Habitat Assessment and Restoration Planning in the Salt Creek Watershed, Lower Klamath River Sub-Basin, California

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Captain Scott Gibson surveying Salt Creek during winter base flows in January 2002.

INTRODUCTION

The Yurok People have inhabited the lower Klamath River and relied on native fish populations for their subsistence, cultural, and economic livelihood since time immemorial. Runs of anadromous fish currently returning to spawn in lower Klamath River tributaries are depressed when compared with historical numbers. Numerous studies conducted in these tributaries have linked dwindling fish populations to large-scale habitat degradation (Gale and Randolph 2000; Balanced Hydrologics, Inc. 1995; Lintz and Kisanuki 1992; Lintz and Noble 1992; Kier and Associates 1991; Payne & Associates 1989; USFWS 1979). Extensive timber harvest and road construction activities occurring on steep, naturally fragile terrain, has resulted in chronic streambed sedimentation and a concomitant loss of habitat diversity and production potential in these watersheds (Gale and Randolph 2000; Balanced Hydrologics, Inc. 1995; Voight and Gale 1998).

The declining health and productivity of Klamath River anadromous fish populations is of great cultural and economic concern to the Yurok Tribe. Therefore, the Tribe is dedicated to restoring lower Klamath River tributary habitats to levels that support viable, self-sustaining populations of native anadromous fish. To address this long-term restoration goal, the Tribe formed the Lower Klamath Watershed Restoration Partnership in conjunction with Simpson Resource Company and the California State Coastal Conservancy in 1995. This cooperative framework is intended to meet the mandates and objectives of state and federal planning efforts, the Northwest Economic Adjustment Initiative and the Endangered Species Act through innovative solutions to resource management issues between Tribal interests, private landowners, and public agencies.

In 1996, the Yurok Tribal Fisheries Program (YTFP) began collecting biological and physical habitat data to identify factors limiting to anadromous fish in lower Klamath River tributaries. This multi-year, interdisciplinary effort, consisting of historical and current condition assessments throughout each tributary, resulted in a prioritized restoration plan for the lower Klamath River Sub-basin (Gale and Randolph 2000). Restoration objectives included rehabilitating important off-estuary slough habitats located in Salt Creek, Hunter Creek, Mynot Creek, and Spruce Creek (Figure 1). It is believed these watersheds were historically interconnected and formed a large arm of the Klamath River estuary. This slough likely endured significant back flooding events caused by the combination of high flows occurring in the Klamath River, and high tides occurring in the Pacific Ocean. Aquatic habitat quality and biological productivity in the slough during this time is presumed to have been extremely high. Much of this slough habitat, however, has been lost or degraded over the past hundred years as a result of land management, diking and agricultural conversion in these drainages, and hydrologic alterations in the mainstem Klamath and Trinity Rivers.

Salt Creek is the lower-most anadromous tributary to the Klamath River, entering the estuary less than one mile upstream of the Pacific Ocean (Figure 1). Salt Creek flows through a low gradient valley and is comprised of shallow meandering channels interspersed with immense beaver ponds and wetland habitats. In contrast, High Prairie

