

**GOOSE LAKE FISHES
CONSERVATION STRATEGY**

JULY 1996

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EXECUTIVE SUMMARY OF THE GOOSE LAKE FISHES CONSERVATION STRATEGY

Current Status:

There are eight native fishes of the Goose Lake Basin. Four of these species – Goose Lake redband trout, Goose Lake Sucker, Goose Lake tui chub, and Goose Lake lamprey – are considered endemic to the area and known to spend at least part of their lives in the lake. The other four native species are primary stream dwelling. They are the Pit-Klamath brook lamprey, speckled dace, Pit roach, and Pit sculpin. Our limited information has indicated declines in the lake run Goose Lake redband trout prior to the drying of Goose Lake in 1992. Large runs in Oregon ceased altogether in 1981. Similar trends were observed in California with small runs continuing until 1989, when runs ceased.

Reasons for Decline and Habitat Requirements:

It is known that lake runs reestablished following previous drying of Goose Lake from 1924-1934. The 1986-1992-drought period contributed to the disappearance of California runs and completed loss of the lake population; however loss of runs in Oregon and limited runs in California occurred despite average or better water years. This indicates that drought and non-drought related problems have contributed to this decline. Other watershed problems affecting the aquatic habitat may include upstream passage, diversion of outmigrating fish, water quality and quantity, riparian and upland habitat alteration, introduced species, and angling use.

Recovery Objective:

This Conservation Strategy has been initiated to conserve the species by reducing threats to the subject species, stabilizing the species populations, and maintaining its ecosystem. The documents primary purpose is to conserve this species through interim conservation measures under the Endangered Species Act of 1973, as amended.

Recovery Criteria:

The interim objective is to maintain secure populations of all native species within the basin.

Actions Needed:

This Conservation Strategy describes a framework for prelisting recovery. Key to this strategy is outlining actions that will need to be taken to establish proper management to achieve healthy functioning ecosystems that affect the Goose Lake native fishes. Management

planning will be done on a watershed or subwatershed basis, as appropriate, because all management activities in a watershed have the potential for affecting all resources in a watershed. This planning will be done through cooperative efforts among public and private landowners, resource agencies, and resource users in order to achieve watershed or subwatershed management.

Costs:

See appendix A. This budget will be updated as appropriate over time.

I INTRODUCTION

Goose Lake basin, on the border of northeastern California and south-central Oregon, contains 8 native fish species, 4 of which are considered endemic to the basin. Of these 4 fish species 3 are Category 2 Candidate species for federal listing under the Endangered Species Act. Six out of the 8 native fish species have some level of federal or state special management status.

The 4 endemic fish species—Goose Lake redband trout, Gooses Lake sucker, Goose Lake lamprey, and Goose Lake tui chub—reside in the lake for at least part of their life cycle. The lack of observed spawning migrations of the Goose Lake redband trout, Goose Lake sucker, and Goose Lake lamprey into the tributaries of the lake since 1981 in Oregon and 1989 in California caused concern and some initial studies on the status of the species. The desiccation of the lake in 1992 after a 7-year drought period increased this concern, emphasized the need for increasing efforts to benefit the fish, and prompted the development of a conservation strategy. With lowered summer flows in the tributary streams, of concern were not only the 4 species that use the lake but all 8 of the native fish species of the basin.

Because the Goose Lake basin is an area of mixed ownership, the conservation strategy for the fish species requires the involvement of private landowners and several different government agencies. For most of the tributary streams used for spawning, migratory fish need to pass through privately owned stretches of stream to reach spawning gravels on either side of the Fremont or Modoc National forests. Migratory species that may spawn in the lower reaches of the streams as well as other resident species could be affected by any activities in the watersheds.

Because any government or private land management activity in one part of a watershed has the potential to affect the aquatic ecosystem in another part of the watershed, it was recognized that there was a need for a conservation strategy to be developed out of cooperation and coordination of the different land management agencies, resource agencies, private landowners, and other interested parties. This document, the Goose Lake Fisheries Conservation Strategy, is the result of such an effort, involving forty-two (42) public and private agencies and interests that comprise the Goose Lake Fishes Working Group. The Strategy sets fourth a framework for developing watershed-level management plans to benefit the fish species with a goal of achieving health, functioning ecosystems to improve conditions for all of the beneficial uses of the water-dependent resources.

II DESCRIPTION OF RESOURCES

A. Physical Description of the Basin

The Goose Lake Basin is located at the northeastern corner of California extending well into south-central Oregon. The basin extends about 53 miles along its north-south axis and about 36 miles along the east-west axis. Approximately two thirds of the 1,100 square mile basin are in Lake County, Oregon; approximately one third located in Modoc County, California; and a very small part is located in Klamath County, Oregon. The lake itself occupies about 144 square miles with the majority of the water on the California side (Morgan 1988).

Goose Lake lies within a semiarid plain surrounded by mountains. To the east lies the Warner Mountain range, extending from California to Oregon and rising to elevations of over 8,000 feet within 5 to 6 miles of the lake. To the north, the broad plain rises gradually to an elevation of about 7,000 feet in the Fremont Mountains. To the west, the wooded ridges of the Devils Garden rise steeply 800 to 1,000 feet above the lake. To the south, a low divide separates the lake from the North Fork Pit River (Morgan 1988).

At overflow stage, elevation 4,716 feet, Goose Lake inundates 194 square miles (43,500 acres). It has a maximum depth of approximately 24 feet, with a north-south axis of about 28 miles long and an east-west axis of about 10 miles at its widest point. At the overflow stage, the volume of the lake is approximately 2,250,000 acre-feet.

All Surface drainage in the basin is to Goose Lake. There are a total of 1100 square miles (704,000 acres) in the basin (see Table 4). In Oregon, 375 miles of stream are perennial and 488 miles are intermittent or ephemeral. The major portion of the surface water inflow to Goose Lake comes from the Oregon tributary streams, principally Dry, Mill, Drews, Antelope, Cottonwood, Thomas, Crane, Cogswell, Tandy and Kelley Creeks. In California, the perennial streams draining the Warner Mountain Range are New Pine, Cottonwood, Willow, Lassen, and Davis Creek. To the west, the tributaries are only ephemeral, including Corral and Branch Creeks.

Most streams in the basin are fed by snowmelt and the major runoff occurs during the April-May period each year. Average annual precipitation ranges from 12 to 14 inches per year on the surface of Goose Lake, as low as 5 inches in some places on the valley floor to 32 inches per year at the crest of the Warner Mountains (Phillips and van Denburgh 1971). Most precipitation occurs during December and January with the least occurring during July and August.

In addition to the surface run-off contributing to the volume of water that supports fish habitat, Goose Lake also receives inflow from groundwater basins from different directions, depending on the time of the year (CVRWQCB 1966). During winter and spring, when precipitation is significant, ground water enters from all directions. During late summer and early fall, inflow comes from the north, east, and west, while water permeates to the south from the lake to the north fork of the Pit River. In California, 2 of 7 sub-basins in the Goose Lake basin are known to flow towards the lake: Willow Ranch sub-basin and Davis Creek sub-basin (2 upper aquifers). The lake has no large springs emerging from the bed; however, several small springs maintain soggy areas in the bottom (Phillips and van Denburgh 1971).

The average annual evaporative loss at Goose Lake is about 42 inches. From 1935-1960, the tributary springs and streamflow provide an estimated 250,000 acre-feet of water, of which an estimated 165,000 acre-feet is inflow to the lake and an estimated 85,000 is used for irrigation or evaporates from surface storage reservoirs (Phillips and Van Denburgh 1971).

Goose Lake has both overflowed and gone dry in the past. The lake reportedly overflowed into the North Fork Pit River in 1868 and the last time in 1881. The lake went completely dry in the summer of 1992, except for ¼” of standing water at the springs on the west and east sides (CDFG unpub. Data). The lake has previously dried in summers of 1851, 1852, 1926 and 1929 to 1934, although lake bottom marsh areas were reportedly supplied with water from springs during the 1926-1934 dry periods. Native American legend indicates the lake had been dry 5 times during the 3000 years prior to the 1830’s (CVRWCQB 1966).

In general, the water quality characteristics of Goose Lake are typical of closed basin, alkali lakes. Water quality in the basin reflects the continual input of various dissolved salts and mineral from the surrounding watershed (see Table 1). Sodium, chloride, and bicarbonate are the principal ions found in this water. See CVRWCQB, 1966 and the Monitoring Report “Water quality measurements in the Goose Lake 1993”, by Heiman and Lewis, RWQCB.

Table 1. Water Quality Measurements in Goose Lake

Ph	9.0-9.8 (1993)
Electrical conductivity	2000-2600 umhos (1942) 2000-3000 (1993)
Dissolved Solids (measured)	1060 ppm (1912) 1270 ppm (1962) 1800 ppm (1969) 1200-2000 ppm (1993)

B. Native Fish Species

There are 8 native fishes of the Goose Lake basin. Four of the species – Goose Lake redband trout, Goose Lake sucker, Goose Lake tui chub, and Goose Lake lamprey - are considered endemic to the area and known to spend at least part of their lives in the lake. The other four native species are primarily stream dwelling. They are the Pit-Klamath brook lamprey, speckled dace, Pit roach, and Pit sculpin (see Appendix B for descriptions). These species and their administrative status as of 1994 are as follows:

Table 2. Native Species Of The Goose Lake Basin And Their Administrative Status

FISH NAME	ADMINISTRATIVE STATUS
Goose Lake redband trout; lake and stream dwelling)	USFS Region 5 Management Indicator Species USFS Region 6 Sensitive and Management Indicator Species CDFG Species of Special Concern ODFW Sensitive

STREAMS	Goose Lake redband trout	Goose Lake sucker	Goose Lake lamprey	Goose Lake tui chub	Pit Klamath brook lamprey	Speckled dace	Pit roach	Pit sculpin	Introduced species
OREGON STREAMS									
KELLEY	X								
THOMAS	X-	X-			X	X		X	

CALIFORNIA STREAMS									
BADGER-CLOUD (SUCKER)		X		X-					
(LONG) BRANCH		X		X					
CORRAL	X	X		X		X			
COTTONWOOD	X								
DAVIS	X	X				X			Brown trout, brook trout, Sacramento perch, bluegill
LASSEN	X-	X-	X-	X-	X	X		X	
-COLD	X-		X-					X	
NEW PINE	X								Brown trout
WILLOW	X-	X-	X-	X		X	X	X	Brown bullhead, fathead minnow
-BUCK	X-								

RESERVOIRS	Goose Lake redband trout	Goose Lake sucker	Goose Lake lamprey	Goose Lake tui chub	Pit Klamath brook lamprey	Speckled dace	Pit roach	Pit sculpin	Introduced species
OREGON RESERVOIRS									
COTTONWOOD	X	X	X	X		X			Fathead minnow, small mouth bass
COTTONWOOD MEADOWS									Brook trout, rainbow trout, fathead minnow
DOG	x	x		x					Yellow perch, white crappie, black crappie, bluegill, pumpkinseed, largemouth bass, brown bullhead

RESERVOIRS	Goose Lake redband trout	Goose Lake sucker	Goose Lake lamprey	Goose Lake tui chub	Pit Klamath brook lamprey	Speckled dace	Pit roach	Pit sculpin	Introduced species
OREGON RESERVOIRS									
DREWS		X		X					Yellow perch, white crappie, black crappie, brown bullhead, pumpkinseed, channel catfish
CALIFORNIA RESERVOIRS									
EVERLY				X					Largemouth bass
ENQUIST									Largemouth bass
BRILES									Rainbow trout, brown trout, largemouth bass
HOUSEHOLDER									Largemouth bass
MCGINTY									Rainbow trout

Goose Lake lamprey observations include only those where adults or lamprey scars on other fish were found to verify the lamprey species. It is possible that some ammocoetes that were identified as Pit-Klamath brook lamprey could be ammocoetes of Goose Lake lamprey.

