immediately and recommendations to do so will be considered regardless of their source (i.e., monitoring results from CDFW and USFS activities developed pursuant to this CA or input from other public or private agencies or individuals).

3. Collections for Scientific or Educational Purposes

The CDFW requires a scientific collection permit to take any fish for scientific, educational, or non-commercial propagation purposes from any waters of the state, including waters of the upper McCloud River drainage. Policies were adopted in 1997 that require individuals to obtain authorization to collect in each individual lake or stream. Any collecting permits applications pertaining to the McCloud River drainage will be evaluated by the CDFW on a case-by-case basis.

C. Predation, Competition, Disease, and Nonindigenous Species

Historic stocking of nonindigenous coastal rainbow trout, brown trout, and brook trout in the upper McCloud River has altered the species composition throughout much of the drainage and may have contributed to the decline of McCloud redband due to hybridization, predation, competition, and possible introduction of diseases. Of these potential stressors, the distribution of non-native trout can be most easily measured and should be monitored into the future in order to determine areas of highest restoration potential for McCloud redband.

Poorly documented historical fish stocking occurred in the upper McCloud River drainage beginning in the late 1800s. Non-native brook and brown trout have been established in the upper McCloud River basin since approximately 1910. In 1957, annual stocking of catchable-sized coastal rainbow trout from nearby Mt. Shasta Hatchery was conducted throughout the summer months in the main stem McCloud River above Middle Falls. Stocking above Lakin Dam was discontinued in 1994 when the results of a genetic analysis completed by Berg (1994) suggested that introgression of McCloud redband with hatchery rainbow trout may have occurred. Berg and a number of fisheries biologists became concerned that the McCloud redband's existence could be jeopardized by the continued stocking of hatchery coastal rainbow trout. It is possible that stocking over the last century has altered the species composition from exclusively McCloud redband above Middle Falls to a system mostly dominated with introgressed and non-native fishes. However, it is unknown, and will likely never be known, whether the historical condition (pre-1800's) was such that only McCloud redband occupied the upper watershed, or if both ancestral redband and more recent coastal rainbow forms naturally invaded the upper McCloud basin prior to the volcanic events that created the series of falls on the McCloud River, which became permanent barriers to upstream fish movement.

Non-native brook and brown trout are widespread throughout the main stem McCloud River and in a majority of its tributary streams, including: Bigelow Gulch Creek, Blue Heron Creek, Bundoora Spring Creek, Tate Creek, Shady Gulch Creek, Colby Meadows Creek, Bull Creek and Cow Creek. Larger brook and brown trout are known to be piscivorus (fish eating); however, the extent of predation by both brook and brown trout on McCloud redband is currently unknown. These nonnative trout certainly compete for food and space since their populations tend to dominate in some parts of the drainage (e.g., Bundoora Spring Creek, and the McCloud River main stem near Colby Meadows, below Tate Creek, and below Lakin Dam). The elimination of these species from some or all of the drainages would likely aid the restoration of McCloud

redband.

Brook, brown and coastal rainbow trout are the only fish species officially documented to have been stocked in the upper McCloud River basin. Wales (1938) reported southern Sierra golden trout (which were probably McCloud redband) and one golden shiner was captured behind Lakin Dam in 1995, but no other fish species have been recorded.

As of 2013, there are currently no trout stocking locations within the upper McCloud basin. In the future, genetically distinct McCloud redband may be stocked to supplement depressed populations, low diversity populations, restoration projects, and/or to fulfill past stocking allotments for recreational use.

Historical fish stocking in the McCloud River may have also introduced diseases and parasites to the system. CDFW Pathological studies conducted in 2012 and 2013 on McCloud redband from Edson, Sheepheaven, Swamp, and Trout creeks and brook trout from Moosehead creek indicated sporadic and minor external parasites, including: Gyrodactylus, Trichodina, and Apiosoma like ectocommensal ciliates. Bacteriology and virology tests were negative for all sampled creeks. Low to moderate levels of external parasite detection is considered normal and would not prevent fish movement in or out of streams.

The unintentional introduction and spread of other aquatic non-indigenous species, such as the New Zealand mud snail (*Potamopyrgus antipodarum*, "NZMS"), poses an ongoing threat to the McCloud redband and other native aquatic organisms throughout the state. Although not currently present in the McCloud River, NZMS has been inadvertently introduced into many waters across the western United States, including local waters such as Lake Shasta and the Sacramento River, near Redding in Shasta County. Humans are believed to be the chief mechanism for spreading the snail. Anglers, biological consultants, researchers, and stream restoration contractors are potential transporters of NZMS into new streams via contaminated wading boots, waders, or other equipment. To minimize the threat of transport and subsequent introduction of unwanted invasive species, CDFW implements decontamination protocols for its employees and contractors to eliminate or greatly reduce the spread of NZMS (as well as other aquatic invasive species and pathogens). In addition, CDFW provides education and enforcement programs to encourage the public to decontaminate gear and personal water craft in order to minimize the spread invasive aquatic species.

D. Absence of regulating mechanisms adequate to prevent decline of the species or degradation of its habitat

The inadequacy of existing regulatory mechanisms was identified by the USFWS as one of the five reasons for upgrading the status of the species to "candidate" (formerly Category 1). Specifically, recreational fishing and grazing regulations were cited as "inadequate or unenforced." After a review of existing federal and state policies and laws (refer to Section VII, Governing Documents and Existing Policies), the Redband Core Group had concluded

in the 1998 CA that there are adequate regulating mechanisms to prevent further decline of the species and degradation of its habitat. For example, permanent sport fish regulation changes implemented on March 1, 1996 eliminated all fishing in Moosehead and Sheepheaven creeks and, on January 1, 2013, eliminated all fishing in Edson Creek and restricted fishing to artificial lures with barbless hooks with a zero take limit in Swamp Creek to protect McCloud redband populations. Law enforcement personnel from CDFW and USFS have enforced these, as well as all other, angling regulations related to the upper McCloud River basin sport fishery. The USFS has also implemented more stringent regulation and monitoring of grazing allotments and improved riparian and instream habitat protections by excluding cattle from sensitive areas.

E. Other natural or manmade factors affecting the species continued existence

Other factors, both natural and manmade, play a role in the current status of the McCloud redband. Redband trout genetics may be negatively affected by introgressive hybridization, isolation, genetic drift, inbreeding depression, and/or founder effects. Natural processes such as drought, fire, forest succession, and climate change may also negatively affect habitat.

1. Genetics

The continued stocking of hatchery coastal rainbow trout on a population of wild trout may cause genetic swamping, especially during drought periods when the population of wild trout is severely depressed. According to Dr. Robb Leary, a professor of fish genetics at the University of Montana, the magnitude of impact of hatchery stocking is determined by the relative proportion of hatchery trout to wild trout present in a stream (E. Gerstung, CDFW, pers. comm.). Even though few stocked hatchery trout survive long enough in the wild to reproduce, those that do can interbreed with wild trout, leading to introgression and reduced fitness of wild stocks. However, there are cases where long-term stocking of hatchery rainbow trout on top of native strains of rainbow trout (e.g., the upper Sacramento River) have shown little to no impact in terms of altering the genetic structure of the native trout population (Nielsen 1996). Nonetheless, phylogenetic analyses using protein electrophoresis data (Berg 1994) and SNP data (Simmons et al. 2010 and Stephens et al. 2013) show clear evidence of hybridization between coastal rainbow trout and McCloud redband populations, particularly in the McCloud main stem in the vicinity of Middle Falls. As such, the cessation of stocking hatchery rainbow trout above Lakin Dam in 1994 was biologically justified and in the best interest of protecting and conserving remaining non-introgressed McCloud redband populations.

Additional concern exists regarding the low numbers of McCloud redband individuals in isolated streams and whether these populations can persist as genetically viable populations. Recent genetic analyses (Simmons et al. 2010 and Stephens et al. 2013) and field surveys (CDFW 2011, unpublished data), have elevated the level of concern for the long-term persistence of the McCloud redband, particularly within the Core

Conservation Area. As noted, the Sheepheaven population (source population for Swamp and Trout creeks) is genetically bottlenecked. Although the Swamp Creek population is very genetically similar to the Sheepheaven population and does not appear to be bottlenecked, their distribution is quite limited within the available wetted habitat in Swamp Creek. The Edson and Moosehead creek populations are also very genetically similar to the Sheepheaven population and are presumed to be aboriginal, but they are also limited in distribution within their respective available habitats. Simmons et al. (2010) indicated the Trout Creek population shows signs of hybridization with coastal rainbow trout, but Stephens et al. (2013), using additional tissues collected in Trout Creek, indicated McCloud redband to be free of hybridization with coastal rainbow trout. Until these inconsistencies can be resolved, Trout Creek will remain a high priority stream, but not included in the Core Conservation Area. While habitat conditions are largely unchanged since the 1998 Conservation Agreement, these recent findings elevate the need to take appropriate conservation measures to ensure the long-term sustainability of McCloud redband trout.

2. Climate Change

Predictive models for climate change, coupled with empirical data, indicate that climate change is likely to alter precipitation patterns in the western United States, which may lead to: a shift in peak flows from spring to winter, increased likelihood of rain on snow events that may cause flash flooding in streams, decreased late summer and fall stream flows leading to longer periods of elevated stream temperature and a reduction in available trout habitats, and may increase wildfire frequency and intensity (Jager et al. 1999; Williams et al. 2009). Given the porous volcanic geology of the upper McCloud River basin and already intermittent nature of many portions of headwater tributary streams, reductions in suitable McCloud redband habitat may be substantial under predicted climate change scenarios. Climate change potential is addressed under CEQA environmental review. Possible effects to McCloud redband can then be identified and mitigations incorporated to offset those impacts.

3. Drought

The McCloud redband was reassigned to “candidate” status in 1994, which was the seventh year of a relatively extreme drought, with low water flows that should be expected no more than 5 out of 100 years (USDI 1996). Extreme low flow conditions prevalent in that year may have escalated concerns for the long-term viability of the McCloud redband, as did low flow conditions in 1977 and 2013-14, leading resource managers to translocate McCloud redband from extremely limited habitats to refuge sites and/or the CDFW’s Mount Shasta Hatchery in order to prevent localized extinction.

As noted in Section VI. B (Soils and Geology), the soils of the upper McCloud River basin are primarily of volcanic origin and highly porous by nature. Annual precipitation is delivered as both rainfall and snowfall. Consequently, annual runoff occurs primarily in the springtime with the few perennial sources associated with natural-spring discharge. After spring runoff, relatively low base flows prevail for the remainder of the year. Many streams of the upper McCloud River watershed, especially within the Core

Conservation Area, have long dry or intermittent reaches even in years of average or above average flows. Habitat typing by CDFW during the summer of 1995 on 14 upper McCloud River tributary streams surveyed a total of 41.74 miles (67.17 km)(CDFG 1996). Of the stream miles surveyed, 50 percent were wetted, 19 percent were intermittent and 31 percent were dry. The 1995 water year was considered above normal and had flows that should be expected no more than 6 out of 100 years (USDI 1996). The USFS habitat typed 33 miles (53 km) across five streams in the summer of 1990, including the main stem upper McCloud River. Roughly 50 percent of the stream habitats surveyed were dry. Of the 24.0 miles (38.6 km) surveyed in the main stem McCloud River, 7.5 miles (12 km) were dry channel. The 1990 water year was relatively dry with flows that should be expected no more than 15 out of 100 years (USDI 1996).

Based on records since 1931, the McCloud basin's annual average precipitation, by calendar year, is approximately 50 inches. Since the 1970s, when the McCloud redband began to be considered as a possibly distinct race or subspecies of *O. mykiss*, there have been a number of below average or critically low rainfall years (Figure 4).

Drought periods will almost certainly continue to impact the naturally limited range of the McCloud redband in the future. Some small headwater streams may be reduced to a series of isolated pools or limited reaches of wetted habitat because of inadequate surface flows. In such conditions, trout populations are generally reduced due to overcrowding, increased competition for food, and increased stream temperatures and corresponding reductions in dissolved oxygen. The long-term effects of drought conditions leading to isolation of McCloud redband populations may account for patterns detected in phylogenetic studies and may pose an ongoing threat to the persistence of McCloud redband.

See Section VIII. C. (Distribution (Historic/Current)) for a description of historic actions taken by CDFW to translocate McCloud redband in response to severe drought conditions. Future actions involving the relocation of McCloud redband in response to drought or other stressors (such as low population size or genetic concerns related to inbreeding depression) need to be carefully evaluated regarding the genetic makeup of donor population(s), size and population structure of donor populations to ensure they can tolerate removal of individuals, and minimum numbers of individuals by age/size class that should be translocated in order to maintain maximum genetic diversity in refuge populations. In response to these concerns, the Upper McCloud Redband Trout Reintroduction Plan was created (Appendix G). This interim reintroduction plan utilizes biological and genetic data to formulate a step-wise approach to conserving McCloud redband trout and maintaining or improving their genetic integrity and diversity. This interim plan will be updated or replaced when a genetics management plan has been completed.

4. Floods

Though somewhat rare in frequency, large floods have altered habitat conditions in the upper McCloud River basin, sometimes dramatically. Resulting changes in channel morphology and suitable trout habitats from floods can be long-lasting. The January 1,

1997 flood, for instance, resulted in significant channel downcutting on many upper McCloud River tributaries including: Trout, Tate, and Swamp creeks. Many of the restoration projects that have been implemented to date have been in response to impacts from flood events. As noted in Section IX.E.2 (Climate Change), the predicted increase of rain on snow events in this geographic area may exacerbate the negative impacts of floods on McCloud redband habitats.

5. Fires

Fire suppression activities in the upper McCloud basin began in earnest in the first decade of the twentieth century, corresponding to the establishment of the Shasta National Forest. Nevertheless, fires continued to be a significant influence on the landscape, as evidenced in the extent of early forest seral stages in the first aerial photographs from the 1940s of the watershed.

Forest conditions such as the number of trees, amount of vegetation, and forest floor to canopy continuum of vegetation, as well as environmental conditions such as weather, wind patterns, and fuel moisture levels, contribute to the size and intensity of wildfires. Low intensity fires leave much of the organic matter on the forest floor, do not cause total loss of canopy, and often affect only a small part of a watershed. As such, changes in vegetation structure, soils, and watershed hydrodynamics may be nominal. In contrast, high intensity fires often cause long-term damage to forest, riparian, and instream habitats. High intensity fires can eliminate all forms of forest vegetation from forest floor to canopy, including, in some cases, riparian vegetation, which provides shade and both flow and temperature moderation for streams. In some extreme cases, high intensity burns can cause direct mortality to fishes due to dramatic increases in stream temperature. Severe fires create a hydrophobic soil condition which may exist for an extended period, especially in forests located in drier climates. Due to the decay of root systems, soil strength is reduced which may increase the occurrence of mass failures. These conditions can lead to increased sedimentation and peak flows in streams, negatively affecting benthic macroinvertebrate populations and trout habitats. Peak stream flow increases following intense wildfires often exceeds typical peak stream flow amounts by 40-60% during the first year or two following a fire (McGreer 1996), which is the period when the effects of vegetation removal are most conspicuous. Intense precipitation or rain-on-snow events could swell peak flow increases several hundredfold.

There is strong evidence that fire was once a critical ecological process throughout much of California, including the McCloud watershed. As part of the natural successional process, low intensity forest fires (including properly controlled prescribed burns) create opportunities for plant community changes, nutrient cycling, and improvement of overall forest health. The success of near total fire suppression has altered, and will continue to alter, the upper McCloud River ecosystem. In addressing fire suppress concerns, the Mt Shasta McCloud Ranger District has an aggressive program of harvest and thinning to reduce the thick, fire-suppression created forests back to more open historic conditions. In addition, the McCloud Ranger District has a regular program of understory prescribed fire. The managed harvest of timber on private

lands also reduces fuels levels, while improving forest health. The net results of these prescriptions should be to reduce the likelihood of large and intense wildfires. Future land management should incorporate, where feasible, fuel management strategies that will aid in reducing the likelihood of intense fires and their potential impacts to McCloud River redband trout.

6. Barriers

Barriers to in-stream migration of fish are generally considered a negative attribute because they may prevent fishes from occupying suitable habitat and may also contribute to restricted gene flow, due to isolation of population segments.

In most McCloud redband-bearing streams, lack of surface flow creates seasonal barriers during low stream flow periods. Furthermore, some dry stream channel segments appear to create permanent barriers to fish movement, causing long-term isolation of metapopulations and lack of gene flow (e.g., the McCloud redband populations in Swamp, Edson, and Sheepheaven creeks). Natural barriers created by low stream flow have already been identified and can be monitored into the future, particularly during above average rainfall leading to high water years when the potential for upstream movement of introgressed fish may exist.

In the upper McCloud River basin, strategically placed permanent barriers have played a positive role in trout management. Barriers have kept some subpopulations of McCloud redband free from direct contact with introduced fishes, thereby eliminating the threats of hybridization, competition, disease, and displacement. For example, a road crossing barrier near the mouth of Moosehead Creek was purposely augmented to reduce the possibility that hatchery stocks or introgressed fish in the main stem could migrate upstream into Moosehead Creek and negatively affect this McCloud redband Core Conservation population. Other tributary streams should be evaluated for the need and feasibility of installing similar artificial barriers.