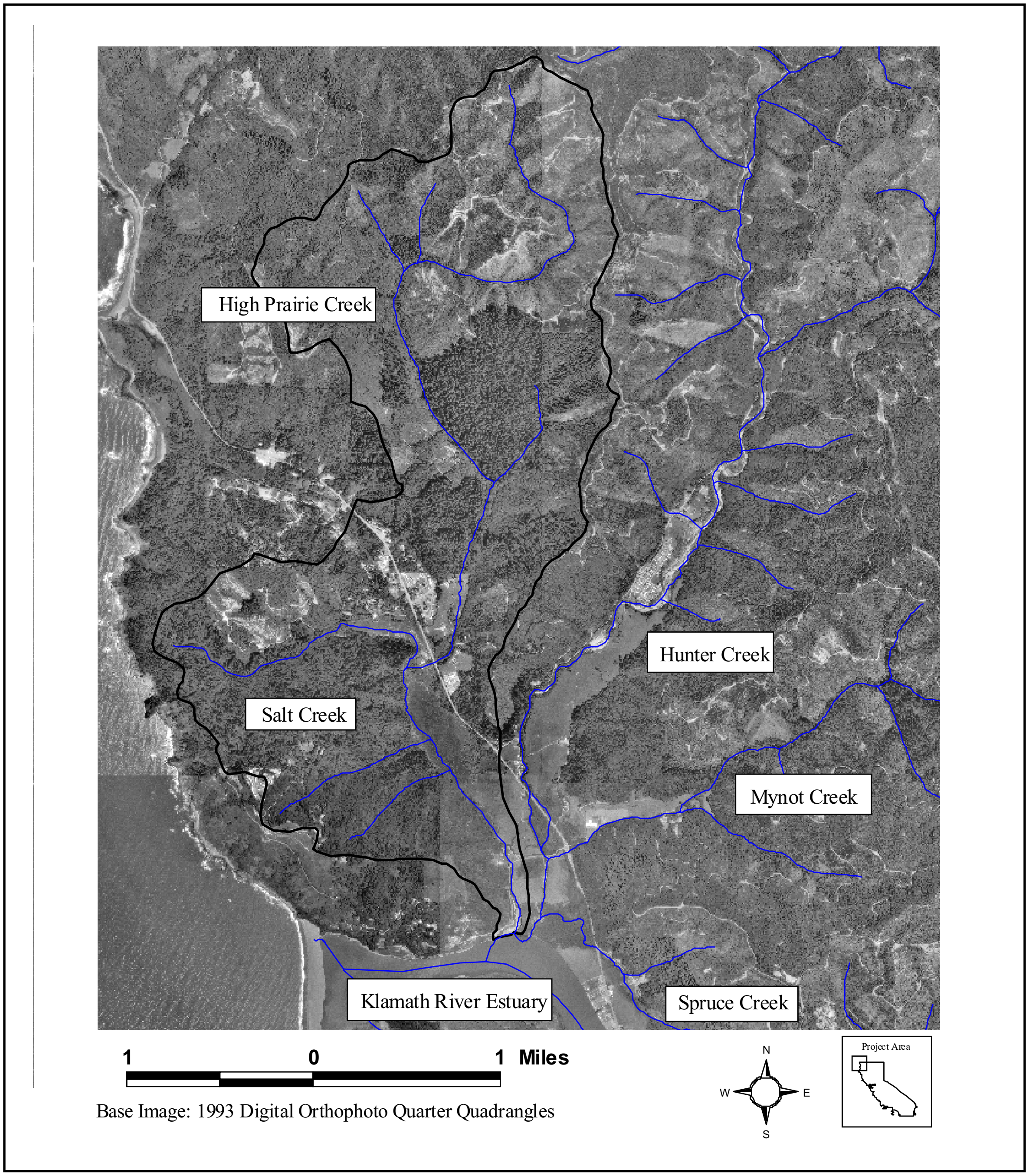


Figure 1. Map of the Salt Creek watershed located in the lower Klamath River Sub-basin, northern California.

Creek (Salt Creek's major tributary) is a steeper and more confined, gravel dominated stream. These very different systems provide salmonids a unique and diverse range of habitats including vast winter rearing in the deep, slow moving reaches of Salt Creek and relatively abundant spawning grounds located in High Prairie Creek.

Prior to this study, limited data existed regarding habitat and water quality conditions or fish use of tidally influenced tributaries. YTFP began documenting water quality conditions and juvenile fish distribution in the Klamath River estuary and the tidally influenced lower reaches of Salt Creek and Hunter Creek in 2000. These initial investigations alerted YTFP to the poor water quality conditions that persist in Salt Creek during low summer and fall months. Reductions to Klamath River flows and the construction of levees along the lower river and in tributary watersheds have adversely affected the production potential for salmonid species in the Salt Creek watershed. Despite the existing impairments, YTFP believes this system has the potential of providing critical rearing habitat for significant numbers of juvenile salmonids emigrating from Salt Creek, as well as non-natal fish from elsewhere in the Klamath Basin seeking off-estuary habitat.

This report summarizes physical and biological assessment activities conducted throughout the Salt Creek watershed and presents a prioritized set of restoration recommendations. Data collection objectives were designed to assist in developing restoration strategies for the Salt Creek watershed, serve as a quantitative baseline to evaluate future implemented restoration projects, and provide for long-term assessment of physical and biological trends.

Data collection objectives included:

- assessment of water quality, habitat conditions, and fish passage in anadromous reaches of Salt Creek and High Prairie Creek;

- documentation of presence, distribution, and relative abundance of salmonid species in the Salt Creek watershed, and

- documentation of changes in land cover and stream pattern occurring in the Salt Creek watershed over time, using aerial photographs and GIS.

These data were used to identify limiting factors affecting various life stages of anadromous salmonids in the Salt Creek watershed and develop prioritized restoration and management actions to specifically address these factors. Baseline watershed data provides the means to assess effectiveness of future restoration.

STUDY AREA

The Salt Creek watershed is located in the Northern Coast Ranges of California approximately one mile inland of the Pacific Ocean (Figure 1). Climate of the area is classified as Marine West Coast, with the Pacific Ocean maintaining relatively moderate air temperatures with cool summers and wet winters. Mean air temperatures for the area are 54.6 ºF for July and 6.8 ºF in January (USFS 1990). Annual average precipitation for the area is 65.4 inches based on hourly rainfall data (WY 1999 – 2002) collected at the USGS gaging station located near Terwer Creek, Del Norte County, California (Station ID: TUR; Sensor ID: 8237) (Latitude: 41º51'20"; Longitude: 123º99'90").

Salt Creek drains 5.85 square miles of low-lying forested hillsides and an expansive valley comprised of pastures and wetlands. Geological evidence suggests that Wilson Creek, a third order watershed now draining to the Pacific Ocean, formed the valley currently inhabited by Salt Creek. Tectonic processes and coastal erosion are believed responsible for the capture of Wilson Creek by the Pacific Ocean.

Hillslopes of the watershed support coast redwoods (*Sequoia sempervirens*), Sitka spruce (*Picea sitchensis*), Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and Port Orford-Cedar (*Chamaecyparis lawsoniana*). Riparian habitats of Salt Creek proper support thick stands of willow (*Salix* spp.) and salmonberry (*Rubus spectabilis*), and a small component of Sitka spruce and red alder (*Alnus rubra*) (Figure 2). Wetland areas are dominated by cattails (*Typha* sp.) and dense growths of sedges (*Carex* spp.). Deep water habitats are often filled with pond lilies (*Nuphar* spp.), *Potomegeton*, duckweed (*Lemna* sp.), watermilfoil (*Myriophyllum* sp.), with creeping buttercup (*Ranunculus repens* L.), giant horse tail (*Equisetum hyemale*) and skunk cabbage (*Lysichitum americanum*) inhabiting the shallow habitats.

Figure 2. Looking downstream at a beaver pond and the associated riparian plant species of Salt Creek on 30 June 2003.

Riparian forests of High Prairie Creek are composed of the aforementioned conifer species, red alder, big-leaf maple (*Acer macrophyllum*), and California bay (*Umbellularia californica*). Under-story vegetation includes salmonberry, thimble berry (*Rubus parviflorus*) black and red huckleberry (*Vacinium ovatum* and *V. parvifolium*, respectively), and multiple fern species (*Polystichum* spp.). Dominant vegetation types found in the sub-watershed are coast redwood – sword fern (*Polystichum munitum*), and red alder – salmonberry (USFS 1990).