In addition to the table, the following streams were known historically as having spawning migrations of Goose Lake redband trout:

In Oregon:

Antelope Creek
Cogswell Creek
Crane Creek
East Fork Thomas Creek
Deadman Creek
Bullard Creek
Hammersly Creek
Kelley Creek

(Anderson, pers. comm.)

In California:

Cottonwood Creek
(CVRWQCB 1966)
Davis Creek
(CVRWQCB 1966)
New Pine Creek
(CVRWQCB 1966)

III. DESCRIPTION OF CURRENT RESOURCE USES

The Goose Lake basin is an area of mixed ownership and multiple resource use. People have inhabited the basin for centuries, beginning with the Modocs and the Achumawis to the Hudson Bay trappers preceding the first record of 1832, to the military control of the area from the 1850s to 1893, which led to the settlements of the late 1800s (Barry 1987). The natural resources in the basin have been used by humans for commercial and consumptive purposes since the first trappers arrived.

Table 4. Acres by public or private ownership in the Goose Lake Basin, not including the lake

Ownership	Acres	Percent of Basin
Public Land-Oregon	316,800	45.0
Private Land-Oregon	193,600	27.5
Public Land-California	144,320	20.5
Private Land- California	49,280	7.0

The following section provides brief description of the different uses of the resources in the Goose Lake basin. More detailed information will be gathered during the development of the watershed management plans for the individual tributaries. At that time, specific management activities can be identified from a watershed-level perspective to develop effective watershed-level conservation plans.

A. Native American

The Native Americans who inhabited the Goose Lake basin prior to white settlement were the Modocs and the Achumawis. Goose Lake formed the eastern border of the Modoc territory, while the lake and the Warner Mountain ridgeline formed the northeastern border of the Achumawi territory. Fish from streams were among the dietary staples of their diets (Gooch and Odgers 1990).

Currently, less than 1% of the basin is under Native American Ownership. There are approximately 640 acres that are part of the XL Ranch Indian Reservation. The primary uses of the land currently are livestock grazing and limited recreational hunting.

The XL Ranch Indian Reservation has water rights for McGinty Reservoir, which drains to Goose Lake and is situated on the Modoc National Forest. The water is used for irrigation.

B. Private

Approximately 34.5% of the basin (27.5% in Oregon and 7.0% in California) is privately owned and used for a variety of resource uses. Irrigation of areas with better soils is used for more efficient hay and grain farming and is necessary for farming of some grains, seeds, potatoes, alfalfa, and commercial native plums, as well as for vegetables and fruits for home use. The basin has 3020 total residents (Table 5). Developed recreational areas are limited. Private holdings of timberlands are not very extensive. Industrial uses in the basin include a mercury mine, an obsidian mine, gravel pits, and small gold mines; lumber mills; and refuse disposal sites. Lakeview had a uranium mill site, which has been reclaimed. Auger Creek had uranium mines, which were not reclaimed.

Table 5. Population Information of Goose Lake Basin

CITY OR TOWN	POPULATION
Lakeview, Oregon	2800
New Pine Creek, Oregon	120
Davis Creek, California	100

C. U.S. Forest Service

The Goose Lake basin contains lands administered by two national forests, the USFS Region 6 Fremont National Forest on the Oregon side of the basin and the USFS Region 5 Modoc National Forest on the California side.

The Fremont National Forest manages 184,302 acres (or 26%) of the basin. The lands to the northeast, part of the Lakeview Ranger District, are characterized by mixed coniferous forest and open meadows. Management activities on the Fremont NF include livestock grazing, wildlife and fish habitat, outdoor recreation, wild horse habitat, and timber sales.

The Modoc National Forest manages approximately 20% of the basin. The Modoc NF lands to the southwest, part of the Devils Garden Ranger District, are characterized by mixed coniferous forest, open meadows, and the 5,000 acre Sugar Hill tree plantation, established approximately 40 years ago following large fires. Management activities on the Modoc NF include livestock grazing, wildlife and fish habitat, outdoor recreation, wild horse habitat, and timber sales.

D. U.S. Bureau of Land Management

The Lakeview District manages 2960 acres (<0.4 %) in scattered parcels.

The Susanville District manages 480 acres (<0.1%) in scattered parcels, ranging from 40 to 160 acres in size, on the east side of Goose Lake.

E. State of Oregon - 18.6% basin

F. State of California - 0.4% basin

IV CURRENT CONDITION

Prior to 1993, information on the Goose Lake Basin fishes was limited. A few years of data were collected on the Goose Lake redband trout in California. Some distribution information is known for Goose Lake fishes. Habitat information has been collected on streams as listed in Appendix C. Stream survey information will be added to the appendices as collected. Trend information other than historical accounts relative to current conditions is lacking. The extent to which we have available information is identified in the following accounts of the individual watersheds. Out limited information has indicated declines in lake run Goose Lake redband trout prior to the drying of Goose Lake in 1992. Large runs of lake run trout in Oregon existed at least through the mid-1950s. Lake runs in Oregon ceased altogether in 1981 (ODFW unpub).

Similar trends were observed in California with small runs continuing until 1989 (CDFG, Modoc NF, unpub).

It is known that lake runs re-established following previous drying of Goose Lake from 1929 1934. The 1986-1992 drought period contributed to the disappearance of California runs and complete loss of the lake population; however, loss of runs in Oregon and limited runs in California occurred despite average or better water years from 1978-1986 (USFS). This

indicates that drought and non-drought related problems have contributed to this decline. Other watershed problems affecting the aquatic habitat may include upstream passage, diversion of outmigrating fish, water quality, riparian and upland habitat alteration, introduced species, and angling use.

The following are brief descriptions of the tributaries to the lake and the human activities or management actions that have occurred in their watersheds. Mileage is estimated from streams designed on BLM 1:100,000 surface maps without regard to perennial or ephemeral map status because these stream reaches will require site-specific investigation of the perennial and potentially seasonal habitat they may support. These activities and actions have been identified as potential risk factors to the aquatic resources that will need to be addressed during the watershed management planning process for these watersheds. Some human activities occurring in the watersheds are listed, regardless of whether or not the potential problems are assumed to have been mitigated. Natural risks and specific habitat conditions are also listed if known. These and additional potential risk factors that may be identified will be addressed during the development of watershed management plans for the individual tributaries. Section C, Past Habitat Improvements, identifies mitigation or restoration efforts that have already occurred.

Davis Creek

Davis Creek enters the lake from the east side, with a steep to moderate gradient where it flows through canyon and meadow reaches from the Warner Mountains to low gradient reach in the basin floor. The Modoc National Forest manages the 4.5 mile south fork and the 4.5 mile north fork. On the main stem, 3.5 miles is owned by the Modoc, and 8.0 miles is privately owned. Habitat data have been collected on 3.5 miles of its north fork on the Modoc NF and 2.5 miles of its middle fork on the Modoc NF (Modoc NF unpub. Data, 1992). Historically the creek flowed to the lake. The creek currently flows into a developed wetlands area.

Davis Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing MNF xing Diversion	Developed Wetlands Irrigation	Lower section mainly low gradient riffle or run with silt substrate. Upper section lacks large woody debris.	Bank Shearing on lower North and South Forks. Unstable banks in upper North and Middle Forks.	USFS Plum Creek CG Several dispersed camping sites USFS Timber harvest USFS Cattle allotment Private ranching Residence 17 mi. roads Private orchards

Mulkey Creek and Briles Reservoir

Mulkey Creek is a steep low gradient outlet from Briles Reservoir, flowing westerly towards the lake from the Warner Mountains. The 1.5 mile creek is privately owned. Briles Reservoir (20 ac) is bordered by private and the Modoc National Forest.

Mulkey Creek and Briles Reservoir Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing Diversion	Irrigation Irrigation to developed wetlands	Briles stocked with rainbow trout.	Road in bottom of drainage along riparian. High degree of unstable banks.	USFS Timber Harvest USFS cattle allotment 3mi road Private ranching Private orchards

Ross Creek

Ross Creek is a steep to low gradient stream flowing westerly to the lake from the Warner Mountains. Two miles of the creek are owned by the Modoc NF, and 1.0 mile is privately owned.

Ross Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing	Irrigation (from springs)	High amount large woody debris. Mostly a low gradient riffle.	Road in riparian area	USFS Timber harvest USFS cattle allotment 3 mi road Private ranching Private residences

Lassen Creek

Lassen Creek enters the lake from the east side, with a steep to low gradient where it flows through canyon reaches and large meadow reaches from the Warner Mountains to a low gradient reach in the basin floor. The creek is managed by the Modoc National Forest (10.0 miles), BLM Alturas RA (0.2 mile), and private landowners (7.0 miles). The Modoc NF manages all 3.5 miles of Cold Creek, the main tributary to the creek. Habitat data have been collected on the entire main stream and on 3.0 miles of Cold Creek

Lassen Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing. County rd xing. USFS rd xing. Diversions Rock barrier above Campground. Beaver Dams. Small woody debris Jams.	Meadow irrigation Sub-irrigation	USFS Structural Improvements (juniper revetment, weirs, and boulders).	Lower reaches: headcut, eroding banks Above lower canyon: incised, gullying, sheeting. Upward trend in riparian condition.	USFS Lassen Cr. Campground Dispersed camping throughout drainage USFS timber harvest USFS cattle allotment Private ranches Transfer station 14 mi roads

Willow Creek

Willow Creek enter the lake from the east side, with low gradient where it flows from its headwaters on private lands, moderate gradient as it flows through Modoc NF lands, and eventually a low gradient reach in the basin floor. Buck Creek, a major tributary to Willow Creek, has a steep to moderate gradient. The Modoc NF manages 3.5 miles of Willow Creek with the remaining 11 miles in private ownership. Three miles of Buck Creek are owned by the Modoc NF with the remaining half mile in private ownership. Habitat data have been collected on 0.5 mile of private land on Willow Creek.