7. Water Diversions

Many of the streams which support McCloud redband have limited flows during drier periods of the year and tend to go subsurface not far from their springs sources. Any reduction in water flow can affect water quality and reduce existing habitat for McCloud redband. In 2011, summertime base flows in McCloud redband streams (as measured where fish were present) ranged from 0.94 (Edson Creek) to 4.64 (Moosehead Creek) cfs. Impacts from diversions are usually associated with the amount (volume) diverted relative to the source and rate (velocity) of the diversion, which, at times, can lead to entrainment. Due to the low natural flow and small size of many McCloud redband streams, any diversion that does not take into account the potential for a reduction in stream flow may pose a threat to McCloud redband. For this reason, diversion points on Sheepheaven and Edson creeks are no longer used by timber companies and the Swamp Creek diversion on SPI land was modified specifically for the protection of McCloud redband.

X. CONSERVATION MEASURES

The conservation measures required for the long-term protection of McCloud redband include the following objectives: (A) maintain the1998 CA McCloud redband refugium and establish a new downstream boundary at Middle Falls, (B) conserve, protect, and enhance McCloud redband habitats, (C) maintain and preserve McCloud redband genetic integrity, (D) implement annual monitoring, and (E) develop contingency plans. Table 4 outlines conservation actions identified to be completed. Development of success criteria for determining whether the objectives listed above have been met is fundamental to this CA and its implementation.

A. Establish and Maintain a McCloud Redband Refugium

A McCloud redband refugium will be defined within the upper McCloud River basin which will emphasize the protection and enhancement of McCloud redband populations and their habitats. The refugium will include that section of the main stem McCloud and key tributaries above Middle Falls capable of supporting viable populations of McCloud redband trout (Figure 1). The refugium boundary was created based on areas where upper McCloud redband habitat was known to exist. The Redband Core Group, through an ongoing evaluation process, can modify the refuguim boundary to better describe areas that benefit McCloud redband and their habitats. Lower McCloud River tributaries (below Middle Falls) that, based on future genetic analyses, are determined to contain McCloud redband will be evaluated for potential conservation actions and included, as appropriate, in updates of this CA.

The refugium boundary was established upstream of the Middle Falls barrier for the following reasons:

- It is assumed that McCloud redband occupied suitable habitat within this entire area of the McCloud River drainage and were isolated from other trout species;
- Although some river and stream sections upstream of Middle Falls are considered to be poor McCloud redband habitat (due to the predominance of non-native or introgressed trout or for other habitat-related reasons), future restoration efforts could be implemented to create favorable habitat conditions for McCloud redband;
- The Middle Falls natural fish barrier prevents the upstream migration of all fishes and provides a logical cut-off point for hatchery stocking of nonindigenous fishes. Nonindigenous fish stocking will cease completely within the refugium, but is likely to continue in select areas below the Middle Falls fish barrier. The termination of nonindigenous fish stocking within the refugium will most likely reduce interspecific competition and aide in future restoration efforts; and
- Since the adoption of the 1998 CA, many of the tributary streams of the upper McCloud River basin have been more closely studied in the context of their respective role(s) as refugia for McCloud redband. The variability of habitat (especially related to surface flow and available wetted habitat) and identification of introgressed versus non-introgressed redband populations has exposed the need to classify the tributaries in terms of their ability to provide refuge and long-term

habitat for McCloud redband. Five categories of stream habitats within the refugium have been established:

1. Redband Stream Habitat - sections of perennial and intermittent streams known to contain non-introgressed McCloud redband. These stream sections, tributaries, and their watersheds, collectively, will be considered a Core Conservation Area within the refugium and will rank as the highest priority streams for restoration, conservation, and protection actions. As of 2015, these streams include Edson, Moosehead, Sheepheaven, and Swamp* creeks.
2. Potential Redband Stream Habitat - sections of perennial and intermittent streams known to contain introgressed McCloud redband and/or other fish species, but have the potential for stream restoration and successful reintroduction/establishment of non-introgressed McCloud redband. These streams, tributaries, and their watersheds will be second in priority to "Redband Stream Habitat" for restoration, conservation, and protection actions. Example streams, as of 2015, include Blue Heron, Raccoon, and Tate creeks.
3. Low Potential Redband Stream Habitat - reaches of perennial and intermittent stream sections known to contain introgressed McCloud redband and/or other trout species that have a low potential for restoration and successful reintroduction/establishment of non-introgressed McCloud redband. These streams, tributaries, and their watersheds will be third in priority to "Redband Stream Habitat" for restoration, conservation, and protection actions. An example stream, as of 2015, includes the main stem upper McCloud River.
4. Non-Redband Stream Habitat - sections of perennial and intermittent stream that do not contain introgressed McCloud redband, non-introgressed McCloud redband, or other fish species. The potential for stream restoration and reintroduction of McCloud redband is questionable due to the existing fishless condition. These streams, tributaries, and their watersheds will rank last in priority to "Redband Stream Habitat" based on the low likelihood of successful McCloud redband reintroduction and long-term sustainability. An example stream, as of 2015, includes Pilgrim Creek.
5. Unidentified Redband Stream Habitat - stream reaches where the presence of McCloud redband (or other trout species) and/or suitable habitat is unknown. These stream reaches will be surveyed and evaluated by the Redband Core Group for classification into one of the above four categories as data become available.

*long-term success uncertain due to fishless condition prior to introductions

Table 4. Conservation measures and actions to be implemented under this Conservation Agreement.

MEASURE/ACTION	LOCATION	RESPONSIBLE PARTY	TIME FRAME
A. Establish and maintain a McCloud redband refugium.	**Refugium**	**Redband Core Group**	**#1, #2 complete, #3 by Feb. 2018**
1. Define a refugium area to conserve and protect McCloud redband (CDFW). 2. Define a Core Conservation Area within the Refugium, based on genetic studies (amend as new data becomes available)(CDFW). 3. Prioritize streams and their habitat to provide guidance on McCloud redband restoration efforts (USFS, CDFW).			
B. Conserve, protect, and enhance existing McCloud redband populations and their habitats.	**Refugium**	**Redband Core Group or other parties as noted**	**Ongoing**
1. Identify and evaluate ongoing water diversions/drafting sites within Core Conservation Area to improve existing sites, relocation to off-channel sites, or elimination (Redband Core Group – 2018). 2. Develop list of unimproved roads in the Upper McCloud River basin to be decommissioned and/or improved (Redband Core Group - 2018). 3. Develop list of proposed, site-specific habitat improvement projects within the Core Conservation Area (based upon subsection A.3. above)(Redband Core Group – by Feb. 2018-20). 4. Implement, maintain, and monitor habitat improvement projects that benefit McCloud redband habitat (Redband Core Group). 5. Evaluate grazing allotment boundaries and proximity to Core Conservation Area streams. Develop management strategies to eliminate grazing impacts upon those streams (readjustment of allotment boundaries, cattle exclosure fencing) (USFS, CDFW – 2018). 6. Develop an action plan (AP) to address isolation of McCloud redband populations within Core Conservation Area (Redband Core Group – 2019). 7. Identify sites for barrier installation to protect McCloud redband from introgressed or non-native trout (USFS and CDFW – 2020). 8. Create or modify existing sport fishing regulations as necessary. 9. Remove brown trout from Trout Creek via electroshocking (CDFW and USFS/annually)			

C. Maintain genetic integrity and safe populations.	**McCloud Watershed**	**CDFW**	**Ongoing**
1. Based on current and future genetic studies, identify and implement management options/actions to maintain and enhance McCloud redband populations and subpopulations. 2. Manage McCloud redband (genetically distinct) populations within Core Conservation Area through active collaboration of Core Group members. 3. Develop a Genetics Management Plan that provides clear guidance on the proper management of the genetic integrity of McCloud redband. 4. Evaluate opportunities to reintroduce genetically distinct McCould redband in suitable streams within the Refugium as opportunities arise. 5. Prevent further introgression with nonindigenous coastal rainbow trout (see #7 under subsection B. above). 6. Evaluate opportunities to translocate genetically distinct McCloud redband into streams outside the Refugium or watershed where feasible. 7. Implement current and future genetic study recommendations and a Genetics Management Plan that addresses the effects of population bottlenecks and isolation in the Core Conservation Area. 8. Identify protection alternatives for landowners within re-introduced and translocated drainages.			
D. Implementation of McCloud redband monitoring plan.	**Core Conservation Area, Trout Creek and Upper McCloud River**	**CDFW, USFS**	**Annually**
1. Further develop and incorporate an annual monitoring plan to improve monitoring of McCloud redband populations, subpopulations, and their habitats. 2. Utilize adaptive management strategies to address monitoring plan findings. 3. Annual reporting of monitoring results at February meeting of Redband Core Group.			
E. Develop contingency plans.	**Refugium**	**Redband Core Group**	**2018-20**
1. Prepare a Contingency Plan for implementation as necessary to address emergency conditions, unforeseen stressors, and other impediments to McCloud redband restoration and recovery. 2. Streamline the implementation process under the emergency conditions identified in Item E(1).			

B. Conserve, Protect, and Enhance McCloud Redband Populations and their Habitats

The conservation of high quality McCloud redband trout habitat is vital to the continued existence of this species. Protection of existing habitats and habitat enhancement actions, where appropriate, will be fulfilled as part of this CA.

Past habitat improvements on federal and private lands in the McCloud River watershed include: development of off-stream water sources for road watering and fire suppression; livestock control fencing to protect riparian areas; installation of barriers; placement of instream structures to enhance habitat complexity; riparian planting; road closures; and road surface stabilization.

Private landowners will continue collaboration with USFS and CDFW personnel toward the development and implementation of additional, habitat enhancement projects, including those on mixed ownership.

1. Habitat Improvement Projects

Implementation of habitat improvement projects, including maintenance and evaluation of past projects, can be an effective tool to restore and enhance impaired systems. Within the McCloud redband Refugium specific projects have been identified for habitat improvement actions. These projects include, but are not limited to:

a. Minimize or discontinue water diversions in the Core Conservation Area - water diversions can negatively affect fishes through loss of habitat, degradation of habitat, and/or entrainment. Streams in the Core Conservation Area have low summer base flows (<5 cfs) and many tend to go subsurface not far from their source springs. Water diversions from these smaller streams may substantially reduce available wetted habitat for McCloud redband, especially during summer or fall, or when drought conditions prevail. Even in wet water years, diversions can cause direct and indirect impacts to McCloud redband as well as other aquatic and non-aquatic organisms. Given the already limited available habitat for McCloud redband within the Core Conservation Area (approximately 10-13 miles (16-21 km) of wetted habitat in 2011 (wet year) and as few as 2.5 miles (4 km) of wetted habitat in a dry year), diversions from Core Conservation Area redband streams need to be minimized or eliminated where feasible to help minimize impacts to McCloud redband. Alternatives and funding will be sought by all parties to this CA for analysis and development of alternative water diversion sites and in locations where modifications will benefit McCloud redband.

   To offset potential impacts to McCloud redband and other species, all ongoing water diversion sites within the Core Conservation Area will be evaluated (location, timing, volume of draft, duration, proximity to occupied McCloud redband habitat, etc.) by the Redband Core Group to determine their potential impacts to McCloud redband. Active diversions will be prioritized based on impacts to McCloud redband and the Redband Core Group will work to find alternatives to Core Conservation Area diversions. Recommendations for projects that improve existing sites, relocation to off-channel sites, or eliminate diversions will be made by the Redband Core Group at

the annual February meeting. The Redband Core Group will create and maintain a map of all known diversions and, if possible, the ownership of the water right associated with that diversion, within the Core Conservation Area excluding emergency drafting (specifically related to fire suppression). Separately, the Redband Core Group will create a map of proposed alternative diversion sites and present that map at the annual February meeting. In the case of emergency conditions diversion sites will be identified and utilized outside the Core Conservation Area whenever possible. The list and accompanying map of existing and proposed drafting sites within the Core Conservation Area will be generated by the Redband Core Group and provided at the February, 2018 annual meeting and updated annually thereafter.

b. Undeveloped road improvements, public road closures, and decommissioning non-use undeveloped roads - undeveloped native surface roads in the upper McCloud basin that have not been maintained, are under- or non-utilized, or were designed improperly could be major contributors of excess sediment into local waterways. The rates of erosion and subsequent sediment transport are accelerated during periods of excessive precipitation and runoff. Although sediment transport into streams is a natural process that varies from year to year, land disturbances (e.g. unimproved and unsurfaced roads, fires, and vegetation clearing) can cause excess sediment loading. This excess sediment transport into streams can bury spawning gravels, increase embeddedness of stream substrates, disrupt primary and secondary productivity (e.g., benthic macroinvertebrate abundance and species composition), impair the development of trout eggs, and reduce habitat suitability for juvenile and adult fish.

   Within the McCloud redband Refugium and, in particular, within the Core Conservation Area, all non-use unimproved roads that are determined to deliver significant amounts of sediment to McCloud redband streams should be either decommissioned or brought up to standard Forest Practice Rules condition. Limiting or blocking access to un-improved roads during times of the year when conditions are conducive to erosion can reduce sediment transfers into streams. Underutilized unimproved roads can be evaluated on a case-by-case basis for both a determination of non-use and potential for seasonal road closure. Determination of non-use and underutilization of a particular roadway will be developed by appropriate members of the Redband Core Group (USFS and private landowner representatives). In addition, all active roads not meeting current FPR standards will implement road improvements to minimize sediment transport into nearby waterways. A list of unimproved roads in the Upper McCloud River basin recommended to be decommissioned and/or improved will be developed by the Redband Core Group no later than January, 2018 and will be presented at the February, 2018 annual meeting.

c. Create and maintain beneficial instream habitat structures and channel modifications - channel complexity in streams provides habitat for trout. Examples include: large woody debris, boulder clusters, undercut banks, diverse habitat types to support multiple life stages of fishes and other aquatic organisms, and a variety of cover types (depth, bubble curtains, overhanging vegetation, interstitial spaces between larger substrates). Increasing the amount or improving the quality of instream habitat

has been a common practice in salmonid restoration projects. Past habitat enhancement projects within the upper McCloud watershed are listed in Appendix B, Table 1A. Near-term (1-5 years) future instream restoration projects should be focused within the Core Conservation Area in order to improve habitats for McCloud redband populations of greatest conservation need. Longer-term (5-10 years) future restoration projects may be expanded to include other streams and sites within the Refugium. Resource managers (USFS, CDFW), in consultation with other members of the Redband Core Group, will develop site-specific habitat restoration plans, adaptive management strategies, and success criteria to evaluate project outcomes. Plans and findings will be reviewed on an annual basis at the February Redband Core Group meeting. A list of proposed habitat improvement projects within the Core Conservation Area will be generated by USFS and CDFW and presented to the Redband Core Group at the February, 2018 meeting with updates presented at the 2019 and 2020 meetings.

d. Utilize cattle exclusion fencing and adequate buffer zones to protect stream habitats - the Forest Service manages grazing and timber management activities on Forest Service lands within the upper McCloud river basin according to the STNF LRMP standards and guidelines and the NWFP ROD, which provides protection to McCloud redband habitat. Grazing and timber management activities are practiced in accordance with the FPR (on private forest lands), which also provides protection. While commercial grazing has been reduced or eliminated in some areas, the need to protect and manage riparian areas, particularly within the Core Conservation Area, from impacts associated with grazing is an ongoing need. Cattle exclusion fencing (such as exists in the Sheepheaven Creek area) to exclude all grazing within stream corridors has been an effective protection measure, and could be extended to other sites within the Core Conservation Area to provide additional protection. In some areas, allotment boundary adjustment or designation of buffer zones may be feasible and may provide this protection without installing cattle exclusion fences. Areas of known McCloud redband occupancy within the four core streams (CDFW 2011, unpublished data) would require evaluation by the Redband Core Group to identify suitable locations to implement these additional protections from grazing.

e. Maintain and improve fish passage - fish passage in the upper McCloud basin (and, in particular, within the Core Conservation Area) is naturally limited by lack of wetted connectivity between McCloud redband-bearing headwater tributary streams. McCloud redband are not able to move between streams within the Core Conservation Area, which has led to the isolation of McCloud redband metapopulations that cannot interbreed. Genetic drift and inbreeding depression in small populations is a major concern regarding the genetic integrity and long-term viability of McCloud redband. Absent natural conditions that will allow for gene flow between these populations, it may be necessary to actively admix these populations (translocate individuals between streams) in order to maintain maximum genetic diversity.

   In other areas within the Refugium, barriers will be evaluated individually to ensure

maximum fish passage, where desirable. Road stream crossings will be assessed and repaired as necessary, following the guidance provided in the STNF LRMP or FPR and additional studies that address barriers and fragmentation of the upper McCloud basin (Pittman 2011). Candidate sites for potential barrier installation will be identified as part of an upper McCloud River basin barrier assessment, in order to protect McCloud redband from invasion of introgressed or non-native fishes. This assessment will be completed by the USFS and CDFW by February, 2018 and presented to the Redband Core Group at that time.

f. Study potential for prescribed removal of forest trees - more information is becoming available on evaporation and transpiration water loss and net water retention in basins. Prescribed removal of forest trees may promote water retention (water quantity and quality) by minimizing water evaporation and transpiration losses. Managing and monitoring these processes collectively could benefit forest ecosystem health.