The Salt Creek watershed supports populations of coastal cutthroat trout (*Oncorhynchus clarki clarki*), steelhead (*O. mykiss*), and coho salmon (*O. kisutch*), which are currently listed as "threatened" under the federal and California state Endangered Species Acts. Recent YTFP investigations have documented the presence of juvenile chinook salmon (*O. tshawytscha*) in lower Salt Creek. In addition to salmonids, the watershed also supports multiple species of lamprey (*Lampetra* spp.), threespine stickleback (*Gasterosteus aculeatus*), sucker (*Catostomus* sp.), speckled dace (*Rhinichthys osculus*), prickly sculpin (*Cottus asper*), and coastrange sculpin (*C. aleuticus*).

Salt Creek proper (2.26 sq mi) is primarily managed for livestock grazing with timber harvest occurring mainly along its western slopes. Two small seasonal businesses located at the mouth of Salt Creek provide recreational vehicle camping and boat access to the Klamath River. High Prairie Creek (3.59 sq mi) flows into Salt Creek ~1.6 miles upstream of the estuary and consists mainly of forestland, including a small stand of old growth conifers (Figure 3). Contained in the watershed is the 1.46 square mile Yurok Redwood Experimental Forest established in 1940 to conduct silvicultural research on coastal redwoods (USFS 1990). Approximately 45 percent of the experimental forest was clearcut between 1956 and 1985. A research and natural area was established in the experimental forest and comprises 16 percent of the forest area. Ecological survey data for the research and natural area is presented in Taylor (1982).

Figure 3. Recently toppled old growth redwood in High Prairie Creek on 5 January 2004.

METHODS

Habitat Assessment

Stream habitats in anadromous reaches of Salt Creek and High Prairie Creek were classified according to Level IV habitat inventory methods outlined in Flosi et al. (1998). A two-person crew moving in the upstream direction performed the inventory. One hundred percent of the units were classified and their lengths, mean width, mean/maximum depths, substrate composition, canopy cover, and bank composition and vegetation were measured or estimated. All pools were classified is this manner with each unit also receiving an estimated shelter value, a breakdown of cover types available, and an estimated value of pool tail embeddedness. Shelter values reflect the quantity and composition of the habitat features available as cover to juvenile salmonids. Values range from zero where no cover is present to three where complexity and quantity of shelter is high. Pool tail embeddedness values reflect the percentage that pool tail gravels are covered by fine sediments. An embeddedness value of five or “unsuitable” is assigned when no suitable spawning conditions exist at the pool tail. Pool tail depths were also measured for each pool encountered. Please refer to Flosi et al. (1998) for detailed descriptions of parameters used.

Habitat assessment of Salt Creek began at its confluence with the Klamath River and was accessed through the Panther Creek Resort. Much of Salt Creek was mapped using a two-person kayak and a network of small trails along the western slopes of Salt Creek. Upper Salt Creek was accessed via Simpson Resource Company roads and the kayak. Habitat conditions were difficult to describe using Level IV methodologies, therefore, photographs, detailed field notes and diagrams were used to supplement survey data in Salt Creek. Some channel reaches were impossible to navigate on foot or kayak. These areas were assessed using collected GPS locations and the USGS 1993 Requa Digital Orthophoto Quarter Quadrangles (DOQQs).

Habitat assessment of High Prairie Creek began at its confluence with Salt Creek approximately 100 feet downstream of the U.S. Highway 101 bridge crossing. High Prairie Creek was accessed from YTFP’s office via a timber road that parallels the creek for several miles and by walking the stream channel.

Habitat data were recorded on field data forms copied from Flosi et al. (1998). Data was initially entered and sorted in Microsoft Excel and then exported to S-Plus 2000 for statistical analysis. Summary tables and figures were designed in Microsoft Excel to correspond to those presented in Flosi et al. (1998).

Channel Type Surveys

Channel types were classified in the surveyed reach of High Prairie Creek according to Rosgen (1996). Channel types and their break locations were first assessed during the habitat survey of High Prairie Creek. For each channel type observed, a representative cross section in the reach was surveyed using methods outlined in Flosi et al. (1998).

Three permanent cross section stations were established in lower High Prairie Creek to monitor long-term channel changes in this reach. All survey benchmarks and endpoints were permanently marked with ¾ inch capped rebar. The benchmark for the lower most station HP_XS1 was established on a right bank levee surface located approximately 300 feet downstream of the wooden bridge used to access the local water supply tank. The benchmark for HP_XS2 was established on the lower most right bank terrace surface 3,246 feet upstream of HP_XS1. The benchmark for the upper cross section HP_XS3 was established on the lower most left bank terrace surface 1,126 feet upstream of the USFS bridge.

Cross section locations were selected in relatively straight channel reaches and for their natural channel indicators of bankfull and flood prone elevations. Each cross section was surveyed by stretching a graduated tape (0.1 feet) across the channel from one survey pin to the opposite pin. Surveys were conducted using either a Topcon level or a Criterion total station. Elevations were shot to delineate important bank and channel features including slope breaks, active scour lines, and floodplain and terrace surfaces. Data collected using the survey level was entered into Microsoft Excel for analysis and to generate figures.

To estimate water surface slopes through cross section reaches, short longitudinal water surface and thalweg profiles were surveyed. Surveys were conducted at stations HP_XS2 and HP_XS3 by placing the Criterion in the channel and surveying elevations at habitat unit breaks and other reference points. The Topcon level and survey rod was used to estimate water surface slope upstream and downstream of HP_XS1. Bed material was characterized through each cross section reach using modified Wolman pebble counts outlined in Rosgen (1996). Pebble count data were entered into Microsoft Excel for analysis and to generate cumulative frequency distributions of particle diameters.