Willow Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing Co. Rd. 47 xing Old Hwy xing Diversion from Buck Creek near guard station.	Irrigation, Buck Cr. Irrigation, Willow Cr.	Lower Willow has high temps., lacks riparian vegetation. Middle Willow has best pool and cover conditions. Upper Willow has high embeddedness. Buck Creek lacks deep pool habitat.	Lower reach: headcut, incised, unstable banks, possible overuse by beaver, tributary headcut, loss of meander, channelized in past above highway Fandango: lack of vegetation ground cover	USFS Buck Cr. Fire Station Private ranches Private residences 16 mi. roads USFS timber harvest CDF timber harvest USFS cattle allotment

Barnes Creek

Barnes Creek enters the lake from the east side, with a moderate gradient on Modoc NF lands and low gradient as it reaches the basin floor. Two and one half miles are on the Modoc NF with the remaining 2.5 miles in private ownership. This is a perennial stream with extremely low flows during the summer. Local landowners have never observed fish in this creek.

Barnes Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing Co. road xing	Low summer flows Irrigation		Loss of Meander Channelization	Private residence USPS timber sales. USFS grazing allotment

Cottonwood Creek, California

Cottonwood Creek is a low to gradient creek that enters the lake from the east side. The creek is managed by the Modoc NF (4.3 miles) and private landowners (2.0 miles). Habitat data have been collected on Modoc NF lands.

Cottonwood Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing Co. Rd. xing	Irrigation	Extremely high gradient in North Fork. High degree of large and small woody debris.	Good on Forest.	USFS timber harvest USFS cattle allotment Trail up channel Private ranches Private residences 1 mi roads

Pine Creek

Pine Creek is a steep to low gradient creek that enters the lake from the east side. This creek is managed by the Modoc NF (2.5 miles) and private landowners (5.5 miles). The creek runs mostly in California except for the lowermost reach, where it enters the lake at Goose Lake Oregon State Park. Data on the upper reaches of this creek on Modoc NF lands have been collected.

Pine Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
U.S. 395 xing 3 culverts Co. road xing Diversions	Good above 395. Poor below 395. Irrigation	Good habitat on North Fork into Oregon. In channel sediment debris in lower reach.	Road along channel	USFS Timber harvest USFS cattle allotment Ancient landslide 10 mi roads Private residences Private ranches Private businesses OR State Park

Corral Creek

Corral Creek is a moderate gradient creek that enters the lake from the west. The creek is managed by the Modoc NF (2.0 miles) and private landowners (3.0 miles). The creek has perennial with low flows during the summer.

Corral Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
West side road xing MNF road xing	Low to no flow in summer			USFS Timber harvest USFS cattle allotment Private ranch

Long Branch Creek

Long Branch Creek is a low gradient creek with a very high gradient reach between the valley bottom and the plateau, which enters the lake from the west. The creek is managed by the Modoc NF (2.0 miles) and private landowners (1.0 miles). This creek is dammed, forming Householder and Everly Reservoirs.

Long Branch Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Dams West side road xing				USFS Timber harvest USFS cattle allotment Private ranch

Kelley Creek

Kelley Creek is a steep to low gradient stream flowing west into Goose Lake from the Warner Mountains. The upper 3 miles of creek, including the forks, are on the Fremont NF; the lower 3 miles are privately owned. Irrigation diversions are present in the lower portion of the stream on private lands. The creek flows to the lake on average and better water flow years during spring months.

Kelley Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Diversions	Irrigation	Substrates > 35% Embedded. 63 pieces large woody debris per mile. 99 pools per mile	Road along channel Shading high Bank stability moderate Naturally erosive soils	Private ranches USFS grazing allotment Steep slopes Erosive soils 1 mi road per mi 2

Tandy Creek

Tandy Creek is a steep to low gradient stream flowing from the east from the Warner Mountains to Goose Lake. The upper 1 mile of the creek is managed by the Fremont NF. The lower 2 miles are on private land. Historically the stream flowed to the lake but is now diverted for irrigation.

Tandy Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Diversions No active mouth to lake	Irrigation			Private ranches

Cogswell Creek

Cogswell Creek is a steep to low gradient stream flowing from the west out of the Warner Mountains towards Goose Lake. The upper 2.5 miles of the forks of Cogswell Creek are on the Fremont NF. The lower 3.4 miles of the creek are on private land. Irrigation diversions are present in the lower portion of the stream on private lands. The creek flows to the lake on average and better water flow years during spring months.

Cogswell Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Diversions	Used for irrigation			

Crane Creek

Crane Creek is a steep to low gradient stream flowing westerly towards Goose Lake from the Warner Mountains. The upper 3.5 miles of the stream are on Fremont NF land. BLM Lakeview owns 0.2 miles of the stream just downstream from the forest boundary. The lower 9.0 miles of moderate to low gradient stream are on private land. A main irrigation diversion at the mouth of the canyon where the creek enters the Goose Lake Valley splits the flow into two channels. The historical mouth of the stream is no longer present to the lake. Several irrigation diversions divert most to all of the water flow for irrigation preventing fish passage into the creek from Goose Lake. The Crane Creek drainage has 17,823 acres.

Crane Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Diversion Above confluence with NFK ½ mi from confluence with mainstream	Used for irrigation		Channelized Road in riparian area	Private ranches 1.03 mi per mi ² USFS dispersed recreation USFS grazing allotment

Thomas Creek (main fork)

Thomas Creek is the largest tributary to Goose Lake, with drainage of 208,000 acres. It is a moderate to low gradient stream flowing in a southeasterly direction and enters the lake at the north end. The upper 20 miles are primarily on Fremont NF land but are interspersed with 5 miles of private land, mostly in Cox Flat. The lower 20 miles of Thomas Creek flow through the Goose Lake Valley and are characterized by numerous irrigation diversions. Much of the lower 20 miles of stream has been channelized as wetland areas were developed for agriculture. Recent fish and habitat surveys have not been completed on Thomas Creek. Major tributaries to Thomas Creek are discussed separately.

Thomas Creek (main fork) Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Diversions	Irrigation High temperature Turbidity	Substrates >35% embedded	Channelized loss of meander Low shading Unstable banks Incision in meadows	Private ranches Private residences USFS timber harvest USFS grazing allotment USFS dispersed recreation

Thomas Creek (East Branch)

The East Branch of Thomas Creek runs east of and parallel to the main fork of Thomas Creek. It is approximately 5 miles of channelized stream west of the town of Lakeview. Water flow is from Deadman Creek, Bullard Creek, Hamersly Creek and Warner Creek.

Thomas Creek (East Branch) Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Diversions			Channelized	

Green Valley Creek

Green Valley Creek is a tributary to Dog Lake. It flows generally east to Dog Lake and is five miles long including the two main forks. Green Valley Creek is entirely on the Fremont National Forest. Gradients range from slight to moderate in the upper and lower meadow reaches to steep to very steep in a 0.5 mile reach midway in the stream. Meadow areas adjacent to the stream are used for grazing.

Green Valley Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Steep reaches may be a barrier to fish passage	Low summer flows		Low shading in meadows	USFS grazing allotments

Cox Creek

Cox Creek, a main tributary stream of Thomas Creek, flows generally in a north to south direction. The upper 4 miles of the stream are mostly in forested areas and is managed by the Fremont NF. Gradients are moderate in the upper reaches of the stream. The lower 8 miles of stream are on private land and flow through meadow areas at moderate to low gradients.

Several irrigation diversions are located in lower reaches of the stream on private land. Fish data only have been collected on the stream upstream from the forest boundary. The Cox Creek drainage has 9,985 acres.

Cox Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
USFS culverts (N Fk) County road xing Diversions	Used for irrigation Low flow Temperature exceeds 68 F in summer	123 pools/mi Substrate >35% embedded. 41 pieces large woody debris per mile	Incised meadows Low shading Channelized	2.98 mi per mi ² USFS dispersed recreation

Bauers Creek

Bauers Creek is the main tributary to Cox Creek. It flows generally south from forested areas into meadow and hayland areas on the lower reaches of the creek. Gradients range from moderate in the upper reaches to low in the lower portions. Most of the upper 5 miles of stream are on Fremont NF with the lower 5 miles being private land. Both fish and habitat data have been collected on the entire stream. The Bauers Creek drainage has 14,994 acres.

Bauers Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
USFS rd xing	Perennial Temps low (November) Used for irrigation	>35% embeddedness. Avg. 14 pieces large woody debris/mi Avg. residual depth 0.8. Avg 18.5 pool/mi	Meadows noted as incised 4' Channelized	82 mi mapped roads 3.5 mi per mi ² USFS Timber harvest USFS dispersed recreation USFS grazing allotment

Camp Creek

Camp Creek is a main tributary of Thomas Creek. It flows southeasterly at steep to moderate gradients. The upper mile of stream is on Fremont NF and the lower 6 miles are on private land. The stream is generally in forested areas in upper portions and breaks into meadowland as it enters the valley floor. Fish data have been collected on the upper 6 miles of the stream. The Camp Creek drainage has 17,810 acres.

Camp Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
USFS rd xing (main and East Camp)	Flow is perennial Water temp 34 F (Oct) Fine sediment movement	FNF: > 35% Embeddedness. 5 pieces large woody debris per mile. Avg. 60 pool/mi. Avg. residual depth 1.1 Small woody debris available.	FNF: Beaver activity: Beaver dam diverting water. Few cutbanks. Good bank cover.	3.89 mi per mi 2 USFS grazing allotment

Auger Creek

Auger Creek, a third order tributary of Camp Creek, originates at Boggs Springs flows southeasterly for 8.7 miles. The stream flows through a mixture of meadows and coniferous forests at moderate to low gradients. The lower 4 miles of stream are on private land, with most of the upper 3.7 miles being on Fremont NF. Fish data have been collected on 4 miles of stream in the upper reaches. The Auger Creek drainage has 17,810 acres.

Auger Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
High gradient from 5.3 mi above Camp Cr.	Some reaches intermittent Sediment from tailings Mine and waste effluent Above USFS Rd. 3780. only .25 cfs	Embeddedness >35%. Avg. 32 pieces large woody debris/mi to 0-1 pieces large woody debris/mi. Avg. residual depth 0.4' to 1.4' Avg. 40 pools/mi. range of 8-86.	Channelized from White King mine tailings and overburden waste size. Channelized from USFS road 3780. Downcutting. Lower 4 mi. stability from willow clumps, grasses, sedges, rushes.	White King uranium mine 124 miles mapped roads 4.46 mi per mi 2 USFS Timber harvest USFS grazing allotment.