2. Stocking of Nonindigenous Fishes

CDFW's policy is to protect and preserve all native species of fishes and their habitats which are threatened with extinction or experiencing significant population decline which, if not halted, would lead to a threatened or endangered listing under either federal and/or state endangered species acts. In adherence with this policy and in consideration of the current concerns for McCloud redband, given recent genetic findings and population surveys, all non-indigenous fish stocking within the Refugium (specifically the brook trout allotment at Lakin Pond) was phased out in 2013, to protect against any possible interspecific competition with McCloud redband. Although the CDFW hatchery rainbow trout allotment above Lakin Dam was discontinued in 1994, it should be noted that no future coastal rainbow trout allotments will be allowed within the Refugium. If CDFW develops hatchery stock of McCloud redband, locations such as the Lakin Pond access may be utitilzed as stocking locations. The CDFW may consider alternative local sites for stocking outside the Refugium to off-set any recreational impacts and create additional fishing opportunities. Any future stocking by CDFW in proximity to the Refugium will be done in compliance with the terms and conditions of the 2010 EIR.

3. Sport Fish Angling Regulations

See Sections VII.B.3. and IX.B.2. for a summary of angling regulations and actions taken to mitigate recreational angling impacts to McCloud redband. California Sport Fishing Regulations within the Refugium may be evaluated in the future, pending further genetic analyses to determine if other non-introgressed redband populations exist within the upper McCloud River basin and need additional protection.

C. Maintain Genetic Integrity and Safe Populations

Landowners and managers will continue to cooperate with CDFW, USFS, and genetic

researchers in support of appropriate biological investigations (e.g., sample collections for genetic and population analyses). The overall goals of the CDFW genetics project are to identify all distinct McCloud redband populations and develop and implement a genetic management plan in order to conserve the species and prevent further declines. See Sections VIII.B. and IX.E.1. for background information on genetics work performed to date and rationale behind actions listed under Subsection C in Table 4.

1. Prepare a Genetics Management Plan

It should be noted that, due to the complexity and uncertainty of managing introgressed fish (e.g., potentially varying level(s) of introgression across different subpopulations, unknown conservation value regarding retention of important McCloud redband alleles), no plan has been developed to address these issues. Until new information becomes available, introgressed McCloud redband within the Refugium will remain a priority, due to the possibility that they retain genetic traits that are of conservation value, but near-term management actions will be focused on non-introgressed McCloud redband within the Core Conservation Area.

In areas where introgressed redband x coastal rainbow trout pose a threat to the genetic integrity of McCloud redband, actions will be evaluated, and taken where appropriate, to minimize or eliminate those threats and may include: installation of barriers, manual removal of introgressed fishes, chemical treatment to eradicate introgressed fishes, or further genetic monitoring. These actions will be reviewed by the Redband Core Group and implemented by the responsible parties on a stream (or stream reach) by stream basis and will be prioritized based upon the potential impacts/benefits to the Core Conservation populations.

Other efforts to maintain or bolster the genetic integrity of McCloud redband and ensure their persistence may include: translocation of McCloud redband between Core Conservation Area streams (admixing) to offset complete isolation and lack of gene flow between these populations, translocation of McCloud redband into naturally fishless or chemically treated refuge streams within or outside of the Refugium (or completely outside the upper McCloud River basin to protect against localized impacts such as fire floods, or drought).

D. Implementation of McCloud Redband Monitoring Plan

Increasing the frequency and intensity of monitoring McCloud redband populations and their habitats is a critical component of this CA and will inform many of the conservation actions listed in Table 4. Monitoring to date has been performed largely by the USFS at established sites on a limited number of streams in the upper McCloud basin (Appendix H, Figure E-1). While data collected at these sites provide valuable long-term population and habitat trend information, they may or may not reflect the range of variability found across a wider portion of the basin. The development of a more comprehensive monitoring plan (See Table 5) is necessary in order to better define conservation priorities, habitat and population enhancement actions, and locations for restoration activities.

A fish monitoring plan will be developed by the USFS and CDFW in 2017-18 and presented to the Redband Core Group at the February, 2018 meeting. As funding allows, monitoring will be performed collaboratively between the USFS and CDFW. The funded monitoring will include continued surveys at the established historic sites, along with random sampling across a larger portion of the basin. Benchmark (long-term monitoring) sites may be established from the random sampling sites as needed, in order to gain long-term trend information on additional streams and/or at additional sites. Frequency of monitoring and number(s) of sites per stream will be identified in the plan. Streams comprising the Core Conservation Area will be monitored, as funding allows, on an annual basis until these populations and their habitats are determined to exhibit diverse population and age class structure (see section D, number 5) and sufficient quantity and quality (instream and riparian habitats) to merit reduced sampling frequency. Monitoring frequency outside the Core Conservation Area will be determined on a stream-by-stream basis.

Monitoring findings will be summarized on an annual basis and presented to the Redband Core Group at the annual February meeting. Any actions to modify or amend the current monitoring program will require approval from the Redband Core Group and comply with the objectives of this CA. Once finalized, the McCloud redband monitoring plan will be incorporated into this CA as an appendix and updated as necessary.

Past accomplishments since the signing of the 1998 CA and planned activities are presented in a Summary of Activities Table (Appendix B) and are organized into three categories:

i. Administrative

ii. Habitat Protection and Enhancement

iii. Research, Inventory, and Monitoring

E. Contingency Plans

1. Prepare Contingency Plans

Contingency plans will be developed to address potential catastrophic or uncontrollable events (e.g., fire, drought, flood, or critically low population levels). Each plan will provide clear guidance on authority, responsible parties, actions to be taken, and assessment procedures to ensure compliance with the plan. CDFW will take the lead on preparation of plans, with input from other Redband Core Group members, as appropriate. Plans will be vetted through the Redband Core Group and, upon approval, incorporated into this CA as appendixes. Contingency plans will adhere to existing agency policies and procedures, while establishing a clearly defined, step-wise strategy to streamline their implementation and prevent delays in protecting McCloud redband under such circumstances.

Table 5. Monitoring actions to be completed under the Conservation Agreement.

	MONITORING	PRODUCT	REPORTING
POPULATION	1. CDFW/USFS to conduct fish monitoring activities. a. Annual monitoring of buffer reaches through direct observations b. Annual monitoring abundances within selected stream sites through electrofishing.	1. Determine redband trout population trends once sufficient data have been collected. 2. Complete genetic studies	1. Annual update on conservation actions identified in Table 4 2. Annual update on monitoring activities by responsible parties to the Redband Core Group
HABITAT	1. Annual monitoring of study sites a. Stream temperature monitoring (landowners and managers). b. Data on selected stream habitat attributes collected in conjunction with population monitoring by CDFW/USFS.	1. Review habitat condition trends once sufficient data have been collected.	1. Field visit(s) by Redband Core Group or subcommittee to determine fish presence and/or habitat potential of streams categorized 2. Annual update on conservation actions identified in Table 4 2. Annual field meeting to subset of project sites from Table 4 (Redband Core Group)

GLOSSARY

Alleles: One of a number of alternative forms of the same gene that imparts a particular character or quality to a plant or animal.

Bioenhancement: Using artificial spawning techniques and controlled rearing methods to increase or enhance survival of the species.

Candidate Species: Those plant and animal species that in the opinion of the USFWS or the National Marine Fisheries Service, may qualify for listing under the Federal ESA of 1973 (as amended).

Category 1: This term, pursuant to the Federal ESA, refers to those species for which the USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded. This classification is no longer in use as of 1995. (Federal Register, Vol. 61, Feb. 28, 1996, p. 7596).

Embeddedness: The degree that larger particles (boulders, rubble, or gravel) are surrounded or covered by fine sediment. Usually measured in classes according to percentage of coverage of larger particles by fines (see definition of fines below).

Fines: The fine-grained particles of sand and silt in stream banks and substrate. These are defined by particle sizes with diameters varying downward from 0.85 mm (0.03 inches).

Founder effects: The principle that, when a small sample of a larger population establishes itself as an isolated entity, its gene pool carries only a fraction of the genetic diversity represented in the parental population. The evolutionary fates of the parental and derived populations are thus likely to be set along different pathways because the different evolutionary pressures in the different areas occupied by the populations will be operating on different gene pools.

Genetic bottleneck: A drastic reduction in the size of a population due to environmental stochastic events (such as earthquakes, floods, fires, or droughts) or human activities. Population reductions may occur over short or long time periods, but reduce the variation in the gene pool of a population drastically.

Genetic fitness: The reproductive success of a genotype, usually measured as the number of offspring produced by an individual that survive to reproductive age relative to the average for the population.

Genetic swamping: The process that occurs when two genetically

isolated populations come into contact and the genes from a larger population dominate over the genes in the small population. As used in this document, genetic swamping refers to the stocking of large numbers of native fish in a stream reach currently supporting a hybridized hatchery/McCloud redband population in order to increase the genetic purity of McCloud redband.

Genome: The total genetic composition of the individual or population, which is inherited with the chromosomes.

Glide: A segment of flowing stream that consists of a relatively wide-channel bottom and where the flow is of low to moderate velocities, lacking pronounced turbulence. The substrate usually consists of cobble, gravel and sand.

Indigenous: Originating in the region or country where found, native.

Introgression: The overlapping and interbreeding of two distinct plant or animal species or subspecies.

Iterative: Repeating; full of repetitions; frequentative.

Meristics: Of or having to do with the number or arrangement of body parts or segments (e.g., use of fin ray counts, lateral line scale counts, gill raker counts, or other external physical measurements to help differentiate taxonomic classifications).

Microsatellite-DNA sequencing: Tandem repetitive elements found throughout the vertebrate genome that consist of reiterated short sequences (particular di-, tri- and tetra-nucleotides) tandemly arrayed, with variations in repeat copy number accounting for a profusion of distinguishable alleles.

Mitochondrial-DNA: The mitochondrial genome consists of a circular DNA duplex that exists outside of the nucleus of the cell in organelles. Mitochondrial DNA (mtDNA) is maternally inherited; therefore, mtDNA is contributed by the female parent to the next generation without recombination. For this reason, it is simpler to trace mutation events through evolutionary time with mtDNA than with genomic DNA.

Native: an animal or plant living in the place where it originated, synonymous with indigenous.

Northwest Forest Plan Record of Decision: Signed in 1994, the NWFP ROD directs all national forests and BLM units within the range of the northern spotted owl to be managed to meet NWFP direction. Dual goals include protection of the owl while providing forest products. Important guidelines for aquatic systems and old-growth associated species were also created including the Aquatic Conservation Strategy and Survey and Manage Program. The Shasta Trinity Land and Resource Management Plan (1994) incorporates the NWFP and is consistent with its goals.

Nucleotides: a compound of sugar, phosphoric acid, and a nitrogen base. It is the principal constituent of nucleic acid and determines the structure of genes.

Nonindigenous: Not originating in the region or country where found.

Phylogenetic: of or having to do with the origin and development of a kind of animal or plant.

Putative: supposed, reputed.

Recombination: a crossover.

Refugium: An area of relatively unaltered climate that is inhabited by plants and animals during a period of continental climatic change (as a severe drought or glaciation) and remains as a center of relict forms from which a new dispersion and speciation may take place after climatic readjustment (plural: refugia).

Relict: A subpopulation or group that is surviving in an area isolated from the main area of distribution due to intervention of environmental events such as glaciation or development of an impassable falls.

Run: A swiftly flowing segment of stream characterized by little surface agitation and no major flow obstructions. Often appears as flooded riffles. Typical substrate consists of gravel, cobble, and boulders.

Single-nucleotide Polymorphisms (SNPs): DNA sequence variation of a single nucleotide occurring within the sequence or gene.

Systematics: The subject or study of taxonomic classification systems of plants or animals.

Taxonomy: Classification, especially of plant and animal species.

Type Location: The geographical location of the occurrence of the population from which the type specimen was taken.

Type Specimen: A specimen from the series of specimens, which either constitute the name-bearing type of a putative species (or subspecies) or from which the name-bearing type has been or may be designated.

Upper McCloud River: For the purposes of this document, that land area the waters of which drain into the McCloud River above the Upper Falls.

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APPENDIX A

U.S. Forest Service Agreement number: 15-MU-11051400-0).

IT IS MUTUALLY UNDERSTOOD BY AND BETWEEN PARTIES THAT:

A. **NONBINDING AGREEMENT.** This Agreement creates no right, benefit, or trust responsibility, substantive or procedural, enforceable by law or equity. The parties shall manage their respective resources and activities in a separate, coordinated and mutually beneficial manner to meet the purpose(s) of this Agreement. Nothing in this Agreement authorizes any of the parties to obligate or transfer anything of value.

Specific, prospective projects or activities that involve the transfer of funds, services, property, and/or anything of value to a party requires the execution of separate agreements and are contingent upon numerous factors, including, as applicable, but not limited to: agency availability of appropriated funds and other resources; cooperator availability of funds and other resources; agency and cooperator administrative and legal requirements (including agency authorization by statute); etc. This Agreement neither provides, nor meets these criteria. If the parties elect to enter into an obligation agreement that involves the transfer of funds, services, property, and/or anything of value to a party, then the applicable criteria must be met. Additionally, under a prospective agreement, each party operates under its own laws, regulations, and/or policies, and any state or federal obligation is subject to the availability of appropriated funds and other resources. The negotiation, execution, and administration of these prospective agreements must comply with all applicable law.

Nothing in this Agreement is intended to alter, limit, or expand the agencies' statutory and regulatory authority.

Any modifications made to this Agreement shall be done in accordance with section V.G. MODIFICATIONS.

B. **WITHDRAWAL.** Any of the parties, with sixty (60) days written notice, may withdraw from this MOU in whole, or in part, at any time before the date of expiration.

C. **MODIFICATIONS.** Modifications within the scope of this Agreement must be made by mutual consent of the parties, by the issuance of a written modification signed and dated by all properly authorized, signatory officials, prior to any changes being performed. Requests for modification should be made, in writing, at least sixty (60) days prior to implementation of the requested change.

D. **COMMENCEMENT/EXPIRATION DATE.** This Agreement is executed as of the date of the last signature and is effective through ten (10) years at which time it will expire.

E. The following U.S. Forest Service supplemental provisions are hereby incorporated into this Agreement and made a part thereof:

1. NOTICES. Any communications affecting the operations covered by this Agreement given by the U.S. Forest Service or the parties signatory to this Agreement is sufficient only if in writing and delivered in person, mailed, or transmitted electronically by e-mail or fax.

2. PARTICIPATION IN SIMILAR ACTIVITIES. This Agreement in no way restricts the U.S. Forest Service or the parties signatory to this Agreement from participating in similar activities with other public or private agencies, organizations, and individuals.

3. ENDORSEMENT. Any of the parties' contributions made under this Agreement do not by direct reference or implication convey U.S. Forest Service endorsement of any of the parties' products or activities.

4. USE OF U.S. FOREST SERVICE INSIGNIA. In order for any of the parties to use the U.S. Forest Service insignia on any published media, such as a Web page, printed publication, or audiovisual production, permission must be granted from the U.S. Forest Service's Office of Communications. A written request must be submitted and approval granted in writing by the Office of Communications (Washington Office) prior to use of the insignia.

5. MEMBERS OF U.S. CONGRESS. Pursuant to 41 U.S.C. 22, no U.S. member of, or U.S. delegate to, Congress shall be admitted to any share or part of this agreement, or benefits that may arise therefrom, either directly or indirectly.

6. FREEDOM OF INFORMATION ACT (FOIA). Public access to this Agreement or Agreement records must not be limited, except when such records must be kept confidential and would have been exempted from disclosure pursuant to Freedom of Information regulations (5 U.S.C. 552). Requests for research data are subject to 2 CFR 215.36.Public access to culturally sensitive data and information of Federally-recognized Tribes may also be explicitly limited by P.L. 110-234, Title VIII Subtitle B §8106 (2008 Farm Bill).

7. TEXT MESSAGING WHILE DRIVING. In accordance with Executive Order (EO) 13513, "Federal Leadership on Reducing Text Messaging While Driving," any and all text messaging by Federal employees is banned: a) while driving a Government owned vehicle (GOV) or driving a privately owned vehicle (POV) while on official Government business; or b) using any electronic equipment supplied by the Government when driving any vehicle at any time. All cooperators, their employees, volunteers, and contractors are encouraged to adopt and enforce policies that ban text messaging when driving company owned, leased or rented vehicles, POVs or GOVs when driving while on official Government business or when performing any work for or on behalf of the Government.

8. DEBARMENT AND SUSPENSION. Each party signatory to this Agreement shall immediately inform the U.S. Forest Service if they or any of their principals are presently excluded, debarred, or suspended from entering into covered transactions with the federal government according to the terms of 2 CFR Part 180. Additionally, should any party or any of their principals receive a transmittal letter or other official Federal notice of debarment or suspension, then they shall notify the U.S. Forest Service without undue delay. This applies whether the exclusion, debarment, or suspension is voluntary or involuntary.

9. U.S. FOREST SERVICE ACKNOWLEDGED IN PUBLICATIONS, AUDIOVISUALS AND ELECTRONIC MEDIA. All parties signatory to this Agreement shall acknowledge U.S. Forest Service support in any publications, audiovisuals, and electronic media developed as a result of this Agreement.

10. NONDISCRIMINATION STATEMENT – PRINTED, ELECTRONIC, OR AUDIOVISUAL MATERIAL. All parties signatory to this Agreement shall include the following statement, in full, in any printed, audiovisual material, or electronic media for public distribution developed or printed with any Federal funding.

    In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited bases apply to all programs.)

    To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964

(voice and TDD). USDA is an equal opportunity provider and employer.

If the material is too small to permit the full statement to be included, the material must, at minimum, include the following statement, in print size no smaller than the text:

"This institution is an equal opportunity provider."