Large Woody Debris Survey

Large woody debris (LWD) is defined as those pieces of wood larger than 12 inches in diameter with a minimum length of six feet. Instream LWD and potential LWD recruitment from riparian habitats of High Prairie Creek were inventoried according to methods outlined in Flosi et al. (1998). The potential LWD recruitment zone includes the floodplain and the adjacent riparian habitats located within 50 feet of the floodplain (Flosi et al 1998). Field data were entered on the standard form and then entered in Microsoft Excel for sorting and generating tables and figures.

Fish Migration Barrier Assessment

All fish migration barriers in the Salt Creek watershed were identified and characterized during habitat surveys conducted in summer 2002. Additional field surveys were conducted throughout the study period to observe specific barriers during high flow events and to monitor any changes in barrier status. Each barrier was assigned an individual identification code and mapped in Arc View 3.2 using a precision hand-held GPS unit (<0.5 meter resolution) or from stream lengths measured during habitat surveys. A database that includes location and barrier descriptions was developed following similar methods outlined in Gale (2003).

For this study, a fish barrier was defined as a landscape feature that either significantly hindered or blocked migration to adult or juvenile salmonids. The status of each barrier was described using the following designations: complete, partial, or seasonal. Complete barriers were features known to prohibit upstream passage to all anadromous salmonid species. Partial barriers were features known to present a significant hindrance to migrating fish but may provide passage to some species and/or under some conditions. A seasonal barrier prohibits migration on a seasonal basis with passage dependent mostly on flow conditions.

Fish Distribution

Fish species presence and distribution in the Salt Creek watershed were assessed using several different methodologies including: direct observation, electrofishing, baited minnow traps, hook-and-line sampling, and migrant fish traps. All fisheries assessments conducted by YTFP within the Salt Creek watershed are presented in this report.

Electrofishing surveys in the Salt Creek watershed were first conducted by YTFP in 1997. These qualitative surveys primarily consisted of a single upstream pass through a select reach. Brief descriptions of dominant habitat, cover types, substrate, and riparian canopy were recorded on most occasions. All salmonids captured were enumerated with fork lengths (nearest mm) and condition codes recorded for all or a subsample of the capture. Fish species codes used in fish summary tables are presented in Table 1. The condition codes used in these studies reflect the degree of smoltification observed for a given salmonid. Juvenile coho presence in upper High Prairie Creek was assessed following CDFG's ten-pool direct observation methods in summer 2002.

It was not possible to use backpacking electrofishing gear to capture salmonids in the deep beaver ponds and wetland habitats of Salt Creek. Therefore, YTFP attempted alternative sampling methods including hook-and-line sampling and baited minnow traps to assess salmonid populations in these habitats.

Table 1. Definitions of fish species codes used in fish summary tables.

Species Code	Species	Common Name
OM	*Oncorhynchus mykiss*	Steelhead or Rainbow Trout
OC	*Oncorhynchus clarki clarki*	Coastal Cutthroat Trout
OK	*Oncorhynchus kisutch*	Coho Salmon
OT	*Oncorhynchus tshawytscha*	Chinook Salmon
GA	*Gasterosteus aculeatus*	Three-spined Stickleback
LT	*Lampetra tridentata*	Pacific Lamprey
LP	*Lampetra pacifica*	Brook Lamprey
Cottus	*Cottus* spp.	Sculpin Species
Catostomus	*Catostomus* spp.	Sucker Species
RO	*Rhinichthys osculus*	Speckled Dace
ST	*Salmo trutta*	Brown Trout
NC	*Notemigonus crysoleucas*	Golden Shiner
LC	*Lepomis cyanellus*	Green Sun Fish
PGS	*Dicamptodon ensatus*	Pacific Giant Salamander
RSN	*Taricha granulose*	Rough Skin Newt

Salt Creek Migrant Trap

A downstream migrant trap was installed using weir panels and a frame net draining to a live box to assess salmonid emigration from lower Salt Creek. The trap fished select outgoing tides during the period 30 April – 9 May 2002. The trap was set by installing the frame net and live box at high tide and allowing the trap to fish until low tide. Fish collected in the live box during this interval were enumerated and fork lengths, development codes, and condition codes were recorded for all salmonids present.

A similar trap design was used to capture emigrating salmonids from a new location in lower Salt Creek during the period 3 April – 30 May 2003. The trap was fished by connecting the frame net and live box on Monday morning, allowing the trap to fish until Friday morning when the live box was disconnected. Fish captured in the live box were enumerated daily and the aforementioned parameters were recorded for all salmonids captured.

During the spring of 2003, YTFP made several attempts to assess salmonid immigration patterns in the tidally influenced reach of Salt Creek. Migrant traps were set facing downstream prior to the daily incoming tide and allowed to fish until slack tide. No fish were captured during these efforts due to flow constraints and the limitations of the equipment used.

Spawning Surveys

A combination of direct observation and bank surveys were employed in High Prairie Creek during the salmonid spawning season of 2002 – 2003. Objectives were to determine which species were using the drainage for spawning and to document the relative abundance/distribution of redds. Species, fork length, sex and other comments were recorded in field notebooks for all adult fish observed. Total length, average width, and associated water depths of each observed redd were also recorded. All fish and redds observed were given a location on a USGS topographic map of the stream channel.

Water Quality

YSI Measures

Water temperature, dissolved oxygen, conductivity, and salinity were monitored using a YSI 85 Meter at several permanent monitoring stations. Five stations were established in the tidally influenced reach of Salt Creek and were monitored once monthly at high slack tide and low ebb tide for the period January – December 2002 (Figure 4). Four other sites were established throughout the Salt Creek watershed: Salt_High, Upper Salt, Lower High Prairie, and Upper High Prairie (Figure 4). These sites were monitored monthly for the period August 2002 – June 2003.