Shingle Mill Creek

Shingle Mill Creek flows easterly into Augur Creek. The stream is only 2 miles long, with the upper mile being on Fremont NF and the lower mile being on private land. The stream gradient ranges from low in most areas to moderate in the upper portion. Fish data have been collected for the 2 miles of stream.

Shingle Mill Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
No known factors				

Cottonwood Creek, Oregon

Cottonwood Creek flows in a southeasterly direction into the Goose Lake Valley. Gradients range from steep to low. Historically the stream flowed to the lake; however, agricultural development of wetlands and construction of many irrigation canals now prevent an active mouth of the creek to Goose Lake. The stream is 20 miles long, all on private land except for the upper 3 miles, which is on Fremont NF land. Cottonwood Irrigation Reservoir is located 12 miles upstream from the historic mouth of the stream and stores 8,740 acre-feet of water. The Cottonwood drainage has 22,230 acres.

Cottonwood Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
No active mouth six waterfalls, two of which can be bypassed by a side channel	Used for irrigation Max temp 63 F in August Impoundments at Cottonwood Reservoir, Cottonwood Meadows Lake, and Muddy Creek Reservoir (Muddy Creek) Turbidity	Substrate embedded >35%. 70 pools per mile. 68 pieces large woody debris per mile.	Irrigation canals Developed wetlands Cattle and old beaver activity Two areas with headcuts Eroding banks Highly erosive soils	2.91 mi per mi 2 USFS dispersed recreation USFS Cougar Creek Campground and Beaver Dam Picnic Ground USFS grazing allotment

Drews Creek

Drews Creek flows in a southeasterly direction for approximately 22 miles. It enters Goose Lake in the northwest corner. All but 2 miles of the lower 16 miles of the stream are on private land. The other 2 miles in the lower reaches and 6 miles in the upper reaches of Drews Creek are on Fremont NF land. Gradients range from steep in the Quartz Mountain area to low when it enters the valley floor. Drews Reservoir, which stores 62,500 acre-feet of water for irrigation, is located 10 miles up from the mouth. It inundates 6 miles of historic stream and is a barrier to upstream movement and fish. The watershed has 49,413 acres.

Drews Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Drews Reservoir dam Diversions?	Turbidity			USFS dispersed recreation USFS Drews Creek campground and picnic ground USFS grazing allotment

Dry Creek

Dry Creek flows in an easterly direction and enters Goose Lake from the west side. All 8 miles of the stream are on private land. Renner Reservoir is five miles upstream from the mouth and stores 3,270 acre-feet for irrigation. The reservoir is a barrier to upstream movement of fish. As the creek enters Goose Lake Valley, several irrigation diversions are present to irrigate adjacent agricultural land.

Dry Creek Potential Factors Affecting Fish

PASSAGE	WATER QUALITY AND QUANTITY	IN-CHANNEL FISH HABITAT	RIPARIAN CONDITION	UPLAND HABITAT
Renner Reservoir dam Diversions	Used for irrigation	High Temp. >76 F	Incised meadows Low stream shading	

Goose Lake

Because not much is known about the fish requirements in the lake, the current condition of Goose Lake with respect to fish habitat cannot be determined at this time. It is known that, when filled, the lake provides habitat for at least the Goose Lake redband trout, Goose Lake sucker, Goose Lake tui chub, and Goose Lake lamprey.

Based on other studies of a wide range of conservation issues for fish habitat in lakes (Goldman and Horne 1983), several potential factors affecting fish habitat specifically in the lake can be identified for investigation for Goose Lake. These are in addition to effects on water quality that may be coming from the tributaries and are as follows: water diversions that in excess can accelerate the succession and extinction of a lake; desiccation or development of the lake's wetlands where spawning and rearing habitat occurs; and input of nutrients that can increase eutrophication, which in early stages can cause an increase in fish production but can also create the conditions under which oxygen depletion can occur.

Habitat improvements (direct or indirect) that have occurred in the past on private and public lands

Past efforts to improve the fisheries habitat and associated ecosystems have been made by private landowners and interest groups and public agencies (Table 7). Some improvements have been seen even though they were conducted mainly on a site by site basis.

Table 7. Past efforts to benefit the native fish of Goose Lake

YEAR	WHO	PROJECT
1958	CDFG	Baffles installed in Highway 395 culvert, Lassen Creek
1959	Cloud Ranch	Steel pilings in drop structure installed to aid trout migration on Willow Creek
1966	CDFG	Provide outmigrant passage by blasting channel at mouth of Lassen Creek, 2-2.5 ft deep, 5 ft wide, 500-600 feet long
1978	CDFG	Baffles installed in Highway 395 culvert, Lassen Creek
1981	CDFG	Baffles installed in Highway 395 culvert, Lassen Creek
1981	Fremont NF	Bank armoring, seeding, and road closures for Howard Creek
1981	Fremont NF	Loose rock check dams on Dent Creek Trib.
1982	Fremont NF	Loose rock check dams installed above lake on Dog Creek
1983	Fremont NF	Loose rock check dams and bank armoring on Green Creek
1984	Fremont NF	Loose rock check dams, juniper revetment, and fencing on Thomas Creek
1986	Modoc NF; Hapgood	Implementation of rest-rotation spring-use grazing system in upper Lassen Creek on Lassen Creek Allotment.
1987	Modoc NF; CCC	Bank stabilization of 3 miles of Lassen and Cold Creek
1987	Cloud Ranch; SCS; Goose Lake RCD	Installation of 4 fish ladders to provide upstream migration passage on Willow Creek on Cloud Ranch
1987	CDFG; Bishop Ranch	Installation of fish screens on irrigation ditches on Lassen Creek on Bishop Ranch
1987	Cloud & Morton Ranch; SCS; Goose Lake RCD	Concrete structure with fish ladder to control headcut and allow fish passage on Willow Creek
1987-1988	CDFG; Bishop Ranch	Channelizing to provide upstream migration passage on Lassen Creek on Bishop Ranch
1987-1988	Cloud Ranch; CDFG (580 program)	Willows planted for erosion control and riparian habitat on Willow Creek
1989	Fremont NF	Loose rock check dams installed on lateral drainages and juniper revetment installed on main stem, Dent Creek
1989	Fremont NF	Loose rock check dams and bank armoring on Green Creek
1989	Fremont NF	Loose rock check dams, juniper revetment, and fencing on Thomas Creek
1989	Fremont NF	Loose rock check dams and bank shaving and seeding on Mesman Creek

YEAR	WHO	PROJECT
1989	Bishop Ranch; CDFG	Headcut control with loose rock structures on Lassen Creek
1989	Cloud Ranch; CDFG; SCS	Developed Wildlife Management Plan which included habitat improvement for GL redband trout on Willow Creek
1990	Fremont NF	Loose rock check dams, fencing, seeding, and riprapping at Warner Ski Hill
1990-1992	Modoc NF; CDFG	Provide upstream migration passage by blasting large debris jams and beaver dams on Lassen Creek
1991	Fremont NF	Loose rock check dams and bank armoring on Green Creek
1992	Cloud Ranch; CDFG; SCS	Developed Wildlife Management Plan which included habitat improvement for GL redband trout on Willow Creek
1992	Modoc NF; CDFG	Began providing spawner access to upper Lassen Creek by blasting rock barrier
1992	ODWF	Provide upstream migration passage by installing weir with ladder and pipes at Garrett Ranch, Thomas Creek
1992	Leavitt Ranch; ASCS	Provide upstream migration passage by installing weir at Leavitt Ranch, Thomas Creek
1992	State of Oregon	Headcut controls by installing loose rock structures, Thomas Creek
1992	ASCS; Outland Ranch; GWEB	Headcut control by installing loose rock structures, Outland Ranch, Cottonwood Creek, OR
1992	70 Ranch; ASCS; ODA	Headcut control by installing loose rock structures, 70 Ranch, Cox Creek
1992	Private ODFW	Thomas Creek- Garrett weir construction.
1992	ODA; ASCS; Maxwell Ranch	Headcut control and bank stabilization by installing loose rock structures and juniper revetment, Maxwell Ranch, Cox Creek
1993	Matt Outland; ASCS	Headcut control by installing loose rock structures, Outland Ranch, Cottonwood Creek, OR
1993	Fremont NF	Log weirs built to allow fish passage through culvert, headcut stabilized, and 4 pieces of wood added on Bauers Creek
1994	Fremont NF	Headcut shaved and stabilized with rock, Cottonwood Creek, OR.
1994	Fremont NF	Headcut stabilized with loose rock structure, East Fork Camp Creek
1994	Fremont NF	1,423 Willows planted on 1 mile of Dent Creek
1994	Fremont NF	501 Willows planted on 0.5 miles of Dry Creek
1994	Fremont NF	445 Willows planted on 1.5 miles of Hay Creek
1994	Fremont NF	647 Willows planted on 0.75 miles of Cougar Creek for bank stabilization and stream shade
1994	Fremont NF	399 Willows planted on 0.5 miles of Grizzly Creek for stabilization and stream shade
1994	Fremont NF	498 Willows planted on 0.5 miles of an unnamed trib. To Cottonwood Meadows Res.
1994	Fremont NF	532 Willows planted in 1.75 miles of Chandler Creek for bank stabilization and stream shade

YEAR	WHO	PROJECT
1994	Fremont NF	Headcut stabilization and juniper revetment on Dry Creek
1994	Private	Fenced Lassen Creek at Bishop property meadow
1994	Modoc NF, MHS	North Fork Davis Creek rock structures. Created holding pools over ¼ mile of stream
1994	Lakeview Water Users	Drews Creek diversion replacement with fish passage
1994	Private	Drews Creek- 2 miles fence, grazing management
1994	Private, ASCS	Cottonwood Creek rock structures
1994	Private, CDFG, BBN, ASCS	Rock structures for Instream habitat improvement on Lassen Creek at Bishop property meadow
1994	Private Modoc Fish Game & Rec. Commission CDFG	Willow Creek pasture trough on Hapgood property and fencing of ¼ mile of creek
1994	ODFW Private	Thomas Creek private land survey for habitat improvement projects and fish passage problems
1994	ODFW	Kelly Creek private land survey for habitat improvement projects and fish passage problems
1994	ODFW	Crane Creek private land survey for habitat improvement projects and fish passage problems
1994	Private	Improvement projects and fish passage problems
1994	ODFW Private	Cogswell Creek private land survey for habitat improvement projects and fish passage problems (except for one parcel).
1994	Fremont NF	Quartz Creek are- 17 miles of road reclamation

In addition to the above, the Goose Lake Resource Conservation District is currently working with the SCS, Central Valley RWQCB, and others on developing watershed-level management plans and education program for improving the fisheries habitat and the health of associated ecosystems of Lassen and Willow Creeks.