United States Department of Agriculture
U.S. Forest Service
Region 5, Pacific Southwest Region

Represented By:_____
(Asmaa Ali- Grants Management Specialist)
3644 Avtech Parkway
Redding, CA 96002

APPENDIX B

Summary of Activities

ACCOMPLISHMENTS

ACCOMPLISHMENTS AND PLANNED ACTIVITIES

Table A-1. *Redband trout habitat improvement/restoration project/monitoring summary, last update: 2014.*

Project	Location	Responsible Party	Scheduled Date of Completion	Cost Estimate	Project Status	Description
Administrative						
Toad Mountain Allotment boundary adjustment	Trout Creek drainage Edson Creek drainage Sheepheaven Creek drainage	FS	2000	$500	C	Adjustment of Toad Mountain Allotment boundary removing Upper Trout Creek, Upper Edson Creek and Upper Sheepheaven Creek drainages from the allotment.
Bartle Allotment boundary adjustment	Edson Creek drainage	FS	2000	$500	C	Adjustment of Bartle Allotment boundary removing a short reach of lower Edson Creek from the allotment.
Habitat Protection and Enhancement						
Project	**Location**	**Responsible Party**	**Scheduled Date of Completion**	**Cost Estimate**	**Project Status**	**Description**
Swamp Creek fish passage restoration, lower crossing	T41N, R1W, S5	CDFW USFWS SPI Cal Trout	2005-06	$20,000	C	Create series of step-pools (back-flooding weirs) to raise water surface and restore upstream fish passage through CMP at road crossing
Swamp Creek fish passage restoration, upper crossing	T42N, R1W. S31	CDFW USFWS SPI Cal Trout	2006	$10,000	C	Create series of step-pools (back-flooding weirs) to raise water surface and restore upstream fish passage through CMP at road crossing
Stream Habitat Improvements, Edson Creek	T41N, R1E, S28 and S29	Hancock USFWS CDFW	2005 and 2006	$5000	C	Installed 3-4 instream structures to reduce channel downcutting in tributary; refurbished habitat structures placed in 1993; improved weir at crossing and upgraded CMP installation
Road Rocking, Edson Creek	T41N, R1E, S34	SPI	2004	$2000	C	Added boulders for bank stabilization at drafting hole upstream of fish-bearing reach; rocked access road

Edson Creek habitat improvement project	Edson Creek T41N, R1E, S28, S29	John Hancock	1993	$25,000	C	Wetland restoration and habitat improvement along 0.1 mile of Edson Creek.
Road relocation and obliteration	Edson Creek T41N, R1E, S28, S29	John Hancock	1993	$20,000	C	Relocation of approximately 1.5 miles of roads located in bottom of drainages tributary to Edson Creek.
Trout Creek Off-Site Water Source Development	Trout Creek T42N, R1E, S32	FS	2000	$10,000	C	Construction of new off-site overhead fill and elimination of on-site overhead fill from Trout Creek.
Tate Creek channel reconstruction and revegetation: Phase 1	Tate Creek T39N, R1W, S11, S2	FS	2001	$18,500	C	Obliteration of roadbed gully. Reconstruction of pre-1997 flood channel. Revegetation of old roadbed gully
Tate Creek channel reconstruction and revegetation: Phase 2	Tate Creek T39N, R1W, S11, S2	FS	2003	$175,000	C	Obliteration and filling of roadbed gullies, riparian planting, dam removal, floodplain recontouring.
Trout Creek Restoration Project: Phase 1	Trout Creek T42N, R1E, S31, S32 T41N, R1E, S6 T41N, R1W S1	FS Hancock SPI	2006	$475,000	C	Completed Phase 1 of Trout Creek meadow restoration project. Obliterated 1.25 miles of gully using plug-and-pond technique and restored flow to remnant channels.
Trout Creek Meadow Restoration	Trout Creek T42N, R1E, S31, S32 T41N, R1E, S6	FS	2014	$50,000	I	Timber Stewardship Sale – Purpose and need is restoration of Trout Creek Meadows and surrounding stands.
Trout Creek Fencing Project	Trout Creek T42N, R1E, S31, S32 T41N, R1E, S6 T41N, R1W S1	FS Hancock SPI	2007	$45,000	C	Construction of new let-down fence around Trout Creek Restoration Project area and Trout Creek Campground.
Trout Creek rechanneling	Trout Creek T42N, R1W, S25	To be determined	To be determined	To be determined	P	Reconfigure braided channel into one channel and eliminate headwall cutting in upper Trout Creek alder meadow.
Road rocking	Moosehead Creek T39N, R1E, S36 & T39N, R01E, S35	TC&I-Shasta	Completed 2011 and 2012	$20,000	C	Spot rock the following roads: WB2000 Road from north line S36 following spur road along creek southeasterly to road intersection on main ridge in SE ¼ S36; the 39N05 Road in section 36 & 35, and the 38N10 Road from the intersection with the 39N05 to the USFS property line.
Road closure	Upper Edson Creek T41N, R1E, S28	SPI	2002	$5,000	C	Remove existing culvert, close spur road and landing next to Edson Creek.
Road closure	Moosehead Creek T39N, R1E, S36	TC&I-Shasta	2014	$1,500	C	Move gate from south side of main ridge to north line in S36.
Road closure	McCloud River, Dry Ck, Bull Ck, & Tate Ck T39N, R1E, S2, S3,	TC&I-Shasta Hancock	2010	$15,000	C	New Gates on M18 Road at Hwy 89 and BS9000 near junction with Cow Creek Rd (39N090 Rd). Move gate to 39N29Y Rd near section corner. Remove/block low water crossing of Bull Ck in NW1/4

	S4, S10, S11, S14, S15, S21, S22, S27 & T40N, R1E, S33					of S15 and McKay Ck crossing in T40N, R1E, S33. Block several other roads
Road Closure	Trout Creek T42N, R1W, S22, S25, S27	TC&I-Shasta (Campbell)	2010	$8,000	C	New Gate on road entering SE1/4 of S27
Road rocking	Trout Creek T42N, R1W, S25 T42N, R1E, S30, S31	SPI	To be determined	$15,000	P	Rock road from east line in S31 west to Trout Creek crossing.
Road rocking	Edson Creek T41N, R1E, S19, S20, S29	SPI	2007	$67,500	C	Rock road 4.5 miles from intersection with Pilgrim Creek Road to North Black Fox Road to intersection with Black Fox Road. Also included installation of a new (larger) pipe in the NE1/4 of S32.
Stephen's Pass fence and cattleguard installation	Trout Creek T42N, R1E, S17/16	FS	2003	$5,000	C	Install approximately 0.5 miles of fence and cattleguard on Road 43N44 to prevent cattle trespass into Trout Creek.
Sheepheaven Creek fence reconstruction.	Sheepheaven Creek T40N, R1E, S11	CDFW SPI FS	2003	$4,000	C	Remove 2200 feet of deteriorated fence and construct new let-down fence around Sheepheaven Spring.
Sheepheaven Creek habitat restoration	T40N, R1E, S11	CDFW SPI	2004	$3000	C	Enlarged pool volume by removing accumulated sediment (upstream source of sediment has been stabilized)
Trout Creek WNTI Project	Lower Trout Creek	USFWS, USFS, CalTrout, The Sacramento River Exchange	2010	$45,000	C	Improve habitat for redband trout, stabilize eroding bank, and mitigate OHV impacts on the lower perennial reach of Trout Creek within Trout Creek Campground
39N11Y Segment Decommissioning	T39N, R1W, S1	FS	2012	$1000	C	Decommissioned 0.8 miles of road that was impacting a redband reach of Shady Gulch Creek.
39N68 Decommissioning	T39N, R1E, S6	FS	2012	$1500	C	Decommissioned approximately 1 miles of road in Raccoon Creek drainage including crossing decommission on Raccoon Creek tributary.
Algoma Planning Area Road Closures	T39N, T40N, T41N; R1E, R1W; Multiple Sections	FS	2016	$20,000	I	Completed EIS for vegetation management activities in Algoma planning area. EIS also planned road decommissioning and closure projects. 14.5 miles of road will be decommissioned and 22 miles of road will be closed within the refugium boundary.
42N09 Rocking	T41N, R1E, Section 32	FS, TC&I-Shasta (Campbell), SPI	2014	$15,000	C	RAC Grant for Rocking Road 42N09 from Trout Creek Campground to Pilgrim Creek Road. Reduces need for dust abatement.
McCloud Railway	All drainages.	Unknown	Unknown	Unknown	P	Stream crossing restoration projects associated with

Channel Restoration Project						abandonment of McCloud Railway. Opportunities for channel restoration exist at Mud Creek, Ash Creek, Moosehead Creek, McCloud River and Colby Meadows Creek as well as many other unnamed ephemeral channels.
Research, Inventory and Monitoring						
Water Temperature Monitoring	Swamp, Tate, Edson, Moosehead, Trout Creeks, Upper McCloud River	FS	2010	$1,000/yr	O	Annual monitoring of water temperature (hourly sampling) on redband trout streams.
Roads/Watershed Improvement Needs Inventory	Trout Creek drainage Moosehead Creek drainage	FS	1999	$5,000	C	Identification of potential and existing sediment sources (mostly road-related).
Habitat restoration feasibility study	Target reaches of Tate, Trout and Moosehead Creeks	FS	2002	$8,000	C	Studies to determine conceptual plans and feasibility of restoring degraded reaches of Tate, Trout and Moosehead creeks.
Trout Creek Stream Condition Inventory	Trout Creek T42N, R1W, S25; T42N, R1E, S30, S31	FS	2002	$6,000	C	Collection of SCI data on 6 reaches of Trout Creek in lower meadow reach.
Lower Trout Creek Meadow Restoration Project	Trout Creek T42N, R1E, S31, S32 T41N, R1E, S6 T41N, R1W S1	FS	>2006	$300,000	O	Monitoring of implementation and effectiveness of plug and pond construction, rewatering remnant channel, and restoration of wet (or seasonally wet) meadow
Algoma Stream Restoration Assessment	T39N, T40N, T41N; R1E, R1W; Multiple Sections	FS	2010	$16,000	C	Restoration needs assessment for Shady Gulch, Raccoon and Bull Creeks.
Master Thesis Project – Minimum stream length requirement for McCloud River redband trout (*Onchorhynchus mykiss spp.)* in Trout and Tate creeks, Siskiyou County, California	Trout Creek and Tate Creek drainages	Humboldt State University, USFWS	2011	$80,000	C	Located existing and potential barriers to fish movement, evaluated habitat, and estimated minimum stream lengths required to maintain genetically viable populations of McCloud River redband trout (Oncorhynchus mykiss spp) in two streams, Trout and Tate creeks.

Current Status: P = Planning Stage; I = Implementation Stage; C = Completed; O = Ongoing

APPENDIX C

Aquatic Conservation Strategy

Taken from the Aquatic Conservation Strategy for anadromous fishes, but applicable to federal lands within the McCloud watershed.

The aquatic conservation strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on Federal lands managed by the USFS and BLM within the range of Pacific Ocean anadromy. This conservation strategy employs several tactics to approach the goal of maintaining the "natural" disturbance regime. Land use activities need to be limited or excluded in those parts of the watershed prone to instability. The distribution of land use activities, such as timber harvest or roads, must minimize increases in peak stream flows. Headwater riparian areas need to be protected so that when debris slides and flows occur they contain coarse woody debris and boulders necessary for creating habitat farther downstream. Riparian areas along larger channels need protection to limit bank erosion, ensure an adequate and continuous supply of coarse woody debris to channels, and provide shade and microclimate protection. Watersheds currently containing the best habitat or those with the greatest potential for recovery should receive increased protection and receive highest priority for restoration programs.

Any species-specific strategy aimed at defining explicit standards for habitat elements would be insufficient for protecting even the targeted species. The aquatic conservation strategy must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. Because it is based on natural disturbance processes, it may take decades, possibly more than a century, to accomplish all of its objectives. Some improvements in aquatic ecosystems, however, can be expected in 10 to 20 years.

The important phrases in these standards and guidelines are “meet Aquatic Conservation Strategy objectives”, “does not retard or prevent attainment of Aquatic Conservation Strategy objectives”, and “attain Aquatic Conservation Strategy objectives”. These phrases, coupled with the phrase “maintain and restore” within each of the Aquatic Conservation Strategy objectives, define the context for agency review and implementation of management activities. Complying with the Aquatic Conservation Strategy objectives means that an agency must manage the riparian-dependent resources to maintain the existing condition or implement actions to restore conditions. The baseline from which to assess maintaining or restoring the condition is developed through a watershed analysis. Improvement relates to restoring biological and physical processes within their ranges of natural variability.

The standards and guidelines are designed to focus the review of proposed and certain existing projects to determine compatibility with the Aquatic Conservation Strategy objectives. The standards and guidelines focus on ‘meeting’ and “not preventing attainment” of Aquatic Conservation Strategy objectives. The intent is to ensure that a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives. The decision maker will use the results of watershed analysis to support the finding. In order to make the finding that a project or management action “meets” or “does not prevent attainment” of the Aquatic Conservation Strategy objectives, the analysis must include a description of the existing condition, a description of the range of natural variability of the important physical and biological components of a given watershed, and how the proposed project or management action maintains the existing condition or moves it within the range of natural variability. Management actions that do not maintain the

existing condition or lead to improved conditions in the long term would not ”meet” the intent of the Aquatic Conservation Strategy and thus should not be implemented.

The record for a project within a riparian reserve must: (1) describe the existing condition, including the important physical and biological components of the fifth-field watershed(s) in which the project area lies; (2) describe the effect of the project on the existing condition; and (3) demonstrate that in designing and assessing the project the decision maker considered and used, as appropriate, any relevant information from applicable watershed analysis. The record will address these items at a level of detail in proportion to the project.

Aquatic Conservation Strategy Objectives

NFS 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.

Components of the Aquatic Conservation Strategy

Riparian Reserves: Lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use.

Key Watersheds: A system of large refuges comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water.

Watershed Analysis: Procedures for conducting analysis that evaluate geomorphic and ecologic processes operating in specific watersheds. This analysis should enable watershed planning that achieves aquatic conservation strategy objectives. Watershed analysis provides the basis for monitoring and restoration programs and the foundation from which riparian reserves can be delineated.

Watershed Restoration: A comprehensive, long-term program of watershed restoration to restore watershed health and aquatic ecosystems including the habitats supporting fish and other aquatic and riparian-dependent organisms.

These components are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems. Late-Successional Reserves are also an important component of the aquatic conservation strategy. The standards and guidelines under which Late-Successional Reserves are managed provide increased protection for all stream types. Because these reserves possess late-successional characteristics, they offer core areas of high quality stream habitat that will act as refuges and centers from which degraded areas can be recolonized as they recover. Streams in these reserves may be particularly important for endemic or locally distributed fish species and stocks.

Riparian Reserves

Riparian reserves are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Standards and guidelines prohibit and regulate activities in riparian reserves that retard or prevent attainment of the aquatic conservation strategy objectives. Riparian reserves include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing water bodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats. Riparian reserves include areas designated in current plans and draft plan preferred alternatives as riparian management areas or streamside management zones and primary source areas for wood and sediment such as unstable and potentially unstable areas in headwater areas and along streams. Riparian reserves occur at the margins of standing and flowing water, intermittent stream channels and ephemeral ponds, and wetlands. Riparian reserves generally parallel the stream network but also include other areas necessary for maintaining hydrologic, geomorphic, and ecologic processes.

Under the aquatic conservation strategy, riparian reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The riparian reserves will also serve as connectivity corridors among the late-successional reserves.

Interim widths for riparian reserves necessary to meet aquatic conservation strategy objectives for different waterbodies are established based on ecologic and geomorphic factors. These widths are designed to provide a high level of fish habitat and riparian protection until watershed and site analysis can be completed.

Watershed analysis will identify critical hillslope, riparian, and channel processes that must be evaluated in order to delineate riparian reserves that assure protection of riparian and aquatic functions. Riparian reserves are delineated during implementation of site-specific projects based on analysis of the critical hillslope, riparian, and channel processes and features. Although riparian reserve boundaries may be adjusted on permanently flowing streams, the prescribed widths are considered to approximate those necessary for attaining aquatic conservation strategy objectives. Postwatershed analysis riparian reserve boundaries for permanently flowing streams should approximate the boundaries prescribed in these standards and guidelines. However, postwatershed analysis riparian reserve boundaries for intermittent streams may be different from the existing boundaries. The reason for the difference is the high variability of hydrologic, geomorphic and ecologic processes in a watershed affecting intermittent streams. At the same time, any analysis of riparian reserve widths must also consider the contribution of these reserves to other, including terrestrial, species. Watershed analysis should take into account all species that were intended to be benefited by the prescribed riparian reserve widths. Those species include fish, mollusks, amphibians, lichens, fungi, bryophytes, vascular plants, American marten, red tree voles, bats, marbled murrelets, and northern spotted owls. The specific issue for spotted owls is retention of adequate habitat conditions for dispersal.

The prescribed widths of riparian reserves apply to all watersheds until watershed analysis is completed, a site-specific analysis is conducted and described, and the rationale for final riparian reserve boundaries is presented through the appropriate NEPA decision-making process.