Temperature Monitoring

Additional temperature monitoring was conducted using Optic temperature monitors programmed for hourly measurements. Water temperature monitors were placed at sites Salt_Mid, Salt_High, and Upper High Prairie for the period 1 July 2002 – 30 June 2003 (Figure 4). Annual and monthly mean temperatures along with daily mean, maximum, and minimum temperatures were calculated from these data for each site. Annual degree-days were calculated for each site by summing daily mean temperatures over the study period.

Air temperatures were monitored at site Salt_Air, located near the mouth of High Prairie Creek for the period 21 April – 30 September 2003. Data was obtained from an Optic temperature monitor suspended from a limb of an alder tree located on the west bank of Salt Creek (Figure 4). These data were used to calculate daily average air temperatures for this site. Regression analysis was used to determine the line of best fit relating daily mean water temperatures at Salt_Mid and daily mean air temperatures. Fitted parameter constants (a and b) and their associated standard errors were obtained using the least-squares regression function in S-Plus 2000 for Windows.

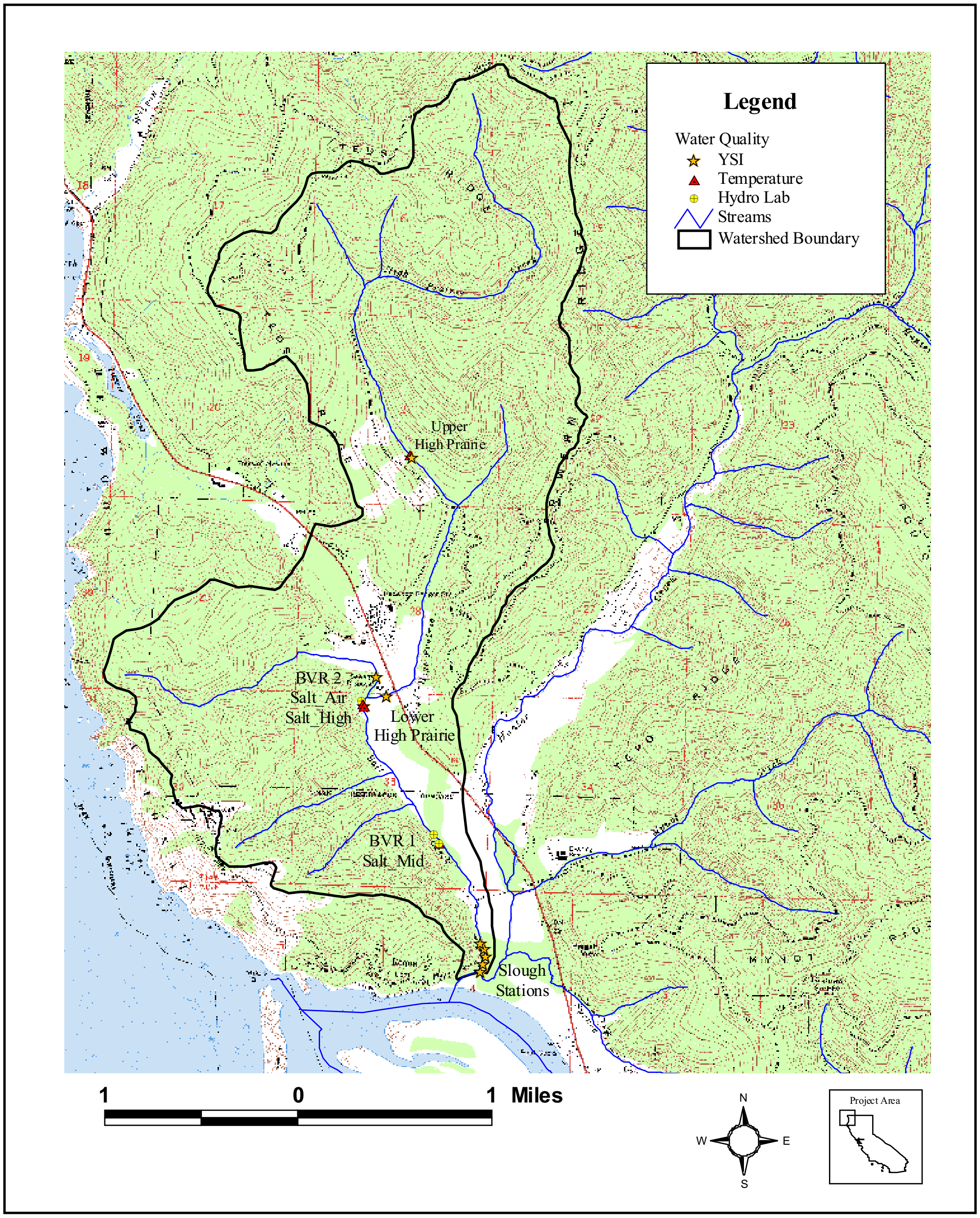


Figure 4. Map of water quality monitoring sites in the Salt Creek watershed, lower Klamath River Sub-basin, California.

Hydro Lab Measures

To document water quality in Salt Creek over 24 hour intervals, Hydro Lab Data Sonde 4a meters were used to measure water temperature, dissolved oxygen, conductivity, and pH during two sample periods in April and June of 2003. Prior to use, meters were calibrated by Yurok Tribal Environmental Program (YTEP) staff and set to record measurements every hour. When meters were retrieved they were immediately transferred to YTEP staff for data download and post calibration.

On 15 April, a Hydro Lab meter was placed at site BVR 2 located in a beaver pond just upstream of the High Prairie Creek and Salt Creek confluence (Figure 4). The meter was placed in the thalweg at 1.1 m depth and retrieved on 23 April. On 17 April, another meter was placed at site BVR 1 located in a beaver pond just upstream of YTFP monitoring site Salt_Mid (Figure 4). The meter was placed in the thalweg at 0.9 m depth and retrieved on 23 April. On 26 June, a Hydro Lab meter was placed at Salt_Mid in the thalweg at 0.1 m depth and retrieved on 30 June. The meter was then moved upstream to BVR 1 at 0.5 m depth and retrieved on 7 July. Every time a meter was deployed or retrieved, the YSI 85 meter or YTEP's Quanta meter was used to measure water quality parameters at the monitoring sites.