A list of proposed projects can be found in Appendix D.

V DESIRED FUTURE CONDITION

The overall Goose Lake Basin habitat will be dynamic, resilient, and consistent with local climate, geology, land-forming processes, and potential natural vegetation. Habitat should be characterized by excellent water quality and physical attributes, which are complex, well-distributed, and similar to those in healthy, unimpacted watershed ecosystems. Aquatic and habitat disturbance within the watershed should be localized and infrequent. Subwatersheds will be viewed and planned as interconnecting units, providing a diverse network of upland, riparian and aquatic habitats throughout the overall watershed. Native fish will be naturally produced at levels reflecting the potential productivity compatibility of the aquatic and riparian habitats.

To meet fish habitat needs, the water quality and quantity and the physical attributes will provide safe and open passage for upstream and downstream migrants, clean spawning substrates, hiding and thermal cover, foraging habitat, and water temperatures to fulfill

physiological requirements. Ecologically appropriate vegetation will allow streambank and upland soil stability and sediment trapping for bank-building to provide diversity of pool and riffle habitats, dissipation of floodwater energy, flushing of spawning substrates, and groundwater recharge and storage for extended flow duration. Ecologically appropriate vegetation will also be a component of cover and foraging habitat.

Stable populations and refugia are established in the Basin to withstand future droughts or other major disturbances, ensuring adaptability and long-term viability of the native fish species.

VI DESIRED FUTURE MANAGEMENT

The intent of the Goose Lake Fishes Conservation Strategy is to outline actions that will need to be taken to establish proper management to achieve healthy and functioning ecosystems that affect the Goose Lake native fishes. Although most on-the-ground actions will need to be developed based on site-specific information and planning, the following management approaches will be followed:

- Management plans will be developed on a watershed or subwatershed basis, as appropriate, because all management activities in a watershed have the potential for affecting all resources in a watershed.
- Management planning will be done through cooperative efforts among public and private landowners, resource agencies, and resource users in order to achieve watershed or subwatershed-level management.
- Management planning will recognize existing land uses, but some changes in management activities are needed. Planning will strive to minimize economic impacts and result in improved habitat for native fisheries as well as improved conditions and operations for other current uses.
- Management planning will use the best scientific analysis possible to determine habitat condition, assess effects of activities, and establish site-specific desired future conditions will be based on the best scientific analysis possible.
- All who are involved or affected by the proposed management plan will be kept informed. Information will be made available to any interested individuals.
- First efforts will be to ensure that all native fish species will be conserved in some refugia to withstand the effects of drought or other catastrophic events.

VII TASKS TO BEGIN CONSERVATION MANAGEMENT

In 1992, the Goose Lake Fishes Working Group began formalizing the tasks that needed to be accomplished for the conservation of the native fish species of the Goose Lake Basin. The tasks are to ensure the long-term recovery and conservation of the native fish species. These tasks are identified below. The rationale for the tasks are as follows:

- **Emergency closure to angling:** Because Goose Lake dried up during the summers of 1992, all of the fish species of concern are residing in the streams and reservoirs. Site-specific angling closure would reduce impacts on these populations.
- **Fish surveys for all fish species:** Fish surveys are needed to determine the overall distribution of the species and identify refugia needs, especially for normally lake-dwelling fish, which may not be as well represented in tributary populations.
- **Habitat surveys:** Habitat surveys are needed to determine the ability of current habitat to sustain their populations, to determine required conditions for management plans to protect and enhance habitat conditions if necessary, and to establish baseline monitoring data to establish a monitoring program for documenting existing conditions and changes over time.
- **Refugia and emergency actions:** Refugial areas will be needed to maintain the fish species in the event of drought or catastrophic events. Sites need to be identified. Site-specific management actions will be developed for the conservation of the native fish. Emergency action plans are needed to ensure that any emergency actions that are needed are implemented in a timely manner.
- **Passage promotion:** Fish passage for upstream migrating adults and downstream migrating adults and young is necessary for lake-dwelling fish. GL redband trout, GL sucker, and GL lamprey are known to migrate into streams to spawn. GL tui chubs were seen migrating upstream in 1992, presumably because of deteriorating lake conditions. Passage problems and possible solutions need to be identified and addressed.
- **Restoration of stream habitat:** Where stream habitat surveys indicate habitat conditions that are not meeting the requirements of the fish, restoration of stream habitat and possible changes or improvements in land management practices should be identified, cooperative management plans developed, and planned actions implemented. Monitoring programs should be established to document changes in habitat over time.
- **Re-establishment of lake populations:** As the lake recovers from the drought, recolonization is expected to occur. Past information on the lake populations has been limited. Because the ecology of recolonization can occur only after periods of drought, research on the recolonization and reestablishment of the lake populations should be started as soon as the lake shows signs of recovering so that we can know more about the whole ecosystem and perhaps be better prepared for the next drought cycle.
- **Genetic analysis:** Genetic analysis needs to be conducted on the native species of the basin to determine the pattern of genetic variability among the population, the amount of genetic variability within the populations, and the amount of interbreeding that the populations may do or may have incurred from the

presence of exotic species. This information will be needed in the development of a long-term conservation strategy for the species.

- **Life history and habitat requirements:** Little is known about the life histories and habitat requirements of the species of the basin. Initial management plans will be based on current information of similar species in other areas or on limited information on species within the basin. Studies on habitat requirements will improve the likelihood for success of future management as well as provide a basis for effective monitoring plans.
- **Restoration of riparian habitat:** Healthy riparian ecosystems are needed to ensure good fish habitat conditions. Management plans for fish habitat will require analysis and management of riparian areas based on watershed and subwatershed-level analysis. Monitoring programs will need to be established to document changes in habitat conditions over time.
- **Reduction of hybridization, competition, and predation threat:** A potential threat to the native fishes of the basin is the effect of introduced fish that could hybridize, out-compete, or prey on them. These threats will be analyzed for the basin and acted upon if necessary.
- **Public outreach and education:** Public outreach, information sharing, and education should result in more people being interested in the management for the fish and in cooperating in the development of watershed-level management plans for the fish and other resource uses. Familiarity with the fish, the overall function of the ecosystem, and the other management practices occurring in the basin will increase the ability of the participant in watershed management planning to develop plans that will better meet the goals of this action plan.

GLOSSARY

Ammocoetes- Larval stage of a lamprey life cycle

Dispersed recreation- Outdoor recreation which occurs outside of planned and maintained recreational facilities, e.g., scenic driving, hunting, backpacking

Embedded- Bottom substrate covered by fine material (1/8" diameter or less)

Endemic- Confined to a certain country or region and with a comparatively restricted geographic distribution

Ephemeral streams- Streams or stream segments that flow only in response to direct precipitation, usually exhibited as overland flow.

Intermittent streams- Streams or stream segments that flow in the winter (following recharge), spring and early summer, usually in response to springs or rim seeps whose flow is in response to the current water year's precipitation. These streams typically cease to flow some time shortly after the snow is gone and has flow with a lag period of less than one year.

Introduced fish species- Any fish species that did not naturally occur in a given body of water

Native fish species- Any fish species that naturally occurred in a given body of water

Parr marks- Dark round or oval markings on the lateral body surface of salmonid fry

Perennial streams- Streams or stream segments that flow every year for most of the year, usually in response to springs whose flow responds to multi-year precipitation and have a lag time response greater than one year

Refugia- A place that provides protection of shelter

Riparian area- An area that is a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

Watershed- (Also known as drainage basin or catchment.) An area bounded by ridges within which surface flows drains to a single location. For Goose Lake watershed, the surface flow drains to the lowest point in the lake. For the tributary watersheds, the surface flow drains to the point where the tributary enters the lake.

Wetlands- Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which, under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. **Developed wetlands** are areas that are artificially maintained and managed to provide wetland habitat

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APPENDIX A.

GOOSE LAKE FISHES WORKING GROUP-BUDGET SUNCOMMITTEE 2 August 1993, Alturas, CA

Attendees were as follows: David Lile, Herb Jasper, Jane Olson, Marty Yamagiwa, and Gina Sato

The following is a budget breakdown for the project from 1992 through 1997.

FISH SURVEYS

Estimate \$200/mile for streams, reservoir figures varied based on size and habitat complexity (labor for 2-person crew, vehicle, equipment, and for CDFG per diem)

USFS, Fremont (108.3 mi + 2 res)	\$ 22,000
Non-USFS, Oregon (237.7 mi + 5 res)	\$ 55,000
USFS, Modoc (42.8 mi + 3 res)	\$ 13,000
Non-USFS, California (42.7 mi +1 res)	\$ 10,000

FISH SURVEY SUBTOTAL

\$ 100,000

HABITAT SURVEYS

Estimate \$700/mile for Fremont NF streams, \$500/mile for non-USFS Oregon streams (less complicated survey), \$900/mile for Calif. Streams (more complicated survey), reservoir figures varied based on size and habitat complexity (labor for 2-person crew, equipment, and for CDFG per diem)

USFS, Fremont (108.3 mi+ 2 res)	\$ 80,000
Non-USFS, Oregon (237.7 mi + 5 res)	\$ 128,000
USFS, Modoc (42.8 mi + 3 res)	\$ 43,000
Non-USFS, California (42.7 mi + 1 res)	\$ 40,000

HABITAT SURVEY SUBTOTAL

\$ 291,000

FISH AND HABITAT SURVEY, GOOSE LAKE

Labor fro 2 person crew, equipment	
Initial set-up (boat, Hydrolab	\$ 25,000
Data collection and analysis,	
(5 yr @ \$20,000/yr)	\$ 100,000

FISH AND HABITAT SURVEY, GOOSE LAKE, SUBTOTAL \$ 125,000

REFUGIA PLANNING

Labor, estimate \$120/day @ 2 days/person for 1 rep each from ODFW, CDFG, Modoc NF, Fremont NF, Bi-County Comm., SDS, ASCS, BLM, USFWS, UC Coop Ext, OR Coop Ext, 6 private landowners

Planning (17 people @ \$240)	\$ 4,000
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FISH COLLECTION FOR REFUGIA

Labor and equipment for 3 days	\$ 1,000
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REFUGIA SUBTOTAL	\$ 5,000
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CORRECTING PASSAGE PROBLEMS, OREGON AND CALIF.

Estimate based on cost of large passage structures on Willow Creek and Thomas Creek

Passage Project	\$ 5,000,000
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ENHANCING ROCKY GORGE PASSAGE, LASSEN CREEK

Labor, supplies, 5 yr @ 1000/yr Passage Enhancement	\$ 5,000
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PASSAGE PROMOTION SUBTOTAL	\$ 5,005,000
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RESTORATION OF STREAM HABITAT, REVIEW OF EXISTING PRACTICES

Estimate 1 month total review effort each for CA and OR, several agencies

Review of practices	\$ 8,000
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RESTORATION OF STREAM HABITAT, DEVELOPMENT OF WATERSHED MANAGEMENT PLANS

Estimate labor equivalent to 1 mo/yr @ \$3500/mo for each watershed for 5 resource specialists plus extra costs for management time, room rentals, public notices, etc.; second year estimated to cost half as much.