Riparian Reserve Widths

Riparian reserves are specified on page C-30 of these standards and guidelines for the following five categories of streams or waterbodies:

- Fish-bearing streams
- Permanently flowing nonfish-bearing streams
- Constructed ponds and reservoirs, and wetlands greater than 1 acre
- Lakes and natural ponds
- Seasonally flowing or intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas

Standards and guidelines specific to riparian reserves begin on page C-31 of Attachment A of the NWFP 1994 ROD as incorporated into the STNF LRMP, and as amended by the 2004 ROD

Intermittent Streams

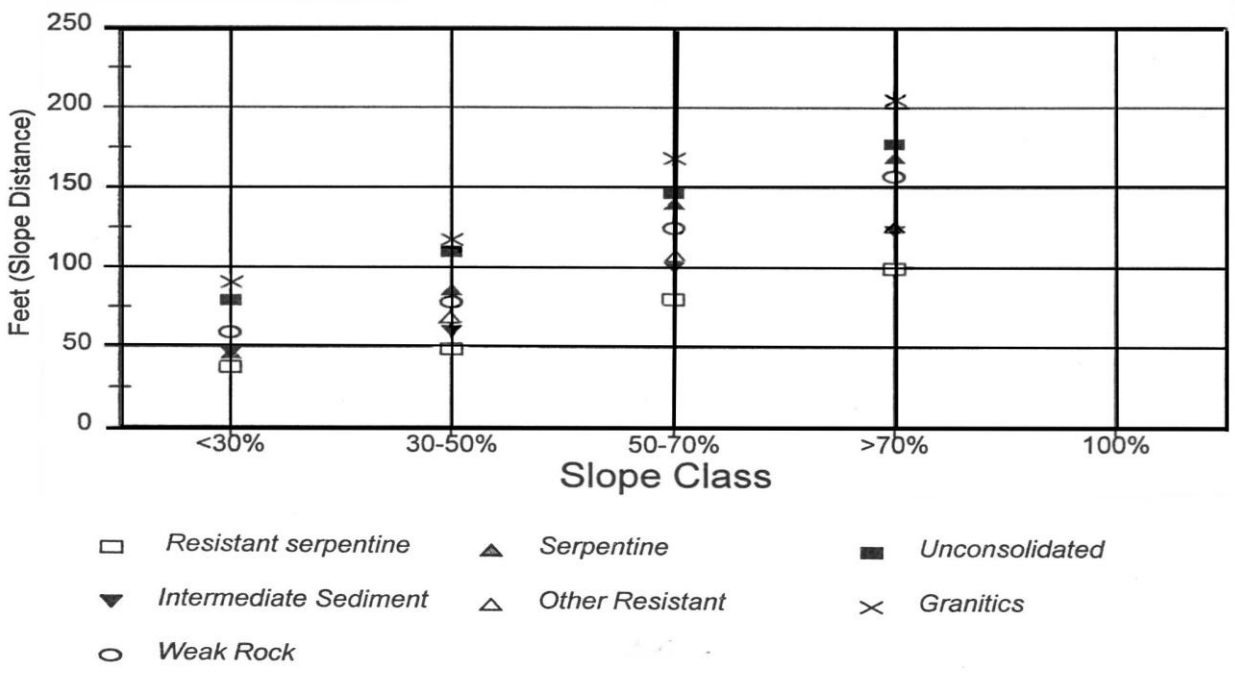
Intermittent streams are defined as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria. Including intermittent streams and wetlands within riparian reserves is important for successful implementation of the aquatic conservation strategy. Accurate identification of these features is critical to the correct implementation of the strategy and protection of the intermittent stream and wetland functions and processes. Identification of these features is difficult at times due to the lack of surface water or wet soils during dry periods. The following discussion provides guidance on steps to identify these features for inclusion within riparian reserves.

Fish-bearing streams are distinguished from intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams or travel routes for fish emigrating from lakes. In these instances, the standards and guidelines for fish bearing streams would apply to those sections of the intermittent stream used by the fish.

The following discussion pertains to riparian reserve widths on intermittent streams and wetlands necessary to meet aquatic conservation strategy objectives. Other riparian reserve objectives, such as providing wildlife dispersal corridors, could lead to riparian reserve widths different than those necessary to protect the ecological integrity of the intermittent stream or wetland. These other objectives could yield wider riparian reserves than those necessary to meet aquatic conservation strategy objectives. There can never be instances where riparian reserves would be narrower than the widths necessary to meet aquatic conservation strategy objectives.

The width of riparian reserves necessary to protect the ecological integrity of intermittent streams varies with slope and rock type. Figure A-l shows the estimated size of riparian reserves necessary to protect the ecological values of intermittent streams with different slope and rock types. It shows width, measured as slope distance needed for streamside protection for reasons other than slope stability. An interagency team of scientists based on professional judgment and experience estimated these widths. Protection needs included surface erosion of stream side slopes, fluvial erosion of the stream channel, soil productivity, habitat for riparian-dependent species, the ability of streams to transmit damage downstream, and the role of streams in the distribution of large wood to downstream fish-bearing waters. Geomorphologists, hydrologists, and fish biologists made these estimates from the BLM, USFS, and the Environmental Protection Agency. These distances are consistent with the height of one site-potential tree used to define riparian reserve widths (see page C-30 of these standards and guidelines). Watershed analysis provides the ecological and geomorphic basis for changing the size and location of riparian reserves.

Figure A-1. *Ecological protection needs for intermittent streams by slope class and rock type*



Intermittent streams (no mass movement)

The prescribed widths for riparian reserves apply to all streams, lakes, ponds and wetlands on lands administered by the USFS and BLM within the range of the northern spotted owl until a watershed analysis is completed. Watershed analysis is expected to yield the contextual information needed to define ecologically and geomorphically appropriate riparian reserves. Analysis of site-specific characteristics may warrant riparian reserves that are narrower or wider than the prescribed widths. Thus, it is possible to meet the objectives of at least the aquatic conservation strategy portion of these standards and guidelines with postwatershed analysis reserve boundaries for intermittent streams that are quite different from those conforming to the prescribed widths. Regardless of stream type, changes to riparian reserves must be based on scientifically sound reasoning, and be fully justified and documented.

Wetlands

The combinations of hydrology, soils, and vegetative characteristics are the primary factors influencing the development of wetland habitats. There must be the presence of surface water or saturated soils to significantly reduce the oxygen content in the soils to zero or near zero concentrations. These low or zero soil oxygen conditions must persist for sufficient duration to promote development of plant communities that have a dominance of species adapted to survive and grow under zero oxygen conditions. These wetland characteristics apply when defining wetlands for regulatory jurisdiction or for technical analysis when conducting inventories or functional assessments. Seeps and springs can be classified as streams if they have sufficient flow in a channel or as seasonal or perennial wetlands under the criteria defined in the 1987 Corps Engineers Wetlands Manual. The standards and guidelines for wetlands, which are based on the hydrologic, physical and biologic characteristics described in the manual, apply to seeps and springs regardless of their size.

Formal definition for implementing Section 404 of the Clean Water Act, adopted by the Environmental Protection Agency, is as follows:

The term wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Detailed technical methods have been developed to assist in identification of wetlands that meet the above definition. Currently, the field manual being used for implementing the Clean Water Act is the "1987 Corps Manual."

For purposes of conducting the National Wetland Inventory, the USFWS has broadly defined both vegetated and nonvegetated wetlands as follows: wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

Wetlands typically occur within and adjacent to riparian zones. It is frequently difficult to differentiate wetlands from riparian areas based on the definitions. Most typically, and particularly in forested landscapes, the riparian zone is defined by its spatial relation to adjacent streams or rivers. However, riparian zones are also commonly considered to be lands integrally related to other aquatic habitats such as lakes, reservoirs, intermittent streams, springs, seeps, and wetlands.

Because of such conceptual and definitional vagaries, there is spatial overlap between wetlands and riparian zones. This then results in only a portion of the riparian zone associated with rivers and streams being considered as wetlands. The extent of that portion will depend on the specifics of hydrologic, vegetation, and soil features. The functions of the wetland portion may also be distinct from the non-wetlands. For example, wetlands may provide habitat for specialized plant species or reproductive habitat for amphibians or other organisms that would not be provided by riparian areas.

Once the riparian reserve width is established, either based on existing widths or watershed analysis, then land management activities allowed in the riparian reserve will be directed by standards and guidelines for managing riparian reserves. As a general rule, standards and guidelines for riparian reserves prohibit or regulate activities in riparian reserves. Watershed analysis and appropriate NEPA compliance is required to change riparian reserve boundaries in all watersheds.

The record for a project within a riparian reserve must (1) describe the existing condition, including the important physical and biological components of the fifth-field watershed(s) in which the project area lies; (2) describe the effect of the project on the existing condition; and (3) demonstrate that in designing and assessing the project the decision maker considered and used, as appropriate, any relevant information from applicable watershed analysis. The record will address these items at a level of detail in proportion to the project. The project is consistent with riparian reserve standards and guidelines (on pages C-31 - C-38 of this attachment) that include direction to “meet,” “not adversely affect,” “not retard or prevent attainment of” or otherwise achieve ACS objectives, if the decision maker determines from the record that the project is designed to contribute to maintaining or restoring the fifth-field watershed over the long term, even if short term effects may be adverse.

Summary of Aquatic Conservation Strategy for Riparian Reserves

- Involves portions of the landscape where riparian-dependent and stream resources receive primary emphasis.

- Riparian reserves are designated for all permanently flowing streams, lakes, wetlands, and intermittent streams.

- Riparian reserves include the body of water, inner gorges, all riparian vegetation, 100-year floodplain, landslides and landslide prone areas.

- Reserve widths are based on some multiple of a site-potential tree or a prescribed slope distance, whichever is greater. Reserve widths may be adjusted based on watershed analysis to meet aquatic conservation strategy objectives.

- Standards and guidelines prohibit programmed timber harvest, manage roads, grazing, mining and recreation to achieve objectives of the aquatic conservation strategy

APPENDIX D

Forest Practice Rules and Regulations

California Department of Forestry and Fire Protection

The Department of Forestry and Fire Protection's mission is to protect the people of California from fires, respond to emergencies, and protect and enhance forest, range and watershed values which provide social, economic and environmental benefits to rural and urban citizens. In addition to its direct responsibility for wildlands fire protection on over 32 million acres of California's privately-owned watershed lands, CDF also provides full fire service protection to an additional 11 million acres under agreements with other governmental entities at the local, state and federal levels. The Department also protects resources through its vegetation management program, which uses prescribed fire and other means of vegetation management to reduce hazardous fuel build-ups in areas at risk to wildlife, and through the regulation of timber harvesting on over 8 million acres of state and private lands. In this latter role, the Department's foresters examine each timber harvesting plan (THP) to evaluate whether the plan may have a significant impact on the environment and to determine its compliance with the Forest Practice Act, the California Environmental Quality Act and other state and federal laws.

Timber Harvest Regulation on State and Private Timberlands

Regulation of timber harvesting on private and state-owned lands in California occurs under the Z'berg-Nejedly Forest Practice Act of 1973 (FPA) and the California Environmental Quality Act (CEQA). The nine-member Board of Forestry adopts regulations under authority of the FPA and CDF administers those rules.

The Forest Practice Act is intended to regulate timberlands to achieve two goals: (1) to enhance, restore and maintain the productivity of timberland wherever feasible and (2) to achieve maximum sustained production of high quality timber while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment and aesthetic enjoyment.

The California Environmental Quality Act requires that public agencies not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects. The applicant must disclose and identify the significant effects of a project for state agency and public review.

The FPA emphasizes decision making based on the rules. The FPR have been evolving over the last 23 years in response to changing environmental considerations (see Table C-1 as an example of the FPR). CEQA, in contrast, emphasizes case-by-case, open-ended analysis of environmental impacts, alternatives, and mitigation measures. The review of timber harvesting plans is a melding of the two processes.

Board of Forestry

The Board of Forestry is a nine-member part-time board appointed by the governor. The board consists of five public members with no financial interests in the forest products industry, three timber industry members and one member with a range and livestock interest. The Board's general powers include the development and maintenance of an adequate forest policy for the state and setting policy for CDF. The Board establishes the forest practice regulations after public hearings.

Registered Professional Forester (RPF)

California's Professional Forester's Law (PFL) became effective on March 7, 1973. The PFL outlines the guiding principles and responsibilities of the Registered Professional Forester (RPF), and provides the state with professionals who are knowledgeable in developing and carrying out timber harvesting plans. General requirements to become an RPF are seven years' experience in forestry related work of which three years must be under the supervision of an RPF, passing a comprehensive examination administered by the Professional Foresters Examining Committee (PFEC) with a score of 75% or more. The Board of Forestry has authority to take disciplinary action against an RPF failing to abide by good forestry practices.

Licensed Timber Operator (LTO)

The Forest Practice Act requires all timber operators to obtain an annual timber operator's license. A first time applicant must have completed an education program approved by the Department that covers the statutes and regulations governing timber operations in the state and have completed 3000 hours of work experience in two or more areas of employment in timber operations. The Department may revoke or deny the license for a record of noncompliance with the FPR.

Timber Harvesting Plan Review

Under the FPA, a timber harvesting plan (THP) must be prepared and signed by an RPF and submitted to CDF for review and approval for each timber harvest. CDF submits the THP to an interdisciplinary review involving the California Regional Water Quality Boards, the Department of Fish and Game, and the California Geologic Service. Other agencies, such as the Department of Parks and Recreation, may participate when the harvest has the potential to affect resources they are responsible for. The Department is the chair of the review team and has the final decision on the THP. The other agencies may nonconcur in writing and may appeal CDF's decision to the Board of Forestry.

A THP must include a description of the site to be harvested, the types of timber operations to be conducted and mitigation measures to be used consistent with the board's rules. Information concerning silvicultural systems, yarding methods, reforestation methods, erosion control methods, stream protection, road building and erosion hazard potential and erosion control measures must be included in the THP. The RPF must conduct a field investigation to apply the rules with respect to watercourse classification and protection measures, location of sensitive terrain and the development of appropriate mitigation measures or alternatives.

Each THP is subject to a preharvest inspection during the review process. All agencies are invited to attend. After the inspection each attending agency can file a written report and, if necessary, will ask for mitigation for any activity that threatens to cause a significant effect on any forest resource or would violate any other state or federal law, such as the California Endangered Species Act or the Porter-Cologne Water Quality Act. The THP is also subject to public review; CDF will consider all comments by the agencies and the public before making a decision on the plan. CDF's records indicate the majority of the plans incorporate additional mitigation measures before final approval as a result of this review process.

The foundation for the regulation of forest practices in California is the FPR. Due to the variety of individual circumstances of timber harvesting in California, the rules are not strictly prescriptive. Flexibility is allowed to cover a wide variety of site-specific circumstances. However, the underlying principle and goal is to achieve the timber harvesting objective without causing a significant adverse impact to any forest resource.

The following table gives a sample of the FPR that provide protection to forest resources. The table lists the five major resources that affect fisheries and what the rules provide as a minimum and what the rules provide in actual practice. The actual practices are taken from the results of the Department and board's on-going monitoring and auditing program and the results the Department is experiencing with the CSC. This table is presented to show that one must not look solely at the rules to assess the protection that the rules are affording forest resources. California's FPR have minimum standards, which can be adjusted to provide additional protection on a site-specific basis. It should be noted that most THPs have been designed to exceed the minimum standards.

Sustained Yield Plans

The Sustained Yield Plan (SYP) is a long-term timber management plan that addresses long-term sustained yield of timber resources, and a cumulative effects analysis, which includes issues of fish, wildlife, and watershed impacts on a large landscape basis. The SYP may be submitted at the option of the landowner and is intended to supplement the THP process. The SYP is similar to a program EIR or EIS. It covers a broad spectrum of issues on a landscape basis. Regardless, whether the landowner prepares an SYP, individual THP's must be submitted for individual harvest areas. However, a THP may tier to the SYP and need not address issues already discussed and mitigated in the SYP.

If an SYP is not utilized, timberland owners of more than 50,000 acres must incorporate a long-term planning process, often called an Option A. This effort requires demonstration of sustainable productivity over a 100-year planning horizon including consideration of other values such as fish and wildlife. With either of these two processes, timber, fish, wildlife, and watershed issues are addressed on a landscape basis.

Exemptions from Timber Harvesting Plan Requirements

While, certain minor timber harvesting operations are exempted from the preparation and review of a THP, these operations are still subject to the operational portions of the rules. Furthermore, exempted operations must meet ten additional requirements to be considered not having a significant adverse impact on forest resources. The exemptions are for Christmas tree cutting, harvesting dead, dying and diseased trees and fuelwood in amounts less than 10% of the average volume per acre, fire safe harvests of trees within 150' of a dwelling and a one-time conversion of three acres to some other use than the growing and harvesting of timber. The ten additional conditions include:

1) No tractor operations on slopes over 50%.
2) No new construction of tractor roads on slopes over 40%.
3) No tractor operations on known slides and unstable areas.
4) No new road construction or reconstruction.
5) No heavy equipment operation in a watercourse protection zone, except for maintenance of roads and drainage facilities.

Table C-1. A sampling of California's Forest Practice Rules.