Biofouling of Hydro Lab probe membranes naturally occurred after short-term exposure to aquatic habitats causing measurements to drift slightly from their true values. Therefore, 48-hour periods where little to no drift occurred for any parameter was selected from each sampling period. These 48-hour periods were used for analyses.

Changes in Land Cover and Channel Patterns, 1936 to 2001

Land cover types and channel patterns were mapped and classified for Salt Creek and lower Hunter Creek watersheds representing four time periods; 1936 - 1948, 1949 - 1965, 1966 - 1988, 1989 - 2001. Mapping of valley bottom land cover (downstream of Highway 101) and low gradient channel patterns within lower Hunter Creek valley was included to provide background on the interaction of the two systems over these time periods. This includes Hunter Creek from approximately 200 feet upstream of Highway 101 and the low gradient channel extent for Mynot, Panther, Spruce and Tepo Creeks.

Maps were prepared by reviewing the series of aerial photographs and Digital Orthophoto Quarter Quadrangles (DOQQS) listed in Table 2 and heads-up digitizing features into an ArcView GIS project (ESRI 2001). Aerial photographs were rectified to the 1993 DOQQs. Discrepancies in spatial accuracy were improved by mapping on the rectified aerial photographs (RAPs) and adjusting the delineation to the 1993 DOQQs. Several field reconnaissance trips were conducted to calibrate aerial image mapping with ground based observations.

Table 2. Aerial photographs and digital orthophoto quadrangles used for mapping land cover types and stream patterns within Salt Creek and lower Hunter Creek.

Flight Date	Source	Flight Line	Frame Numbers	Type
WNT/SPR 1936	unk	unk	20,21,53 & 54	B&W AP
6/23/1948	CDF	20	126,127,129 & 179	B&W AP
9/28/1954	AV	2	5 & 6	B&W AP
9/28/1954	AV	3	6,7,8 & 10	B&W AP
9/18/1963	DNC	11	11,12,13 &14	B&W AP
9/18/1963	DNC	12B	9, 10,11,12,14 & 15	B&W AP
9/18/1963	DNC	11	15,16,17 & 18	B&W AP
7/8/1965	EPT	01FF	141,142,143,144,163,165 & 166	B&W AP
7/7/1969	DNC	11A	12,13,14,15,16,17 & 18	B&W AP
7/7/1969	DNC	9	7,8 & 10	B&W AP
7/7/1969	DNC	10	8,14,15,16,17,19 & 20	B&W AP
9/22/1972	DNC	9	9	B&W AP
9/22/1972	DNC	10	12,16,20, & 21	B&W AP
9/22/1972	DNC	11	13	B&W AP
6/201985	USDA-BIA	485	57,58,59,60,61,63,64 & 65	Color AP
7/18/1988	USDA		Requa	Color Infrared DOQQ
6/12/1993	USDA		Requa	B&W DOQQ
6/7/2001	Hum	22	1	Color AP
6/8/2001	Hum	23	1,2,5,7 & 9	Color AP
6/11/2001	Hum	24	3,5,7 & 9	Color AP

Valley bottom land cover types followed a classification scheme modified from Stewart and Kantrud (1971) and Cowardin et al. (1979). Figure 5 shows the basic features of a Lacustrine System, similar to those habitats mapped in the lower reaches of Salt and Hunter Creeks, as described by Cowardin et al. (1979). Uplands were mapped based on changes in the extent of original coniferous forest and classified as either Coniferous Forest- Unlogged or Coniferous Forest- Second Growth. Table 3 shows the classification scheme for land cover type mapping. Minimum mapping units were one and five acres for valley bottom and upland features, respectively, unless isolated features could be identified and mapped at a smaller scale.

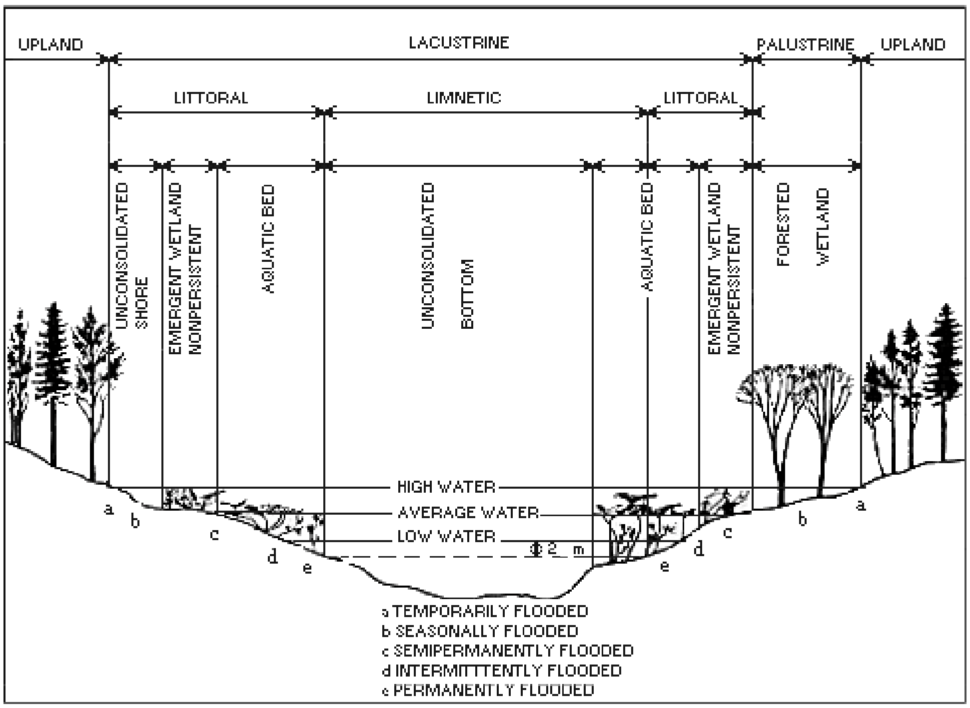


Figure 5. Distinguishing features of habitats in the Lacustrine System (adapted from Cowardin et al. 1979).