Upper Main Thomas (Fremont NF)	\$ 30,000
Lower Main Thomas (private)	\$ 30,000
4 major tribs to Thomas (Fremont NF, 4 x \$ 30,000)	\$ 120,000
Lassen and Willows (Modoc NF and private)	\$ 60,000
Davis (Modoc NF and private but without passage concerns)	\$ 40,000
Pine (Modoc NF and private, start)	\$ 20,000

RESTORATION OF STREAM HABITAT, IMPLEMENTATION

Estimate \$ 200,000/yr for projects and \$ 50,000/yr for maintenance for 3 years; does not include passage corrections; does include Instream and non-instream projects; OR and CA
Restoration implementation \$ 750,000

STREAM RESTORATION SUBTOTAL \$ 1,058,000

GENETIC ANALYSIS

Estimate for analysis of GL redband, GS sucker, GL lamprey, GL tui chub, and speckle dace; does not include other fish at this time because of the need for comparison studies for whole species that are not in the foreseeable future

FIGURES TO COME FROM PHIL HARRIS, OREGON STATE U.

PUBLIC OUTREACH AND EDUCATION

Display to take to meetings	\$ 4,000
Brochures	\$ 4,000
Video	\$ 5,000
Educational materials (5 yr @ \$ 1,000/yr, OR and CA	<u>\$ 10,000</u>
PUBLIC OUTREACH SUBTOTAL	\$ 23,000

1992-1997 STRATEGY PLAN IMPLEMENTATION TOTAL \$ 6,607,000
(+NEEDS FOR GENETIC ANALYSIS)

The following are identified tasks that have already been completed:

FISH SURVEYS

USFS, Fremont (Cox 4, Bauers 5, Camp 6 Auger 4, Shingle Mill 2=21 mi)	\$ 4,200
non-USFS, Oregon (Bauers 5)	\$ 1,000
USFS, Modoc (Lassen 13, 3=16)	<u>\$ 3,200</u>
	\$ 8,400

HABITATA SURVEYS

USFS, Fremont (Cox 4, Bauers 5=9 mi)	\$ 6,300
non-USFS, Oregon (Bauers 5)	\$ 3,500
USFS, Modoc (Lassen 13, Pine 3, Davis 5, Cottonwood 4=25 mi)	\$ 22,500
Non-USFS, California (Willow, .5 mi)	<u>\$ 450</u>
	\$ 32,750

PASSAGE PROMOTION

Lassen Cr rocky gorge passage Enhancement, 1992	\$ 1,000	
Lassen Cr S&D headcut/barrier, 1993	<u>\$ 1,000</u>	
	<u>\$ 2,000</u>	

RESTORATION

Willow Cr fencing, 1993	<u>\$ 3,000</u>	
	<u>\$ 3,000</u>	

TOTAL OF 1992-1997 WORK ALREADY COVERED: \$ 46,150

TOTAL FUNDS STILL REQUIRED FOR 1992-1997: \$ 6,561,000

APPENDIX B.

The following are descriptions of the native fish species of the Goose Lake basin. The descriptions of the Goose Lake redband trout, Goose Lake lamprey, Goose Lake tui chub, Goose Lake sucker, and Pit roach are in Moyle et al. (in press). The descriptions of the Pit-Klamath, brook lamprey, speckled dace, and Pit sculpin are from Moyle (1976). Additional supporting citations, cited in Moyle et al. (in press) and Moyle (1976), are listed at the end of this appendix for the convenience of the reader.

Goose Lake redband trout (Oncorhynchus mykiss ssp.):

The Goose Lake redband trout is a subspecies of rainbow trout that is endemic to the Goose Lake drainage in California and Oregon. There may be two ecological types: a large, lake-dwelling form that spends most of its life in Goose Lake and spawns in tributary streams and a small stream-dwelling form, that remains in the tributary streams.

The body shape of the Goose Lake redband trout is similar to that of rainbow trout. It has a yellowish to orange body color with a brick-red lateral stripe. The dorsal, anal, and pelvic fins are white-tipped. Stream-dwelling adults retain parr marks, while lake-dwelling adults become silvery-grey in color. The lake-dwelling form attains lengths of 450-500 mm total length (TL) and the stream-dwelling form rarely grows larger than 250 mm TL (J. Williams, unpubl. data).

In an extensive electrophoretic analysis of the biochemical-genetic integrity of redband trout, Berg (1987) determined the Goose Lake redband trout are distinctive enough to warrant the status of being a subspecies coastal rainbow trout. There is also no indication of past redband trout/cutthroat trout introgression. Current information indicates that genetic differences between the lake and stream forms have not been investigated. The Goose Lake redband trout has not yet been assigned a sub-specific name.

The lake-dwelling form migrates into tributary streams to spawn in early spring and presumably return during the same season. The young are assumed to rear for a year or more in the streams before migrating to the lake. In the lake, the trout presumably feed on Goose Lake tui chub.

The life history of the stream-dwelling form has not been studied, but it is presumably similar to that of other redband and rainbow trout that live in small, high elevation streams. Such trout typically spawn in their third spring and live four to five years.

Goose Lake Lamprey (Lampetra tridentate ssp.)

The Goose Lake lamprey is an un-described subspecies of the sea-run Pacific lamprey (Lampetra tridentate). Like the sea-run Pacific lamprey, it is parasitic but not much smaller (adults being 190-250 mm TL vs 300-400 mm TL). The lamprey has sharp, horny plates in the sucking disc, the most distinctive being the crescent-shaped supra-oral plate, which has three distinct cusps. The middle cusp is smaller than the two lateral cusps. Adult Goose Lake lamprey are shiny bronze. Ammocoetes have 64-70 myomere segments between the last gill opening and anus.

The closest relative of the Goose Lake lamprey is Lampetra similes of the Klamath River drainage. It may also have affinities with the Pit-Klamath brook lamprey, Lampetra lethophaga, with which it is sympatric (Hubbs, 1971). However, Goose Lake and the Pit River have been separated from the Klamath drainage since the early Pleistocene (1-3 million years); therefore, it is almost certain that the Goose Lake lamprey deserves recognition as a distant species or subspecies. This distinctness was recognized by Hubbs (1925), but the species was not formally described.

Presumably the adults live for one or two years in Goose Lake, preying on Goose Lake tui chubs, Goose Lake suckers, and Goose Lake redband trout. It is likely that they migrate up suitable tributary streams in winter or spring to spawn. They have to move up far enough, possibly 20-30 km upstream of the lake, to find gravel for spawning and to have enough suitable soft-bottomed habitat downstream of the spawning area for survival of the ammocoetes. The ammocoetes probably spend 4-6 years in the stream before metamorphosing into adults and moving out into the lake.

Goose Lake Sucker (Catostomus occidentalis lacusanserinus)

The Goose Lake sucker is a described subspecies of Sacramento sucker. It is a large sucker, reaching 350 mm standard length (SL). The external body coloration is dark grey to black dorsally and light grey-dull brown ventrally. The head is steel grey-brown dorsally, but lighter ventrally. A darker lateral streak is present in larger fish. The caudal, pelvic and pectoral fins are light grey to cream. In reproductive males, sexual tubercles develop on branched and un-branched anal and caudal rays (Martin 1967); pelvic fins become extremely enlarged, elongated, and cupped (Martin 1967); and a red lateral stripe becomes visible (White, pers. comm.).

The Goose Lake sucker was originally described in 1913 as a subspecies (Fowler 1913) and further studies indicated that the subspecies was distinct but the differences were minor. Because of the high variability in morphology of Sacramento suckers, the subspecies status has been questioned; however, until a thorough genetic study of the Sacramento sucker throughout its range is needed for further determination of the appropriate taxonomic level.

During their second year, Goose Lake sucker migrate in April or May, depending on water temperature, to spawn in streams that are tributary to the lake (Martin 1967). Adults have been found in the lake, some of the streams, and some of the reservoirs throughout the year. During summer, young suckers (40-70 mm SL) are very abundant in shallow water among aquatic macrophytes (White unpubl. data.). Goose Lake suckers feed primarily on algae and diatoms (Martin 1967).

Goose Lake Tui Chub (Gila bicolor thalassina)

The Goose Lake tui chub is a described subspecies of tui chub, differentiated from other subspecies of Gila bicolor by their longer fins, more posterior dorsal fin, longer head, and larger number of dorsal rays (usually 9). The coloration is uniformly silver except for a white belly.

Considered by Snyder (1908) to be the naïve tui chub of the upper Pit River from Big Valley upstream to and including Goose Lake, Hubbs et al. (1979) determined that the Pit River form

and the Goose Lake form of tui chub were distinct and that the Goose Lake tui chub was a distinct subspecies with the thalassina name.

The Goose Lake tui chub has been little studied. The size distribution of tui chubs sampled from Goose Lake in 1989 indicate two size modes: greater than 90% of the fish were less than 120 mm SL, while the remainder were 200-300 mm SL (White, unpubl. data). Tui chubs in general are opportunistic omnivores and consume a wide variety of aquatic invertebrates (Moyle 1976). In Goose Lake, they are a major prey of lamprey, as indicated by lamprey scars (R. White, unpubl. data).

In general, tui chubs prefer pools and are generally not found in swift water, although they have been collected from runs in Battle Creek near the west shore of Goose Lake (J. Williams, BLM, unpubl. data). In 1992, large numbers of Goose Lake tui chubs were observed migrating into lower reaches of Thomas, Willow, and Lassen Creeks (GLFWG minutes). This was also observed in 1952 in Lassen Creek, following in time the migration of Goose Lake redband trout (P. Steward, pers. Comm.). 1992 and 1952 were both low waters years.

Pit-Klamath Brook Lamprey (Lampetra lethophaga)

The Pit-Klamath brook lamprey is a small (less than 210 mm TL), non-predaceous lamprey (Hubbs 1971). It has three circumoral plates with two or three cusps each or frequently none. The supraoral plate has three cusps, although the middle may be degenerated or missing. The posterior circumoral plates number only 9 to 15. The cusps on the transverse lingual lamina are file like and difficult to see. The mouth is small and puckered, the disc length less than 5 percent of the total length.

The principal habitat of the species seems to be cool, clear streams or springs with sandy-muddy bottoms or edges (Hubbs 1971). Ammocoetes burrow into soft mud bottoms among aquatic plants. The ammocoete stage lasts at least 4 years, with metamorphosis probably occurring in fall. Spawning begins in early spring but may occur anytime during the summer.