KEY WATERSHED PRODUCTS	RULE MINIMUM	RULE AS APPLIED*
Shade and Temperature	Class I (fish bearing) retain at least 50% of the overstory and 50% of the understory canopy covering the ground and adjacent waters in a well distributed multistoried stand.	Hillslope Monitoring Program shows >70% overstory canopy remaining following harvest, on average (measured with a spherical densiometer 1996-1998).
	Class II (intermittent non-fish bearing fish within 1000' downstream) retain at least 50% of the total canopy covering the ground in a well distributed multistoried plan. Class III (ephemeral) where needed to protect the beneficial uses of water as determined by professional judgment. Percentage leave canopy based on site-specific basis. Alternative or in lieu prescriptions may be developed by the RPF or Director on-site specific basis. Prescription must provide equal or greater protection for the quality and beneficial uses of water.	From 1999 through 2001, canopy cover was measured with a sighting tube. Mean canopy levels exceeded the FPR requirements for Class II watercourses. While likely true also for Class I watercourses, overstory and understory canopy were not differentiated in monitoring program.
Large Woody Debris	Retain at least two living conifers per acre at least 16" DBH and 50' tall within 50' of all Class I and II watercourses. Shade canopy retention standards for Class I and II waters.	Landowners encouraged to place LWD in watercourse with Dept. of Fish and Game concurrence. Their high percentage of canopy retention on Class I and II watercourses means there will likely be many LWD recruitment trees left after harvest and any subsequent harvest.
Sediment	**Watercourse and Lake Protection Zones for tractor logging:**	Considering all FPR related to watercourse and lake protection zone (WLPZ), the implementation rate where the Rules were met or exceeded was 98.4%. Ninety-three percent of problem points were associated with departures from the rules.

* **from Cafferata and Munn, 2002**

	Class I: <30% slope, 75'; 30-50% slope, 100', >50% slope, 150'. Class II: <30% slope, 50'; 30-50% slope, 75'; >50% slope, 100'. Class III: WLPZ not required. ELZs have been required since January 1, 1998. EEZs are often specified for these types of watercourses as well. ELZs allow heavy equipment in the zone only where explained in the THP and approved by the Director; EEZs are zones where heavy equipment is totally excluded.	Implementation of WLPZ widths met or exceeded FPR requirements for about 94% of hillslope monitoring transects, with major departures from the Rules about 1% of the time.
	WLPZ Operations and Protection: * Removal of trees to limit of shade canopy retention standards * No construction or reconstruction of roads, tractor roads, or landing unless specifically approved by Director. * Trees cut in WLPZ felled away from watercourse. * Where less than 50% canopy exists prior to timber operations only sanitation salvage may occur. * At least 75% surface cover and undisturbed area shall be retained. * No heavy equipment use in timber felling yarding or site preparation unless specifically approved. * Areas of mineral soil exceeding 800 square feet exposed by timber operations treated for reduction of soil loss. * Where necessary to protect the beneficial uses of water any amount of area can be required to be seeded, mulched or replanted.	Canopy retention generally exceeds FPR minimum requirements In all cases, surface cover exceeded Rule standards
	* Broadcast burning prohibited. **Road and Landing Construction:**	The Rules associated with *road construction and maintenance* were met or exceeded 93.2%. Rules related to *landings* were met or exceeded 93.5% of the time. 98% of the problem points on roads, and all of the problems on landings were associated with departures from the FPR.

	* Road construction on slopes over 65% requires full bench construction. * Through fills constructed in one-foot lifts * Drainage facilities required to pass 50-year storm event. * Trash or debris racks required when necessary. * Drain facilities shall not discharge erodible fill or other erodible material. Energy dissipaters to be used. * Drainage facilities in place by October 15 each year * No road construction under saturated soil conditions. * Roads used for hauling in winter period shall be surfaced with rock in depth and quantity sufficient to maintain a stable road surface. * Permanent watercourse crossings shall be constructed or maintained to prevent diversion of stream overflow down the road. * All roads and tractor roads except those with permanent drainage facilities are waterbarred by October 15. * During timber operations road running surfaces shall be treated for stabilization to prevent excessive loss of road surface materials.	Overall, the rules governing *watercourse crossings* were met or exceeded 86.3% of the time. This rule was cited with the highest frequency of departures.
	* Drainage structures shall be maintained to allow free flow of water and minimize soil erosion. * Maintain for erosion controls in roads, tractor roads and landing is at least 1 year and can be increased to 3 years. * Cut, fill, or sidecast slopes are to be treated.	

	*Tractor operations prohibited on slopes over 65%; slopes over 50% with a high or extreme erosion hazard rating; slopes over 50% which lead with flattening to sufficiently dissipate water flow and trap sediment.	Rules related specifically to *skid trails* were met or exceeded 95.1% of the time, and about 0.2% of the problems occurred under these situations. 99.8% of the problems were associated with departures from FPR.
Flow	Stream crossing shall allow for unrestricted passage of fish and water.	
Nutrients	Green slash is required to be removed from the stream if deposited by timber operations.	
Cumulative Impacts	Requires an assessment of on-site and off-site interactions of proposed project activities with the impacts of past and reasonably foreseeable future projects.	Each THP is evaluated on an on-site specific basis. THP not approved if cumulative effect analysis inadequate.

6) No known sites of rare, threatened or endangered plants or animals will be disturbed, threatened or damaged.
7) No timber harvesting in a watercourse and lake protection zone except for sanitation-salvage harvesting.
8) No timber operations in a buffer zone of a species of special concern.
9) Operations in a Special Treatment Area will conform to special rules of the Special Treatment Area.
10) No timber operations on any significant archaeological or historical site.

Under certain emergency conditions, timber operations may begin without an approved THP. However, a Notice of Emergency Operations is required. This notice is submitted by an RPF with a declaration, under penalty of perjury, that a bona fide emergency does exist and that immediate harvesting of trees is warranted. Timber operations may begin 5 days after the Department receives the notice and may not extend more than 120 days unless a THP is submitted to and approved by the Department. Emergency timber operations must comply with all operational FPR. The Department places a high priority on field inspections of emergency operations because, unlike the exemption harvesting, emergency harvesting can be a full blown timber operation with potential for environmental damage. The following types of conditions constitute emergencies:

1) Dead, dying trees as a result of insects, disease, parasites or animal damage.
2) Fallen, damaged, dead or dying trees as a result of wind, snow, freezing weather, fire, flood, landslide, earthquake or air and water pollution.
3) Cutting or removing trees required for the emergency repair of roads.
4) Potential financial loss of timber that was previously inoperable or unmerchantable because of access, location, condition, or timber volume, if the harvest of this timber has become unexpectedly feasible, and the opportunity to harvest will not be economically feasible for more than 60 days, provided that the operations will have only minimal impact on timber resources.

Enforcement of the Forest Practice Regulations

After the THP has been approved, CDF will make periodic compliance inspections of the harvesting operations. The operation must not only comply with the FPR but also any special provisions in the THP. The timber operations are conducted by a licensed timber operator. The operator's license may be suspended, revoked or denied for violations of the FPR. Violations of the regulations are misdemeanors and punishable by a fine of not more than $1,000 or by imprisonment in the county jail for not more than 6 months. The Department has authority through the FPA to issue stop work orders, file Notices to Take Corrective Action and issue liens on property if corrective action has to be done by the state. Registered Professional Foresters may also be censured through the Professional Foresters Licensing Committee of the Board of Forestry. The Department conducts thousands of inspections of timber operations yearly, with violation notices, infraction fines, and prosecution of misdemeanor cases by county District Attorneys when appropriate.

Regulatory Changes

Since the signing of the original redband CA, the Board of Forestry has adopted additional rules for both watershed protection and watercourse and lake protection. Specific rules adopted include:

- Extending the winter operating period to May 1 for installing erosion control structures on roads, landings and skid trails concurrent with operations.
- Providing for 50-foot Equipment Limitation Zones (ELZ) on most Class III watercourses. This will offer greater protection from the introduction of sediment into these ephemeral watercourses. Such sediment would have a potential of reaching the higher order streams and causing sediment problems.
- Prohibiting the use of roads under saturated soil conditions.
- Requiring stabilization of approaches to watercourse crossings.
- Adopting and then extending special protections for endangered salmonids within defined "threatened and impaired watersheds."
- Increasing protection for endangered anadromous salmonids by requiring the mapping and evaluation of spawning and rearing habitat as well as specific conditions impacting those watercourse areas.
- Additional rules have been adopted that concern planning and operational practices. These include: Adding opportunities for public comment and review of THPs.
- Increasing the responsibilities of the RPF, LTO, and THP submitter. RPF must now have enough involvement in the conduct of THP operations to be able to provide professional advice to the LTO and timberland owner, to sufficiently advise on the progress of timber operations, and to notify the LTO of potential environmental damage.
- Emphasizing use of planning watersheds for which management and impacts are assessed and planned.
- Requiring additional levels of evaluation and disclosure by the RPF when large, old trees are prepared for removal under the exemption process.
- Encouraging retention of large trees, snags, and decadent trees by allowing their use in meeting stocking requirements.
- Adding rule provisions to update the protection of archaeological sites.
- Emphasizing consideration of hardwood retention in the cumulative effects assessment.
- Water Quality Waivers from Waste Discharge Permits

Pursuant to Section 208 of the Clean Water Act, the US EPA approved the State Water Resources Control Board's certification of the USFS' water quality plan and best management practices.

Prior to January 1, 2003, on non-federal land, California's Water code 13269, in combination with a Management Agency Agreement between the Board of Forestry and the California Regional Water Quality Control Boards, allowed a waiver from requirements of waste discharge to silvicultural activities as long as they were approved under a THP. Senate Bill 390 (2003) amended Section 13269 to provide for the expiration of

all then-current waivers on December 31, 2002. The Central Valley Water Quality Control Board under Resolution
R5-2003-0005 has approved a new process. This Resolution allows a waiver from a waste discharge permit provided certain conditions are met and certified by the RPF. These conditions include compliance with applicable water quality control plans, compliance with the approved THP, disclosure of water quality sensitive conditions, additional professional field review, if necessary, noncommercial riparian vegetation retention, stream temperature maintenance and protection, and notification of herbicide use. Compliance reports by the RPF are required upon completion of operations.

Continuing Education

Both private and state foresters need additional training on the needs of salmon and other fisheries and how they can provide protection when developing and proposing a timber harvesting plan. A Watershed Academy has been developed cooperatively between the Department and the Department of Fish and Game. The academy stresses fish biology, watershed analysis and mitigation. The watershed assessment portion includes road assessment techniques that are designed to catalog road problems and prioritized their corrective work. This week long program will continue to be given through the University of California Extension Service. Furthermore, additional training is provided through private organizations such as the California Licensed Foresters Association, Associated California Loggers and the California Forestry Association.

Policy Changes

The Department and board do not anticipate the changing of any policies at this time.

Organizational Changes

The organizational structure of the Department is not expected to change. The preliminary results of the monitoring program points out some areas of the rules that need to be emphasized in the Department's inspection program. The Department's audit foresters will use the data to place greater emphasis in areas of the rules that are showing a 10-30% noncompliance.

Funding

Funding for the resource management program comes from both state forest timber sales and general fund sources. The present (2005) budget is approximately $35 million annually.

Monitoring of Forest Practices on State and Private Timberlands

The Monitoring Study Group (MSG) was formed by the Board of Forestry in 1989 to develop a Long-Term Monitoring Program (LTMP) for assessing the effectiveness of the FPR in protecting water quality. The group is made up of members of the public, resource agencies and the timber industry. Several projects have been carried out over the past five years that has allowed the LTMP to proceed.

The primary objective of the LTMP is to provide an ongoing assessment of the effectiveness of the FPR, as implemented, in protecting the most sensitive beneficial uses of water; i.e., coldwater fisheries and domestic water supplies) through implementation, effectiveness, and project monitoring.

The LTMP results will be provided to the BOF and the public in a timely manner to contribute effectively to BOF's program for reviewing and, where necessary, strengthening the Rules' performance as best management practices (BMPs).

The LTMP has an in-stream and hillslope component. The data regarding how the FPR are being applied (Table C-1, right column) comes from the Hillslope Monitoring Program (Cafferata & Munn, 2002). The Program has been evaluating the implementation and effectiveness of California forest practices since 1996. The project began with field inspections of 50 THPs in Humboldt and Mendocino counties and every year since then a random sample of 50 plans from throughout the state have been evaluated on site. As part of the program, detailed information has been collected during summer months on plans that have gone through one to four winters after harvesting was completed. In the period from 1996 to 2001, 295 THPs were sampled. Results as of the 2002 Report of the Hillslope Monitoring Program show that implementation rates of the FPR related to water quality are high and that practices required by the rules and the review process are effective in preventing hillslope erosion features when properly implemented. Overall implementation rates were greater than 93 percent for landing, road, skid trail, and watercourse protection zone transects. Watercourse crossings had the lowest overall implementation ratings at 86 percent. Implementation of applicable Rules at problem points was nearly always found to be less than that required by the FPR.

In addition to the hillslope monitoring efforts the Department of Fish and Game has produced an Instream Monitoring Handbook describing in detail how to develop and implement an instream-monitoring program. In addition, the department is working with the North Coast Regional Water Quality Board and the Mendocino County Resource Conservation District in developing an instream-monitoring plan for the Garcia River Watershed.

REFERENCES CITED

Cafferata, Peter H., and John R. Munn, 2002. Hillslope Monitoring Program: Monitoring Results from 1996 through 2001. California Department of Forestry and Fire Protection. Sacramento, CA. 128 pp.

APPENDIX E

U.S. Fish and Wildlife Policy for Evaluation of Conservation Efforts When Making Listing Decisions

SUMMARY: We, the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) (the Services), announce a final policy for the evaluation of conservation efforts when making listing decisions (PECE) under the Endangered Species Act of 1973, as amended (Act). While the Act requires us to take into account all conservation efforts being made to protect a species, the policy identifies criteria we will use in determining whether formalized conservation efforts that have yet to be implemented or to show effectiveness contribute to making listing a species as threatened or endangered unnecessary. The policy applies to conservation efforts identified in conservation agreements, conservation plans, management plans, or similar documents developed by Federal agencies, state and local governments, Tribal governments, businesses, organizations, and individuals.

DATES: This policy is effective April 28, 2003.

AUTHORITY: The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)

POLICY PURPOSE: The Fish and Wildlife Service and National Marine Fisheries Service developed this policy to ensure consistent and adequate evaluation of formalized conservation efforts (conservation efforts identified in conservation agreements, conservation plans, management plans, and similar documents) when making listing decisions under the Act. This policy may also guide the development of conservation efforts that sufficiently improve a species' status so as to make listing the species as threatened or endangered unnecessary.

DEFINITIONS

''Adaptive management'' is a method for examining alternative strategies for meeting measurable biological goals and objectives, and then, if necessary, adjusting future conservation management actions according to what is learned.

''Agreements and plans'' include conservation agreements, conservation plans, management plans, or similar documents approved by federal agencies, state and local governments, Tribal governments, businesses, organizations, or individuals.

''Candidate species,'' as defined by regulations at 50 CFR 424.02(b), means any species being considered for listing as an endangered or a threatened species, but not yet the subject of a proposed rule. However, the FWS includes as candidate species those species for which the FWS has sufficient information on file relative to status and threats to support issuance of proposed listing rules. The NMFS includes as candidate species those species for which it has information indicating that listing may be warranted, but for which sufficient information to support actual proposed listing rules may be lacking. The term ''candidate species'' used in this policy refers to those species designated as candidates by either of the Services.

''Conservation efforts,'' for the purpose of this policy, are specific actions, activities, or programs designed to eliminate or reduce threats or otherwise improve the status of a species. Conservation efforts may involve restoration, enhancement, maintenance, or protection of habitat; reduction of mortality or injury; or other beneficial actions.

''Formalized conservation efforts'' are conservation efforts identified in a conservation agreement, conservation plan, management plan, or similar document. An agreement or plan may contain numerous conservation efforts.

POLICY SCOPE: When making listing decisions, the Services will evaluate whether formalized conservation efforts contribute to making it unnecessary to list a species, or to list a species as threatened rather than endangered. This policy applies to those formalized conservation efforts that have not yet been implemented or have been implemented, but have not yet demonstrated whether they are effective at the time of a listing decision. We will make this evaluation based on the certainty of implementing the conservation effort and the certainty that the effort will be effective.

This policy identifies the criteria we will use to help determine the certainty of implementation and effectiveness. Listing decisions covered by the policy include findings on petitions to list species, and decisions on whether to assign candidate status, remove candidate status, issue proposed listing rules, and finalize or withdraw proposed listing rules.

This policy applies to formalized conservation efforts developed with or without a specific intent to influence a listing decision and with or without the involvement of the Services. Section 4(a)(1) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1533(a)(1)), states that we must determine whether a species is threatened or endangered because of any of the following five factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. Although this language focuses on impacts negatively affecting a species, section 4(b)(1)(A) requires us also to ''take[e] into account those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species, whether by predator control, protection of habitat and food supply, or other conservation practices, within any area under its jurisdiction, or on the high seas.''

Read together, Sections 4(a)(1) and 4(b)(1)(A), as reflected in our regulations at 50 CFR 424.11(f), require us to take into account any State or local laws, regulations, ordinances, programs, or other specific conservation measures that either positively or negatively affect a species' status (i.e., measures that create, exacerbate, reduce, or remove threats identified through the section 4(a)(1) analysis). The manner in which the section 4(a)(1) factors are framed supports this conclusion. Factor (D) for example—the inadequacy of existing regulatory mechanisms''— indicates that overall we might find existing regulatory mechanisms adequate to justify a determination not to list a species. Factor (E) in section 4(a)(1) (any ''manmade factors affecting [the species'] continued existence'') requires us to consider the pertinent laws, regulations, programs, and other specific actions of any entity that either positively or negatively affect the species. Thus, the analysis outlined in section 4 of the Act requires us to consider the conservation efforts of not only State and foreign governments but also of Federal agencies, Tribal governments, businesses, organizations, or individuals that positively affect the species' status.