Land cover types, dominant vegetation and water regimes were determined by observing changes in texture and pattern over sequential aerial imagery and several field reconnaissance trips. Thus, observations were integrated from several sources to produce a map that summarized the conditions for the given period.

Table 3. Classification scheme for land cover type mapping.

Land Cover Type	Dominant Vegetation	Water Regime
Deep marsh	Grass/Herbs	Perennially wet
Shallow marsh	Grass/Herbs/Shrubs	Perennially wet
Emergent marsh	Grass/Herbs	Seasonally wet
Scrub-shrub marsh	Shrubs/Trees	Seasonally wet
Riparian Forest - Unlogged	Trees/Shrubs	Seasonally wet
Riparian Forest-Second Growth	Trees/Shrubs	Seasonally wet
Farmed Bottomland	Livestock Grazing & Hay Cultivation	Seasonally wet
Coniferous Forest-Unlogged	Trees/Shrubs	Upland
Coniferous Forest-Second Growth	Trees/Shrubs	Upland
Farmed Upland	Livestock Grazing & Hay Cultivation	Upland
Residential	Grass/Herbs/Shrubs/Trees	Composite
Commercial	Grass/Herbs/Shrubs	Composite
State Highway	Grass/Herbs	Composite

Channel patterns were mapped and the condition of individual reaches was assessed following the classification scheme outlined in Table 4. The condition assessment visually evaluated changes in vegetation, livestock grazing, road construction, stream bank erosion, sediment transport, and channelization over sequential aerial imagery and is intended to guide future ground based investigations and restoration planning. The spatial accuracy of remotely mapping changes in channel location and condition is limited by channel obscuring vegetation and image resolution; as such only reach scale changes were delineated, unless obvious changes were clearly evident.

Table 4. Classification scheme for stream condition assessment.

Stream Condition	Description
Open	Channel form and function is not visibly distressed by recent anthropogenic or natural events.
Abandoned	A channel disconnected from channel maintaining flows; most likely by natural processes. These channels may continue to receive surface and subsurface flow and still be linked to the current stream network.
Dewatered	A channel disconnected from channel maintaining flows by land use activities.
Altered	Channel form and function visibly disrupted by any one or combination of the following: vegetation conversion, livestock grazing, road construction, stream bank erosion, sediment transport, and channelization.
Stressed	Similar to Altered but the magnitude of disturbance is visibly more significant and/or chronic.
Impaired	Channel form and function severely disrupted by land use activities. Original channel pattern may no longer exist.

RESULTS

Habitat Assessment

Salt Creek

A total of 79 instream habitat units were classified in 12,540 feet of mainstem Salt Creek during September – October 2002. Pool and flatwater habitats were the most frequently encountered Level II habitat types (Figure 6). When survey lengths are considered, pools remain the dominant habitat type comprising half of the total survey length with flatwater and marsh at approximately twenty percent each (Figure 6).

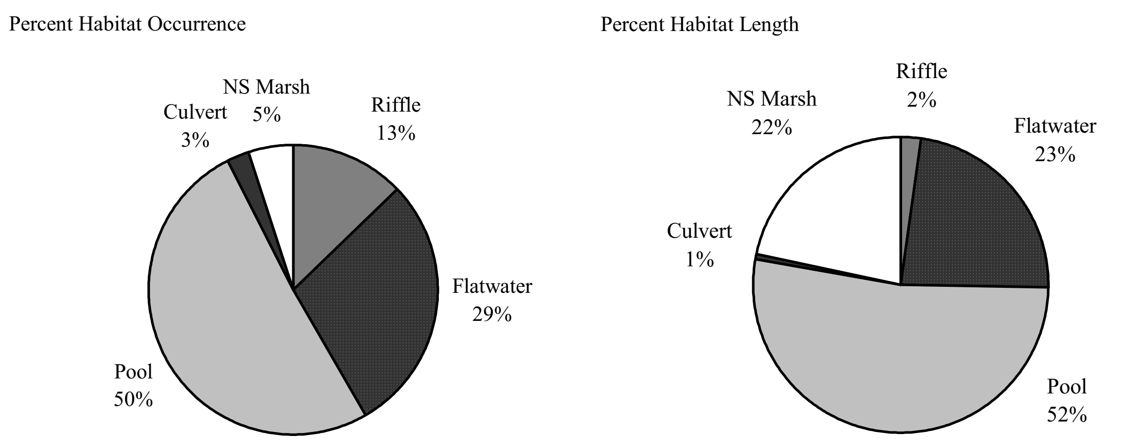


Figure 6. Summary of Level II habitat types classified during fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

A total of 14 different Level IV habitat types were identified in Salt Creek (Table 5). Mid-channel pools and runs comprised nearly half of the total Level IV habitat types identified (Figure 7). Dammed pools (beaver ponds) and marsh habitats dominated when survey lengths were considered with mid-channel pools and flatwater habitats being sub-dominant (Figure 7).

Table 5. Summary of habitat parameters measured using Level IV habitat inventory methods in fall 2002 in the primary channel of Salt Creek, lower Klamath River Sub-basin, California.