Speckled dace (Rhinichthys osculus)

Speckled dace are a small (less than 90 mm TL), highly variable species. They are distinguished by their small, sub-terminal mouths pointed snout, small scales, thick caudal peduncle, and slender body. Color is highly variable but usually consists of dark blotches on the rear half of the fish that often coalesce to resemble a dark lateral band. The bases of the fins of both sexes turn orange to red during the breeding season. Males may or may not develop tubercles on the pectoral fins.

Speckled dace primarily inhabit cool flowing rocky-bottomed permanent streams and rivers. Their usual habitat is among rocks in riffles. Fry tend to concentrate in the warm shallows of streams.

Speckled dace are generally bottom browsers on small invertebrates. They become mature their second summer, with most spawning activity occurring in June and July, probably introduced by rising water temperatures (Jhingran 1948). In intermittent streams, spawning may be introduced by flooding (John 1963).

Pit roach (*Hesperoleucus symmetricus mitulus*)

The Pit roach is a subspecies of California roach and is represented by the populations found in the Pit River tributaries and Goose Lake. They are small (usually less than 100 mm TL) and chunky bodied. Their eyes and head are relatively large and mouth small and slanted at a downward angle. The upper half of the roach is generally dark, ranging from dusky grey to steel blue. The lower half is usually a dull silver. During breeding season, patches of red orange appear on the chin, on the operculum, and at the base of the paired and anal fins. The males may develop numerous tiny bleeding tubercles on the head at this time.

In the Pit River system, roach are found in deep mud/rock bottomed pools in 2-3 order streams and in the Pit River itself (Moyle and Daniels 1982). Their habitat is characterized by low flows, moderate gradients, warm temperatures and edge vegetational mats. Their main food is filamentous algae, although aquatic insects, small crustaceans, and diatoms also make up part of their diet, depending on season and availability (Greenfield and Deckert 1973, Moyle 1976). Spawning occurs at about two years of age, from March through June (Moyle 1976). The fish usually move up from pools onto shallow, flowing areas where the bottom is covered with small rocks 3-5 cm in diameter.

Pit sculpin (*Cottus pitensis*)

Pit sculpin, the only sculpin in the Goose Lake basin, are a distinct species that apparently evolved from riffle sculpin (*Cottus gulosus*) populations isolated in the upper Pit River. They have 2, occasionally 3, opercular spines and patches of prickles just behind or slightly above the base of the pectoral fins. Color patterns are variable, but usually 5 to 6 faint dark "saddles" are present on the back. A dark band often encircles the end of the caudal peduncle. The belly is light colored.

Pit sculpins are most abundant in the smaller streams of the Pit River system, with a strong preference for riffles. They feed primarily on aquatic insect larvae and are highly selective in their feeding. Spawning occurs in April and May.

Exotic Fish Species:

In addition to the 8 native fish species, there are 10 exotic fish species known to occur in the basin through past and present planting operation. These are as follows:

Rainbow trout (*Oncorhynchus mykiss*)

Brown trout (*Salmo trutta*)

Brook trout (*Salvelinus fontinalis*)

Lahontan cutthroat trout (*Oncorhynchus clarki*)

Brown bullhead (*Ictalurus nebulosus*)

Black crappie (*Pomoxis nigromaculatus*)

White crappie (*Pomoxis annularis*)

Pumpkinseed (*Lepomis gibbosus*)

Largemouth bass (*Micropterus salmoides*)

Yellow perch (*Perca flavescens*)

Fathead minnow (*Pimephales promelas*)

Smallmouth bass (*Micropterus dolomieu*)

Channel catfish (*Ictalurus punctatus*)

Sacramento perch (*Archoplites interruptus*)

Largemouth bass (*Micropterus salmoides*)

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APPENDIX C.

By stream, surveys conducted through 1994.

CREEK	TOTAL STREAM LENGTH MILES	MILES HABITAT INVENTORIED	YEAR & AGENCY OREGON	TYPE OF SURVEY	MILES BIOLOGICAL INVENTORIED	YEAR & AGENCY
KELLY & TRIBS	6.5	3.4	1994 ODFW	R6-L2	3.4	1994 ODFW
		3.1	1993 FNF			
TANDY	3	0			0%	
COGSWELL	12	50%	1994 ODFW		3	1994 ODFW
CRANE	12	50%	1994 ODFW		50%	1994 ODFW
	3.6	1.5	1992 FNF	R6-L2	0	
NORTH FORK CRANE	0.87	0.87	1992 FNF	R6-L2	0	
THOMAS THOMAS & TRIBS	25	100%	1993 ODFW		100%	1993 ODFW
		21	89,93 FNF	R6-L2	?	79,88,89,93 FNF
THOMAS EAST BR.	5	0%			0%	
GREEN VALLEY & FORKS	5	3.1	1994 FNF	BLS	0	
COX	12	100%	91,93 ODFW		100%	91,93 ODFW
	13.4	3.6	1993 FNF	R6-L2	0?	79,88 FNF
NORTH FORK COX	3.9	2.05	1993 FNF	R6-L2	?	88,93 FNF
BAUERS	10	100%	1991 ODFW		100%	1991 ODFW
	12.3	6	1989 FNF	R6-L2	0?	71,79,88,93 FNF

CREEK	TOTAL STREAM LENGTH MILES	MILES HABITAT INVENTORIED	YEAR & AGENCY	TYPE OF SURVEY	MILES BIOLOGICAL INVENTORIED	YEAR & AGENCY
CAMP	10	0			60%	47? 80? 1991 ODFW
	12.4	1.8	1989 FNF	R6-L2	?	
EAST FORK CAMP	4.5	1.7	1993 FNF	R6-L2	?	80 FNF 47, 80, 91 ODFW
AUGER	8.7	80%	1991 ODFW	R6-L2	80%	1991 ODFW
	9.8	8.7		R6-L2	?	1979 FNF
SHINGLE MILL	2	0%	1990 FNF		100%	1991 ODFW
	3.34	2.63	1994 FNF	R6-L2	?	1979 FNF
COTTONWOOD	20	15%	1992 ODFW	R6-L2	15%	1992 ODFW
		4.4	1993 FNF	R6-L2	?	25, 32, 48, 50, 52-61, 88, 93 FNF
DREWS	22	9%	?		8%	1991 ODFW
DRY	8	0%			0%	
	14.5	3.63	1994 FNF	BLS	0	
MESMAN	5.83	3.03	1993 FNF	R6-L2	0	
CRANE	3.58	1.5	1992 FNF	R6-L2	0	
DOG MTN.	4.67	4.67	1994 FNF	BLS	0	
HORSESHOE	6.43	6.43	1994 FNF	BLS	0	
COLD	1.5	1.5	1994 FNF	R6-L2	?	47-51, 53, 57 FNF
DENT & TRIBUTARY	9.7	8	1994 FNF	BLS	0	
LITTLE MUDDY & TRIB.	4.7	2.69	1994 FNF	BLS	0	
MUDDY	10.12	3.63	1994 FNF	R6-L2	0	
HAY	11.6	2.5	1994 FNF	BLS	0	
SNYDER MEADOWS	5	1.74	1993 FNF	BLS	0	
SPRING	1.9	1.9	1979 FNF	UNK	0	
WHITEROCK	1.9	1.84	1994 FNF	BLS	0	

CREEK	TOTAL STREAM LENGTH MILES	MILES HABITAT INVENTORIED	YEAR & AGENCY	TYPE OF SURVEY	MILES BIOLOGICAL INVENTORIED	YEAR & AGENCY
FAWN	1.5	1.5	1994 FNF	BLS	?	79 FNF
TOM YOUNG	1.56	1.56	1993 FNF	R6-L2	?	79 FNF
HELPENSTEIN	3.6	2.65	1994 FNF	BLS	0	
McCAIN	2.84	1.85	1994 FNF	BLS	0	

Survey Methodology

The Fremont NF used the Ochoco NF's BottomLine Survey (BLS) which consists of taking shade readings from Solar Pathfinder at 100 feet intervals (segments). Within each 100 foot segment, pieces of large woody debris (LWD) were counted and cutbanks estimated for length and height. For the purpose of this survey, LWD includes and perennial woody debris that influences channel habitat. Reach summaries were written using data collected, comment forms, and photograph. The BLS is typically used on intermittent and/or non-fish bearing streams, but not always.

The Fremont NF Region 6 Level 2 (R6-L2) Stream Survey is used to access habitat on fish bearing streams. The stream is broken into habitat types (pool, riffle, glide, side channel, dam, fall, chute, and culvert). The habitat type is then estimated for length, width, depth, depth at pool tail crest, stream substrate, pieces of large woody debris, cover for fish, bankfull width and depth, stream embeddedness, bank substrate, bank ground cover, floodplain vegetation, water temperature, stream shading, bank stability, and gradient. General comments and photos are also collected. Reach and Executive Summaries are prepared.

APPENDIX D.
Goose Lake Basin Projects-California (6 February 1995)