While conservation efforts are often informal, such as when a property owner implements conservation measures for a species simply because of concern for the species or interest in protecting its habitat, and without any specific intent to affect a listing decision, conservation efforts are often formalized in conservation agreements, conservation plans, management plans, or similar documents. The development and implementation of such agreements and plans has been an effective mechanism for conserving declining species and has, in some instances, made listing unnecessary. These efforts are consistent with the Act's finding that ''encouraging the States and other interested parties * * * to develop and maintain conservation programs * * * is a key * * * to better safeguarding, for the benefit of all citizens, the Nation's heritage in fish, wildlife, and plants'' (16 U.S.C. 1531 (a)(5)).

In some situations, a listing decision must be made before all formalized conservation efforts have been implemented or before an effort has demonstrated effectiveness. We may determine that a formalized conservation effort that has not yet been implemented has reduced or removed a threat to a species when we have sufficient certainty that the effort will be implemented and will be effective.

Determining whether a species meets the definition of threatened or endangered requires us to analyze a species' risk of extinction. Central to this risk analysis is an assessment of the status of the species (i.e., is it in decline or at risk of decline and at what rate is the decline or risk of decline) and consideration of the likelihood that current or future conditions or actions will promote (see Section 4(b)(1)(A)) or threaten a species' persistence. This determination requires us to make a prediction about the future persistence of a species, including consideration of both future negative and positive effects of anticipated human actions. The language of the Act supports this approach. The definitions for both ''endangered species'' and ''threatened species'' connote future condition, which indicates that consideration of whether a species should be listed depends in part on identification and evaluation of future actions that will reduce or remove, as well as create or exacerbate, threats to the species. The first factor in section 4(a)(1)—''the present or *threatened* destruction, modification, or curtailment of [the species'] habitat or range''—identifies how analysis of both current actions affecting a species' habitat or range and those actions that are sufficiently certain to occur in the future and affect a species' habitat or range are necessary to assess a species' status. However, future Federal, State, local, or private actions that affect a species are not limited to actions that will affect a species' habitat or range. Congress did not intend for us to consider future actions affecting a species' habitat or range, yet ignore future actions that will influence overutilization, disease, predation, regulatory mechanisms, or other natural or manmade factors. Therefore, we construe Congress' intent, as reflected by the language of the Act, to require us to consider both current actions that affect a species' status and sufficiently certain future actions—either positive or negative—that affect a species' status.

As part of our assessment of future conditions, we will determine whether a formalized conservation effort that has yet to be implemented or has recently been implemented but has yet to show effectiveness provides a high level of certainty that the effort will be implemented and/or effective and results in the elimination or adequate reduction of the threats. For example, if a state recently designed and approved a program to eliminate collection of a reptile being considered for listing, we must assess how this program affects the status of the species. Since the program was just designed, an implementation and effectiveness record may not yet exist. Therefore, we must evaluate the likelihood, or certainty, that it will be implemented and effective, using evidence such as the State's ability to enforce new regulations, educate the public, monitor compliance, and monitor the effects of the program on the species. Consequently, we would determine that the program reduces the threat of overutilization of the species through collecting if we found sufficient certainty that the program would be implemented and effective.

In another example, a state could have a voluntary incentive program for protection and restoration of riparian habitat that includes providing technical and financial assistance for fencing to exclude livestock. Since the state has already implemented the program, the state does not need to provide certainty that it will be implemented. If the program was only recently implemented and no record of the effects of the program on the species' status existed, we would evaluate the effectiveness of this voluntary program at the time of our listing decision. To assess the effectiveness, we would evaluate the level of participation (e.g., number of participating landowners or number of stream-miles fenced), the length of time of the commitment by landowners, and whether the program reduces the threats on the species. We would determine that the program reduces the threat of habitat loss and degradation if we find sufficient certainty that the program is effective.

In addition, we will consider the estimated length of time that it will take for a formalized conservation effort to produce a positive effect on the species. In some cases, the nature, severity, and/or imminence of threats to a species may be such that a formalized conservation effort cannot be expected to produce results quickly enough to make listing unnecessary since we must determine at the time of the listing decision that the conservation effort has improved the status of the species.

Federal agencies, Tribal governments, state and local governments, businesses, organizations, or individuals contemplating development of an agreement or plan should be aware that, because the Act mandates specific timeframes for making listing decisions, we cannot delay the listing process to allow additional time to complete the development of an agreement or plan. Nevertheless, we encourage the development of agreements and plans even if they will not be completed prior to a final listing decision. Such an agreement or plan could serve as the foundation for a special rule under Section 4(d) of the Act, which would establish only those prohibitions necessary and advisable for the conservation of a threatened species, or for a recovery plan, and could lead to earlier recovery and delisting.

This policy provides us guidance for evaluating the certainty of implementation and effectiveness of formalized conservation efforts. This policy is not intended to provide guidance for determining the specific level of conservation (e.g., number of populations or individuals) or the types of conservation efforts (e.g., habitat restoration, local regulatory mechanisms) specifically needed to make listing particular species unnecessary and does not provide guidance for determining when parties should enter into agreements.

We do encourage early coordination in conservation measures to prevent the species from meeting the definition of endangered or threatened. If we make a decision not to list a species or to list the species as threatened rather than endangered based in part on the contributions of a formalized conservation effort, we will track the status of the effort including the progress of implementation and effectiveness of the conservation effort. If any of the following occurs: (1) a failure to implement the conservation effort in accordance with the implementation schedule; (2) a failure to achieve objectives; (3) a failure to modify the conservation effort to adequately address an increase in the severity of a threat or to address other new information on threats; or (4) we receive any other new information indicating a possible change in the status of the species, then we will reevaluate the status of the species and consider whether initiating the listing process is necessary. Initiating the listing process may consist of designating the species as a candidate species and assigning a listing priority, issuing a proposed rule to list, issuing a proposed rule to reclassify, or issuing an emergency listing rule.

In some cases, even if the parties fully implement all of the conservation efforts outlined in a particular agreement or plan, we may still need to list the species. For example, this may occur if conservation efforts only cover a portion of a species' range where the species needed to be conserved, or a particular threat to a species was not anticipated or addressed at all, or not adequately addressed, in the agreement or plan.

EVALUATION CRITERIA: Conservation agreements, conservation plans, management plans, and similar documents generally identify numerous conservation efforts (i.e., actions, activities, or programs) to benefit the species. In determining whether a formalized conservation effort contributes to forming a basis for not listing a species, or for listing a species as threatened rather than endangered, we must evaluate whether the conservation effort improves the status of the species under the Act.

Two factors are key in that evaluation: (1) for those efforts yet to be implemented, the certainty that the conservation effort will be implemented, and (2) for those efforts that have not yet demonstrated effectiveness, the certainty that the conservation effort will be effective. Because the certainty of implementation and effectiveness of formalized conservation efforts may vary, we will evaluate each effort individually and use the following criteria to direct our analysis.

A The certainty that the conservation effort will be implemented:

1. The conservation effort, the party(ies) to the agreement or plan that will implement the effort, and the staffing, funding level, funding source, and other resources necessary to implement the effort are identified.
2. The legal authority of the party(ies) to the agreement or plan to implement the formalized conservation effort, and the commitment to proceed with the conservation effort are described.
3. The legal procedural requirements (e.g. environmental review) necessary to implement the effort are described, and information is provided indicating that fulfillment of these requirements does not preclude commitment to the effort.
4. Authorizations (e.g., permits, landowner permission) necessary to implement the conservation effort are identified, and a high level of certainty is provided that the party(ies) to the agreement or plan that will implement the effort will obtain these authorizations.
5. The type and level of voluntary participation (e.g., number of landowners allowing entry to their land, or number of participants agreeing to change timber management practices and acreage involved) necessary to implement the conservation effort is identified, and a high level of certainty is provided that the party(ies) to the agreement or plan that will implement the conservation effort will obtain that level of voluntary participation (e.g., an explanation of how incentives to be provided will result in the necessary level of voluntary participation).
6. Regulatory mechanisms (e.g., laws, regulations, ordinances) necessary to implement the conservation effort are in place.
7. A high level of certainty is provided that the party(ies) to the agreement or plan that will implement the conservation effort will obtain the necessary funding.
8. An implementation schedule (including incremental completion dates) for the conservation effort is provided.
9. The conservation agreement or plan that includes the conservation effort is approved by all parties to the agreement or plan.

B. The certainty that the conservation effort will be effective:

1. The nature and extent of threats being addressed by the conservation effort are described, and how the conservation effort reduces the threats is described.
2. Explicit incremental objectives for the conservation effort and dates for achieving them are stated.
3. The steps necessary to implement the conservation effort are identified in detail.
4. Quantifiable, scientifically valid parameters that will demonstrate achievement of objectives, and standards for these parameters by which progress will be measured, are identified.
5. Provisions for monitoring and reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the conservation effort are provided.
6. Principles of adaptive management are incorporated.

These criteria should not be considered comprehensive evaluation criteria. The certainty of implementation and effectiveness of a formalized conservation effort may also depend on species-specific, habitat-specific, location-specific, and effort-specific factors. We will consider all appropriate factors in evaluating formalized conservation efforts. The specific circumstances will also determine the amount of information necessary to satisfy these criteria.

To consider that a formalized conservation effort(s) contributes to forming a basis for not listing a species or listing a species as threatened rather than endangered, we must find that the conservation effort is sufficiently certain to be implemented and effective so as to have contributed to the elimination or adequate reduction of one or more threats to the species identified through the section 4(a)(1) analysis. The elimination or adequate reduction of Section 4(a)(1) threats may lead to a determination that the species does not meet the definition of threatened or endangered, or is threatened rather than endangered.

An agreement or plan may contain numerous conservation efforts, not all of which are sufficiently certain to be implemented and effective. Those conservation efforts that are not sufficiently certain to be implemented and effective cannot contribute to a determination that listing is unnecessary or a determination to list as threatened rather than endangered.

Regardless of the adoption of a conservation agreement or plan, however, if the best available scientific and commercial data indicate that the species meets the definition of ''endangered species'' or ''threatened species'' on the day of the listing decision, then we must proceed with appropriate rule-making activity under section 4 of the Act.

DATED: September 16, 2002.

Steve Williams,
Director, Fish and Wildlife Service.
December 23, 2002

William T. Hogarth,
Assistant Administrator for Fisheries,
National Marine Fisheries Services

REFERENCE:
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APPENDIX F

Historic McCloud redband abundance trends in the Upper McCloud River Basin for 1975-2005.

Stream	Year	Trout per Mile (est)	Sampling Technique	Water Year
Tate Creek				
upper	1975	393	mark-recapture	normal
lower	1975	552	mark-recapture	normal
site 2	2001	1320	multipass electro	dry
site 1	2001	4857	multipass electro	dry
site 2	2002	1478	multipass electro	dry
site 1	2002	1531	multipass electro	dry
site 2	2003	581	multipass electro	normal
site 1	2003	1162	multipass electro	normal
site 2	2004	792	multipass electro	normal
site 1	2004	1901	multipass electro	normal
site 2	2005	1478	multipass electro	wet
site 1	2005	2534	multipass electro	wet
Trout Creek				
…..	1981	755+	single-pass electro	normal
…..	1983	400+	single-pass electro	normal
section 1	1986	1060	multipass electro	normal
section 2	1986	1067	multipass electro	normal
section 3	1986	1237	multipass electro	normal
section 3	1990	864+	single-pass electro	dry
site 1	2000	370	multipass electro	wet
site 2	2000	898	multipass electro	wet
site 3	2000	1584	multipass electro	wet
site 4	2000	1162	multipass electro	wet
site 1	2001	2006	multipass electro	dry
site 2	2001	370	multipass electro	dry
site 3	2001	9768	multipass electro	dry
site 4	2001	6811	multipass electro	dry
site 1	2002	2006	multipass electro	dry
site 2	2002	634	multipass electro	dry
site 3	2002	792	multipass electro	dry
site 4	2002	2482	multipass electro	dry
site 5	2002	2587	multipass electro	dry
site 6	2002	581	multipass electro	dry
site 1	2003	1003	multipass electro	normal
site 2	2003	475	multipass electro	normal
site 3	2003	158	multipass electro	normal

site 4	2003	1320	multipass electro	normal
site 5	2003	1320	multipass electro	normal

Historic McCloud redband abundance trends in the Upper McCloud River Basin for 1975-2005. (cont'd)

Stream	Year	Trout per Mile (est)	Sampling Technique	Water Year
site 6	2003	211	multipass electro	normal
site 1	2004	1637	multipass electro	normal
site 2	2004	1214	multipass electro	normal
site 3	2004	739	multipass electro	normal
site 4	2004	2798	multipass electro	normal
site 5	2004	2429	multipass electro	normal
site 6	2004	3115	multipass electro	normal
site 1	2005	1372	multipass electro	wet
site 2	2005	897	multipass electro	wet
site 3	2005	475	multipass electro	wet
site 4	2005	844	multipass electro	wet
site 5	2005	1372	multipass electro	wet
site 6	2005	1320	multipass electro	wet
Edson Creek				
…..	1975	315	mark-recapture	normal/high
…..	1979	57	visual	start of wet
…..	1992	400+	single-pass electro	dry
Moosehead Creek				
lower	1975	856	mark-recapture	normal
middle	1975	810	mark-recapture	normal
middle	1990	326+	single-pass electro	dry
Sheepheaven Creek				
……	1975	250	mark-recapture	normal
……	1979	400+	single-pass electro	wet
upper	1986	1779	multipass electro	normal
middle	1986	400	multipass electro	normal
lower	1986	668	multipass electro	normal
lower	1992	100+	single-pass electro	dry
site 1	2001	317	multipass electro	dry
site 1	2002	211	multipass electro	dry
site 1	2003	211	multipass electro	normal
site 1	2004	422	multipass electro	normal
site 1	2005	---	not sampled	wet
Swamp Creek				
…..	1979	400+	single-pass electro	wet
above upper culvert	1986	248	multipass electro	normal

Historic McCloud redband abundance trends in the Upper McCloud River Basin for 1975-2005. (cont'd)

Stream	Year	Trout per Mile (est)	Sampling Technique	Water Year
between culverts	1986	324	multipass electro	normal
below lower culvert	1986	120	multipass electro	normal
Raccoon Creek				
…..	1990	90+	single-pass electro	dry
Upper McCloud River				
below Upper Falls	1986	2820	multipass electro	normal
below Lakin Dam	1986	260	multipass electro	normal
below Cattle Camp	1986	1009	multipass electro	normal
site 1	2001	4594	multipass electro	dry
site 2	2001	1320	multipass electro	dry
site 1	2002	6706	multipass electro	dry
site 2	2002	1690	multipass electro	dry
site 1	2003	2323	multipass electro	normal
site 2	2003	370	multipass electro	normal
site 1	2004	2059	multipass electro	normal
site 2	2004	476	multipass electro	normal
site 1	2005	2956	multipass electro	wet
site 2	2005	53	multipass electro	Wet

[1] Abundance estimates are based on various sampling techniques with some techniques providing more precise estimates than others.

APPENDIX G

December 13, 2013

Upper McCloud River Redband Trout Reintroduction Plan

1.0 Background

The McCloud River, located in Shasta and Siskiyou counties, originates southeast of Mount Shasta and flows into McCloud Reservoir and then to Lake Shasta (the McCloud River was historically a tributary to the Pit River). The McCloud River is commonly described in terms of an upper and lower river component. The separation is formed by a series of natural waterfalls (Lower Falls, Middle Falls, and Upper Falls) and it is believed that Middle Falls prevents upstream migration of fish (historical limit to anadromy). The upper McCloud River basin is located on the east/southeast side of Mount Shasta and contains numerous small spring creeks surrounded by volcanic porous soils. The only native fish to the upper McCloud River - McCloud River redband trout (*Oncorhynchus mykiss stonei*), is a unique subspecies of coastal rainbow trout (*O. mykiss*) found only in the McCloud River basin.

The upper McCloud River contains non-native trout species due to hatchery introductions that began in the late 1800's. These introductions included coastal rainbow trout, brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*). In 1994, due to concerns related to hybridization with McCloud River redband, stocking of hatchery rainbow trout was ceased in the upper McCloud River above Middle Falls. The last tributary of the upper McCloud stocked with hatchery fish was Trout Creek (1976). Decades of stocking, coupled with the unique geology, and hydrology of the upper watershed have resulted in varying levels of redband/coastal rainbow introgression within the basin.

In the 1970's, the Department of Fish and Game (Department) translocated McCloud River redband trout from Sheepheaven Creek (believed to be the best genetic representative of McCloud River redband) to other tributaries within the basin in order to protect this distinct local population. In response to drought conditions which significantly reduced Sheepheaven Creek habitat in 1973 and 1974, the Department introduced McCloud River redband from Sheepheaven Creek to Swamp Creek. Swamp Creek was believed to be fishless prior to this introduction.

In 1977, again due to threats of severe drought conditions, the Department chemically treated Trout Creek to remove all fish in order to re-stock with McCloud River redband from Sheepheaven Creek. The Department has not stocked Trout Creek with any hatchery trout since this reintroduction.

There are no Department records of translocations of McCloud River redband from Sheepheaven Creek to other known genetically distinct redband streams - Bull, Dry, Edson, or Moosehead creeks or from any other source population.