YEAR	WHO/WHERE	PROJECT DESCRIPTION GOOSE LAKE BASIN LAKE COUNTY	CS ID#
PASSAGE PROMOTION			
1996	Cooperator: Fremont NF Location: Thomas Creek T37S, R18E, sec. 27	Mesman Crossing (Thomas Creek). Replaced culvert in Thomas Creek at FR 3724 with concrete low-water ford structure, including fish passage slot.	5,6
1997	Cooperator: Fremont NF Location: Thomas Creek, T37S, R18E, sec. 27	Thomas Creek Culvert Replacement. Replaced existing culvert with bottomless arch at downstream end of Cox Flat.	5
1998	Cooperator: Fremont NF Location: Crane Creek, T41S, R21E, secs. 8 & 9	Crane Creek Flood Repair. Installed larger culvert in upper Crane Creek and rebuilt incised channel below with step pool system. Removed two culverts and replaced them with low water fords.	5,6
1998	Cooperator: Fremont NF Location: Kelly Creek, T41S, R21E, sec. 18	Kelly Creek Flood Rehabilitation. Removed Culvert and installed low water ford in Kelly Creek; improved drainage and reinforced road.	5,6
1997	Cooperator: Fremont NF Location: Thomas Creek, T37S, R17E, sec.24	Thomas Creek Slump. Rehabilitation of a 4 acre slump via re-contouring, planting conifer seedlings and placement of large wood.	10
1998	Cooperator: Fremont NF Location: Sugar/Kelly Creek, T41S, R21E, sec. 17	Sugar/Kelly Creek Flood Rehabilitation. Removed Culvert and installed low water ford in Sugar Creek, near confluence with Kelly Creek.	6
1998	Cooperator: Fremont NF Location: Horseshoe Creek, T40S, R17E, sec. 24, T40S R18E, sec. 19,20	Horseshoe Creek. Built approximately 6 loose rock check dams. Armored about 15 small to medium headcuts. Cut and placed over 150 juniper trees instream.	6
1999	Cooperator: Fremont NF Location: Dent Creek Sub-shed	Obliterated 13.62 miles of roads in Gumbo TS.	10
1999	Cooperator: Fremont NF Location: Lower Forest Boundary upstream to Cox Flat; Immediately upstream of Cox Flat	Thomas Creek Flood Rehabilitation: Enhanced five miles of stream below Cox Flat including rock weir/pool creation structures, large wood additions, check dam construction, and bank stabilization (shaving, armoring and planting). Also enhanced existing structures via large wood addition and planting. Constructed ¼ mile of new channel upstream of Cox flat including instream structures.	6
1999	Cooperator: ODFW Location: Thomas Creek	Fish screen on Gover Weir placed 1999 to positively affect redband trout.	5
1999/ 2000	Cooperator: ODFW Location: Thomas Creek	Radio Telemetry in Thomas Creek and tributaries.	2
2000	Cooperator: ODFW, USFWS Location: Drews Creek	Excluded livestock on Drews Creek USFWS owned land and began weed control program.	
2000 **	Cooperator: Fremont NF Location: Dog Lake	Green Creek and Dog Mountain Creek at Dog Lake. Constructed approximately 40 loose rocks check dams to create wildlife ponds and raise water tables.	6
2000	Cooperator: Fremont NF Location: Dog Mountain Creek, T40S, R16E, sec. 17	Constructed five check dams, armored 15-20 headcuts, cut and placed over 100 junipers in stream.	6,10
2000	Cooperator: ODFW Location: Dry Creek	Dry Creek fish ladder.	5
2000/01	Cooperator: ODFW Location: Thomas Creek	Steep pass denil fish ladders on Gover, 70 and Utley weirs. Positive affect to all fish species found in this creek.	5
2001	Cooperator: ODFW	Tomerelli prints on Goose Lake redband trout adfluvial form from Thomas Creek & resident redband from Lassen Creek 2001	2
2001	Cooperator: Fremont NF Location: Green Creek at Green Valley, T40S, R16E, sec. 29	Cut and placed over 100 junipers to create channel aggradations structures instream.	6
2001/02	Cooperator: ODFW Location: Thomas Creek	Radio telemetry and Screw trap monitoring on Thomas Creek.	2
2002	Cooperator: ODFW, Landowner Location: Thomas Creek	Riparian fence constructed to distribute cattle to alternate water sources away from the creek.	

YEAR	WHO/WHERE	PROJECT DESCRIPTION LAKE BASIN LAKE COUNTY	CS ID#
PASSAGE PROMOTION			
2002	Cooperator: ODFW Location: Thomas Creek	Thomas Creek screw trap.	5
2002	Cooperator: Fremont NF Location: Dog Mountain Creek, T40, R16E, sec. 17	Raised level of existing check dams. Constructed new check dams. Armored headcuts. Added juniper to channels.	6
2004	Cooperator: Fremont NF Location: Upper Drews Creek, T38, R17, secs. 5-6	Planted about 1000 willow cuttings on Upper Drews Creek.	6,10
2004	Cooperator: Private, ODFW Location: Drew's Creek	Riparian Fencing on Drew's Creek.	
2004 ***	Cooperator: Private, SWCD, OWEB Small Grant Team Location:	Irrigation reservoir. Repair earth dam at irrigation reservoir, install new diversion pipe and head gates. Improving water efficiency.	
2004 ***	Cooperator: Private, Watershed Council, OWEB Small Grant Team Location: Deep Creek	Stock water development. Landowners placed a temporary fence to keep cattle away from Deep creek. Small Grant paid for solar pumps, panels, and water tanks.	
2004 ***	Cooperator: Private, SWCD, OWEB Small Grant Location: Pennington Ranch, Westside Goose Lake Basin	Pennington irrigation mainliner; Set up a tail water recovery system for more efficient irrigation water use.	
2004 ***	Cooperator: Private, SWCD, OWEB Small Grant Team Location: Westside Goose Lake Basin	Pond rehabilitation. Dredge bottom of old irrigation reservoir, install new head gates, pipes and bank stabilization.	
2004	Cooperator: Private, SWCD, OWEB, Watershed Council Location: Westside Goose Lake Basin	Juniper thinning and cross fencing.	
2004 ***	Cooperator: Private, SWCD, OWEB Small Grant Location: Goose Lake Basin	Replaced deteriorating 6 inch pipe above ground mainline with 10" below ground mainline.	
2005	Cooperator: Fremont NF and Private Landowner Location: Cottonwood Creek	Cottonwood Creek Watershed Restoration. Restore floodplain access; create floodplain; promote channel aggradations and pool enhancement/creation via rock/wood structures construction; add large wood to floodplain; transplant whole willows onsite; reconstruct stream channel to reestablish meandering, single thread channel. 0.5 miles stream.	6,10
2005	Cooperator: ODFW, Private Location: Thomas Creek	Placement of fish screen.	5
2005	Cooperator: Private, OWEB, SWCD, Watershed Councils Location: Drew's Creek	Seventy acres of juniper thinning to improve water distribution and availability to forbs and grasses. Aspen grove Enhancement. Overall improvement to range condition.	
2005	Cooperator: Private, SWCD, OWEB Location: Dry Creek	Riparian fencing on the point ranch. Juniper thinning and pasture seeding to improve riparian area and range function and condition.	
2005	Cooperator: Private, SWCD, OWEB Location: Cottonwood Creek	Off stream water project. Installation of a solar pump to better disperse cattle away from riparian area.	
2005 ***	Cooperator: Private, DU Location: McFarland Project	Pond enhancement for waterfowl habitat.	
2005	Cooperator: Private, SWCD, ODFW, OWEB Small Grant Team Location: Thomas Creek	Thomas Creek bank stabilization. Rip rap placement to stop streambank erosion. Fish screen installation also included in this project.	5,6
2005-07	Cooperator: Private, DU, OWEB Location: Thomas Creek	Nine miles of stream restoration along Thomas Creek. 2000 acres of wetland restoration.	6
Ongoing	Cooperator: Fremont NF Location: Throughout Basin on NFS Lands	Collection of water temperature data at 15-20 sites from 2003 to present. Various locations and years prior to 2003. Data generally collected from June through September. Data on file and available at Lakeview RD.	3
Ongoing	Cooperator: Fremont NF Location: Throughout Basin on NFS Lands	Collection of stream habitat data 1995 to 2005. Data on file and available at Lakeview Interagency Office.	3

YEAR	WHO/WHERE	PROJECT DESCRIPTION LAKE BASIN LAKE COUNTY	CS ID#
ON-GOING PROJECTS IN THE GOOSE LAKE BASIN			
Ongoing	Cooperator: ODFW Location: Gover Screen	Monitoring of Gover Screen live box beginning in 1999.	
PLANNED PROJECTS FOR FUTURE BENEFITS TO GOOSE LAKE BASIN			
2006	Cooperator: Fremont NF Location: Bauer's Creek	Bauer's Creek Culvert Replacement at FR 3628-018; FUNDED	5
2006	Cooperator: Fremont NF, Private Location: Cottonwood Creek	Cottonwood Creek Watershed Restoration Phase II. Riparian planting throughout reach; fence entire reach; build new diversion structure. FUNDED	6,10
2006	Cooperator: ODFW, Stewart Reid, Private Consulting Location: Goose Lake Basin	Modoc Sucker research/site location throughout Goose Lake Basin.	
2006	Cooperator: USFS, ODOT, ODFW	Replace Hwy. 140 culverts on Drew's Creek for fish passage and improvement.	5
2006	Cooperator: Private & DU Location: Thomas Creek	7000' of new channel of new channel to allow fish passage past a dam on the creek.	5
2006	Cooperator: Private, USFW, OWEB Location: Kelley Creek	Culvert Replacement/Re-Design for improved fish passage, road development and improved streambank stability. Native grass seed planted along riparian area and forty willows planted for additional stabilization and rehabilitation.	5
2006	Cooperator: Private, OWEB, Watershed Council, DU Location: Thomas Creek	Technical Assistance dollars granted through OWEB to Thomas Creek on the Harmon property for survey and design. Future restoration grant project through OWEB for stream and habitat restoration.	
2007	Cooperator: Fremont NF Location: Cottonwood Creek	Cottonwood Creek Watershed Restoration Phase III. Re-contour four miles of road prism along Cottonwood Creek currently designated as trail; reconstruct trail. SUBMITTED FOR FUNDING 2006.	6
2007	Cooperator: Fremont NF, Private, ODFW, Watershed Councils Location: Cottonwood Creek	Cottonwood Creek Watershed Restoration Phase IV. Fish screen installation in diversion ditch. Funded by RAC	6
2007	Cooperator: ODFW, Private Location: Upper Drew's Creek	Fish passage improvement and placement of three fish screens. (FUNDED)	5
2007	Cooperator: Private, OWEB, NAWCA, DU, SWCD, Watershed Council Location: Thomas Creek	Two miles of stream restoration on two adjacent landowner properties. Specifics include: channel shaping, habitat improvement, bank stabilization, and site re-vegetation. One Mile of riparian fencing.	6
2007	Cooperator: Fre-Win NF, ODFW, ODOT, Federal Highways Administration Location: Drew Creek	Drews Creek Hwy. 140 Culvert Replacement; Approved funding for NEPA and Design in 2006.	5
2007	Cooperator: Fre-Win NF, ODFW, Landowner Location: Thomas Creek	Thomas Creek Falls Fish Passage Restoration; Currently in planning stage.	5
2007	Cooperator: Fre-Win NF Location: Crane Creek	Crane Creek road repair/relocation; Currently in planning stage.	6,10
1997	Cooperator: Private, CDFG Location: Willow Creek, Forest Road 47N05	Natural bottom bridges in replacement of culvert.	
2006	Cooperator: Cal Fish & Game, Modoc Co. Extension, Goose Lake RCD, Private, Modoc County, USFS Location: Lassen Creek	Fish habitat/passage and rehabilitation project.	
2006	Cooperator: Private, Goose Lake RCD Location: Lassen Crk., Willow Crk, and Davis Creek.	Fish surveys to be conducted yearly by Stewart Reed.	

POTENTIAL FUNDING SOURCES

- Bring Back the Natives
- Trout Unlimited
- California Farm Bureau
- California Cattlemans Association
- Restoration and Enhancement (R&E) from ODFW
- ASCS
- USFWS- Partners in Wildlife Program
- USFWS- Section 6
- EPA- 319 Grant
- EPA- 205 J Grant
- Oregon Watershed Enhancement
- Stewardship Incentive Program (ODF & CDF)

sae/knr
17 June 2008