As part of a redband genetics project, the Department (working with the U.C. Davis Genomic Variation Laboratory) collected McCloud River redband/rainbow trout tissue samples from the McCloud River drainage (upper and lower sections) to be analyzed for unique McCloud River redband genetic markers and genetic fitness. The results of the genetics project indicated distinct McCloud River redband trout were still present in the upper McCloud River drainage, but were restricted to seven small streams and some tributaries to these streams (Bull, Dry, Edson, Moosehead, Sheepheaven, Swamp and Trout creeks) (Simmons et al. 2010, Simmons et al. 2013). Edson, Sheepheaven, Moosehead, and Swamp creeks should be managed collectively and considered a single Management Unit (Simmons et.al. 2013). Other streams, such as Bull and Dry creeks, may be included in the Management Unit in the future; however, additional genetic samples are needed to validate their integrity and relationship to already identified McCloud redband populations.

In general, levels of McCloud River redband/coastal rainbow trout introgression within the upper McCloud River tributaries increase in streams or stream segments with hydrologic connectivity and close proximity to the mainstem McCloud River. The unique porous volcanic terrain of the upper McCloud River basin has created a hydrologically isolated environment (connectivity in many tributaries only occurs during extreme wet conditions) which has likely protected Sheepheaven, Edson, Swamp, and Trout creeks from invasion of coastal rainbow trout, introgressed coastal rainbow trout x McCloud redband and non-native trout. In contrast, Bull, Dry, and Moosehead creeks (southern tributaries) can be hydrologically connected (seasonally) to the mainstem McCloud River. However, upper reaches of these creeks have likely been (and continue to be) protected from upstream invasion by introgressed and non-native trout species through a combination of limited hydrologic connectivity with the mainstem McCloud River and natural or man-made fish barriers.

1.1 Overview

In June, 2011 the Department's Heritage and Wild Trout Program (Program) conducted single-pass backpack electrofishing in Sheepheaven Creek to document the status of this localized McCloud River redband population. The sampling effort indicated that the Sheepheaven Creek population is very limited in number and does not exhibit multiple life stages (age classes). The sampling results prompted the Program to reschedule staff to conduct a more thorough sampling effort in August, 2011, (multi-pass electrofishing to generate population estimates) in the other streams,(based on genetic information for 2010) that are known to contain genetically distinct McCloud redband (Edson, Moosehead, and Swamp creeks). The results are as follows:

	Edson	Moosehead	Sheepheaven	Swamp
Fish Occupied Habitat (mile)	0.8	1.9	0.5	2.3
Fish-per-Mile	805	557	86	789
Estimated Population	644	1,059	43	1,814

The Department has developed McCloud River redband trout density data (fish-per-mile) in Sheepheaven Creek for seven different years between 1975 and 2011. The highest documented density within this time frame was 949 (1986). The lowest reported fish-per-mile within this time frame was 86 (2011). The average for the seven years surveyed is 349 fish-per-mile.

Comparing historical data with the most current surveys, redband populations in Edson, Moosehead, and Swamp creeks appear to be stable, but all streams (including Sheepheaven Creek) have very limited perennial instream habitats.

Recent genetic findings from Simmons et al. (2010, 2013) indicate at least several localized populations (Cow, Sheepheaven, and Swamp creeks) have lost genetic fitness (genetically bottlenecked). In addition, the Sheepheaven Creek population structure has shifted towards sub-adult and adults stages, occupied habitat is very limited (0.5 miles in 2011), and the extremely low population size (estimated at 43 individuals in 2011, but was likely underestimated based on subsequent observations and relocation efforts) make this population very susceptible to further genetic degradation and localized extinction.

The following reintroduction plan has been developed with the most current available data (genetic and population) for McCloud River redband and provides strategies and actions to protect and conserve upper McCloud River redband populations. Ultimately, a genetics management plan will be developed and implemented to guide future actions for reestablishing, conserving, and enhancing McCloud River redband populations. Until the genetics management plan is developed and implemented, this reintroduction plan serves to provide immediate management strategies for protection and conservation of McCloud River redband populations. The forthcoming McCloud River redband trout genetics management plan will be a high priority of the Department's trout management programs.

1.2 Reintroduction factors/requirements

Based on recent fish population and habitat surveys, along with findings from genetic analyses, the Department recommends that a reintroduction effort be conducted as soon as possible for populations susceptible to localized extinction and/or are considered genetically bottlenecked, but only if the following determining factors below are met:

(1) extremely low estimated population size

(2) limited effective population;

(3) suitable habitat is available in sufficient amounts, but is unoccupied or occupied in low density;

(4) nearby donor stocks occur in streams with no connectivity and cannot naturally recolonize;

(5) genetically suitable donor stocks are available and their population(s) can likely withstand extraction of individuals without compromising population stability or genetic integrity;

(6) genetic analysis indicates low genetic diversity;

(7) historic flow conditions during drought periods indicate that available habitat may be limited to fragmented stream segments or isolated pools;

(8) extant population is not evenly distributed throughout or across available habitats; and

(9) age and size class distribution appears to be limited to sub-adults and adults, indicating potentially limited or absent spawning and/or poor early life-stage recruitment.

2.0 Reintroduction Plan and Implementation Strategy

Prior to any reintroduction, the Department will perform habitat and fish density assessments for both receiving and donor populations. If the survey results indicate that:

(1) there is a significant risk to the existing population if no action is taken;

(2) there is suitable habitat available in the receiving creek and no apparent stressors that would limit trout production; and

(3) there are extant redband populations that have appropriate genetics, sufficient size/age class density and diversity, and lack of disease to allow for removal as donor stocks; then a reintroduction plan and implementation strategy is warranted.

If any of these assessments do not support the concept of donor transfer into a receiving creek, then a justification and rationale position paper should be written outlining the concerns with alternatives.

To accomplish the project goal, this plan has three objectives related to project implementation, monitoring, and evaluation:

(1) determine if the proposed action is required for the short-term persistence of a given receiving population and consistent with the determining factors in subsection 1.2;

(2) ensure that the proposed action does not threaten donor or receiving populations;

(3) monitor and evaluate the effectiveness actions implemented relative to increasing abundance, diversifying size/age class distribution, expanding utilization of suitable habitats, and increasing genetic diversity in the receiving population.
.

The upper McCloud River reintroduction plan may be implemented to benefit any upper McCloud River redband population meeting the reintroduction factors/requirements described in subsection

1.2. The Sheepheaven Creek population has been identified through genetic studies and field sampling as a high priority creek that will require reintroduction of suitable donor redband stocks to alleviate effects caused by genetic bottlenecking and poor population structure. Below is a phased approach for Sheepheaven Creek to increase genetic diversity and restore a healthy size/age class structure. The phased approached is specific to Sheepheaven Creek, but can be used as an example for developing other specific plans for other redband creeks as needed.

In order to implement the reintroduction of redband trout into Sheepheaven Creek, the Department proposes to utilize donor stocks from genetically similar populations with priority going to populations with higher allelic richness and more robust population numbers. The Department will collect fish of various life stages (initially juvenile, sub-adult, and adult) consistent with project numerical goals (see subsection 2.1 below), from the selected donor creek(s). The Department proposes to annually translocate multiple life stages of redband trout directly from the source population(s) to identified receiving creeks via a three-phased adaptive management approach until either: (1) an evaluation of the project shows the goal of the project has been met or is on a trajectory to be met through natural reproduction based on monitoring and evaluation; (2) mid-process outcome evaluation suggests the successful supplementation of redband trout is unlikely (i.e., the effort is not showing acceptable levels of success based upon population estimates, and size/age class structure, habitat utilization, or genetic studies); or (3) evaluation indicates an unacceptable level of impact to the donor population from previous removal efforts.

The goals of the reintroduction plan and implementation strategy for Sheepheaven Creek are to: (1) provide the framework, objectives, actions, timelines and effective monitoring required to re-establish a self-sustaining effective redband trout population of 100-300 individuals in Sheepheaven Creek by 2019; and (2) maintain the effective population goal through, at least, five-consecutive years. This effort would contribute to the conservation and recovery of McCloud River redband trout in the McCloud River basin and to overall management criteria outlined in the revised McCloud Redband Conservation Agreement. For the purposes of this plan, a self-sustaining population is defined as one that maintains a minimum adult annual spawner abundance of 100 individuals, contains a high level of genetic diversity representative of the donor stock, and requires no additional transfers. The numerical goal of 100-200 adult spawners is consistent with historic population estimates and available habitat. Although the amount of suitable habitat in Sheepheaven Creek varies based on season and water year, previous survey data suggest there is sufficient capacity to support a population of this size.

Phase One (2014-2016): Phase one of the reintroduction will be the key active management and learning phase. The release strategy will be dependent upon the life stage being introduced and may be modified as necessary based on monitoring results. Adult life stages captured from the donor populations will be released in areas of suitable habitat in Sheepheaven Creek (suitable habitat will be determined just prior to stocking). Juveniles (and fry if utilized in the future) will be released in all suitable habitats on a rotating basis. Emphasis will be placed on not releasing donor stocks directly into habitats currently occupied by redband trout and selecting release sites to minimize impacts to the existing population based on pool/stream carrying capacity. Released sites will be determined based upon both previous surveys and assessments conducted just prior to transfer.

Phase Two (2016-2019): Based on phase one monitoring, adaptively manage the implementation strategy to favor more successful life stages and perform releases into preferred habitat areas. If phase one is determined to be unsuccessful, reevaluate components of the reintroduction strategy such as donor stock, release locations and timing, life-stages, numbers transferred, and environmental conditions to inform whether to significantly modify or discontinue the effort.

Phase Three (2019-2024): By the year 2024 (or sooner if the goal and objectives are achieved) discontinue active management and stop implementation. Continue to implement a post-treatment monitoring and evaluation program.

2.1 Annual Donor Stock Availability

The numbers and life stages of donor stock to be transferred to Sheepheaven Creek will be guided by donor stock availability criteria developed by the Department with input from geneticists from the U.C. Davis Genomic Variation Laboratory. The donor stock availability criteria, ultimately developed to minimize risk to the donor stock, represent the maximum number of individuals that could be removed annually by age class based on current population estimates for the donor population(s). The donor stock availability criteria and other appropriate elements of this plan will be incorporated into a genetics management plan for the entire upper McCloud River basin.

Information suggests redband in the upper McCloud River drainage mature at age 2 and have short life spans (3-4 years). Adult redbands in upper McCloud River basin tributaries typically range in size from 150 - 200 mm (TL). We define the sub-adult life stage as individuals two to three years old (80 - 149 mm TL) and which have not yet spawned. Given that most redbands in the upper McCloud River tributaries mature at age two and do not live much past four years, any impacts to the limited adult population can be significant. However, given their early maturation rates, removal of adults from the effective donor population will likely see an influx of new breeding adults the following year.

For the purposes of this proposed plan we define the fry/juvenile life stage of redband trout as individuals that are age 0+. Given the limited abundance, age of maturity, and relatively low fecundity, the removal of fry/juvenile from the donor populations could have an adverse impact to the 0+ and 1+ cohort numbers. Adaptive management and monitoring will be employed to determine the most suitable and successful age classes for transfer that will minimize negative impacts to the donor population and enhance expansion of the receiving population.

2.2 Numbers and Life Stages Proposed for Transfer

Based on existing donor population abundance and donor criteria discussed above, the following approximate numbers of fish by life stage are proposed for transfer each year during Phase 1 of the project. Annual monitoring of the donor stock and the introduced fish in Sheepheaven Creek will help adaptively manage future numbers and life stages for transfer. The numbers and life stages of fish for transfer will be reviewed annually by the Department.

• Adults (3+-4+): Approximately 30 per year (equal numbers of males and females if gender can be identified) for the first 2 years. Continuation through Phase 1 is dependent on monitoring and evaluation results and donor availability. For this project, adults are considered to be equal to and greater than 150 mm (TL). Emphasis will be placed on the collection and translocation of adults at the lower end of the adult size range.

• Sub-adults: (1+-2+): Approximately 30 per year for the first 2 years. Continuation through Phase 1 is dependent on monitoring and evaluation results and donor availability. For this project we consider sub-adults to be fish that are 80 mm – 149 mm (TL).

• Fry/juvenile (age 0+): We are not proposing to utilize fry and juveniles during the first phase of the project given the limited numbers and low reproductive rate of the adults. There is also high natural mortality in younger size classes, thus higher transfer numbers would be required to confer survival to reproductive age.

2.3 Donor Stock Fish Marking

All donor fish will be physically marked (adipose, dorsal, maxillary, pectoral, pelvic fin clip etc.) to identify donor stocks to help evaluate reintroduction success/failures with management objectives. Different marks maybe used to identify annual stocking events and/or individuals from different populations.

2.4 Donor Stock Collection and Timing

The collection and timing of donor stock will be based on biological life history patterns, environmental conditions, and criteria to fulfill reintroduction objectives. Reintroduction criteria may be modified at any time, based upon effectiveness monitoring findings. To minimize impacts to the donor stock and relocated fish, collections and transfers will be scheduled during the late summer to early fall periods (September-October). This time period should fully avoid the spawning period and minimize impacts to emergent fry, which are expected to be parr by this time. In addition, the late season time-frame coincides with the low flow period of the year, which will give the best indication of minimal perennial habitat available. Other time periods may be considered, based on environmental conditions and biological justification to meet plan objectives.

2.5 Release Locations and Timing

Release locations will be selected from suitable habitats identified from a reconnaissance survey prior to translocating McCloud redband into Sheepheaven Creek. The reconnaissance survey will be typically conducted during the low flow period (September-October). Release locations will be considered when the following two criteria have been met:

(1) suitable habitats for reintroduction have been identified during low flow periods; and,

(2) habitats are not currently occupied by McCloud redband or redband densities are so low that no negative impact is expected.

2.6 Pathogen Screening

Given the close proximity of the McCloud redband donor populations to one other and to Sheepheaven Creek, within-basin transfers likely pose a low risk of disease transfer. However, given the extremely low population size in Sheepheaven Creek and the potential impact introduced pathogens could have on an already severely depressed population, a subset of the donor populations (six individuals from each donor population) will be collected for pathogenic screening. A comprehensive screening for viral and bacterial pathogens will be conducted by the Department Fish Health Laboratory prior to any movement of fish from the donor populations. If any detrimental pathogens are identified by the Fish Health Laboratory, no donor fish will be move/relocated from that body of water. If the infected body of water can be quarantined, treated, and cleared by the Fish Health Lab, that body of water may be reconsidered as potential donor stock.

2.7 Reintroduction Alternatives

The preferred method of stocking Sheepheaven Creek is to translocate redband from a single, genetically similar, diverse, and robust donor population. If these criteria cannot be met, alternatives may be considered to restore the Sheepheaven Creek population while still meeting reintroduction plan goals and objectives. These alternatives may include:

1. Use genetically similar redband from multiple source populations to increase genetic diversity and meet transfer number goals. This option would be employed to increase the potential of increased allelic richness and protection for smaller donor populations.

2. Remove, relocate and replace Sheepheaven Creek redband with genetically similar, diverse redband from one or more sources. This option would be employed to address limited fish holding habitat and alleviate intraspecific competition among redband to minimize impacts to the existing population. While this option may not increase population numbers, its focus is to add more genetic diversity to the population.

3.0 Monitoring Strategy

The monitoring and evaluation component of this plan is twofold; (1) to assess the effectiveness of the reintroduction throughout implementation to inform adaptive management of the project (i.e., refine the implementation strategy and modify management approaches accordingly); and, (2) to document the outcomes of the reintroduction plan for future upper McCloud redband reintroductions and development and implementation in other systems. Monitoring will be implemented with three major objectives:

(1) ensure that the proposed action does not threaten the donor stock population;

(2) adaptively manage the reintroduction process; and

(3) document changes over time in the donor and target populations (density estimates, population structure, instream distribution, habitat occupancy, genetic monitoring).

3.1 Monitoring and Evaluation Guidance

McCloud River redband monitoring will be conducted as necessary to evaluate the objectives of this plan. Initially, annual monitoring will be conducted to document the overall health (population structure, recruitment, fish density estimates, distribution, condition factor, genetic sampling) and habitat utilization/instream distribution of both donor and receiving populations. If reintroduction objectives are being met through initial monitoring, monitoring frequency may be conducted every 2nd or 3rd year. Monitoring will likely take place during the spring through fall depending on life-stage targeted and adaptively managed to continue to meet monitoring objectives.

3.2 Donor Population Monitoring

Two questions should guide the monitoring of the redband reintroduction donor population in the first phase of the reintroduction project:

D1. Does the donor stock population have the minimum threshold number of adults and sub-adults required to conduct donor stock removal?

D2. Is the donor population pathogen-free?

Monitoring the donor population is necessary to detect any deleterious effects from removal of individuals and also to serve as a guide for the number of fish available for the reintroduction program on an annual basis. A third question, which may be addressed more explicitly at the end of Phase 1 or at the beginning of Phase 2 (pending resource availability), is:

D3: Are there any indications of deleterious impacts (genetic fitness or population abundance) to the donor population from removing individuals for translocation?

Tissue collections and genetic studies should be utilized to monitor potential impacts to the donor population, as well as potential benefits to the recipient population, over time. Although it may take a number of generations to reveal any quantifiable changes to the genotype of individuals or allelic shifts in the population, it is anticipated that, with the short generation time of McCloud redband trout, changes may be detectable within a reasonable time frame; while genetics studies and findings may not be available to inform adaptive management within the time frame of this proposed plan, such information would be of great value in developing future restoration plans and implementation strategies.

Literature Cited

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Simmons, R. E., Stephens, M., and May B. 2013. Genetic analysis of California redband trout. Final report: Genetic analysis of native California trout (phase 6). Genomic Variation laboratory, University of California, Davis.

APPENDIX H

Figure E-1. Past (1998 through 2011) McCloud redband monitoring sites to measure population trends and habitat changes.