Drainage: Klamath River **Confluence Location:** Quad: Requa Latitude:41º 32' 40" Longitude: 124º 03' 40"

Total Units Measured	Habitat Type	Habitat Occurrence %	Total Length Ft	Mean Length Ft	Total Length %	*Mean Width Ft	*Mean Depth Ft	Max Depth Ft	*Total Area Ft^2	*Mean Area Ft^2	*Total Volume Ft^3	*Mean Volume Ft^3	*Mean Canopy %
10	LGR	12.7	281	28	2.2	5	0.2	0.5	13488	1349	29674	2967	57
1	GLD	1.3	1340	1340	10.7	20	4.5	6.4	26800	26800	120600	120600	10
16	RUN	20.3	1002	63	8.0	11	1.1	0.9	168336	10521	2912213	182013	45
6	SRN	7.6	544	91	4.3	4	0.4	1.2	13600	2267	34000	5667	73
22	MCP	27.8	1447	66	11.5	10	0.9	2.0	317472	14431	6381183	290054	54
1	CRP	1.3	35	35	0.3	13	1.6	2.4	455	455	728	728	40
4	LSL	5.1	110	28	0.9	4	0.5	1.4	1760	440	3344	836	93
5	LSR	6.3	421	84	3.4	15	1.1	2.5	32417	6483	184777	36955	30
1	LSBK	1.3	127	127	1.0	15	2.4	4.8	1905	1905	4572	4572	40
1	SCP	1.3	20	20	0.2	15	0.6	2.0	300	300	180	180	40
1	BPL	1.3	25	25	0.2	18	0.6	1.1	450	450	270	270	60
5	DPL	6.3	4384	877	35.0	22	3.4	5.5	473472	94694	7954330	1590866	NA
2	CUL	2.5	74	37	0.6	4	NA	NA	NA	NA	NA	NA	NA
4	MAR	5.1	2730	683	21.8	NA	NA	NA	NA	NA	NA	NA	NA
79	**Totals**		12540										

* Estimated Value

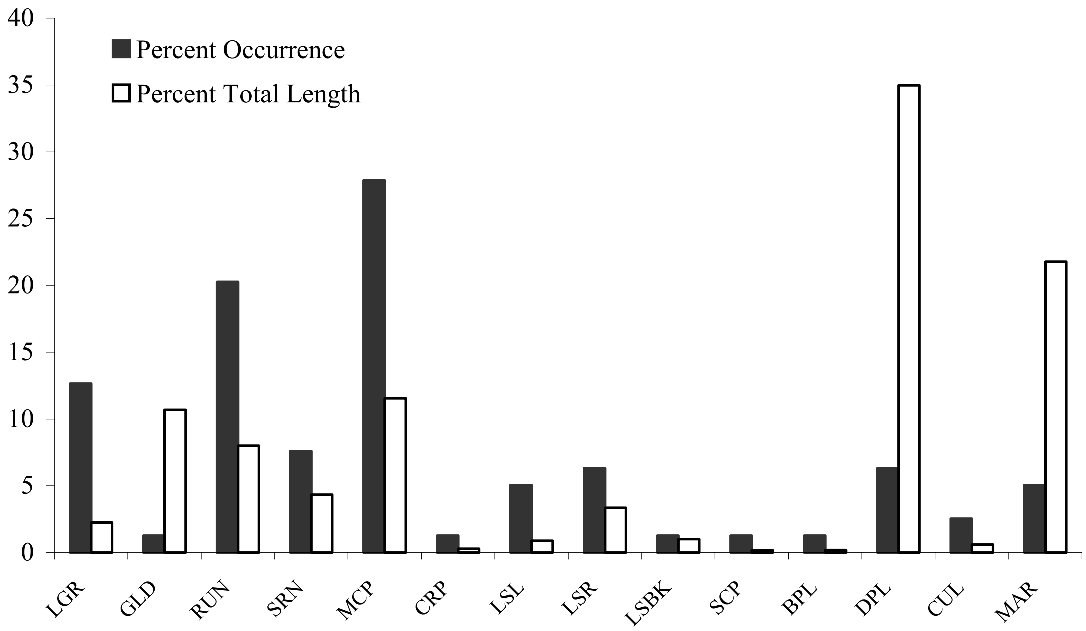


Figure 7. Summary of Level IV habitat types classified during fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

A total of eight Level IV pool types were identified in Salt Creek (Table 6). Mid-channel pools were the most frequent pool type with lateral scour pools formed by rootwads and damned pools being subdominant (Figure 8). Maximum pool depths by pool type are summarized in Table 7. Forty-five percent of the pools surveyed had maximum depths greater than two feet (Figure 9). Pool tail embeddedness values were considerably high in Salt Creek with 81 percent being classified as “unsuitable” for spawning (Figure 10). Generally pool tails in Salt Creek were classified as unsuitable due to insufficient substrate particle size or because the pool tail was buried by woody debris (beaver dams).

Table 6. Summary of pool habitat parameters measured using Level IV habitat inventory methods in fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

Drainage: Klamath River **Confluence Location:** Quad: Requa Latitude:41º 32' 40" Longitude: 124º 03' 40"

Total Units Measured	**Habitat Type**	**Habitat Occurrence** %	**Total Length Ft**	***Mean Length Ft**	**Total Length %**	***Mean Width Ft**	***Mean Depth Ft**	**Max Depth Ft**	***Total Area Ft^2**	***Mean Area Ft^2**	***Total Volume Ft^3**	**Mean Volume* Ft^3**	***Mean Resid Volume Ft^3**	***Mean Shelter Rating**
22	MCP	55.0	1447	66	0.22	10	0.9	2.0	317472	14431	6381183	290054	5063	2.1
1	CRP	2.5	35	35	0.01	13	1.6	2.4	455	455	728	728	364	2.0
4	LSL	10.0	110	28	0.02	4	0.5	1.4	1760	440	3344	836	484	2.0
5	LSR	12.5	421	84	0.06	15	1.1	2.5	32417	6483	184777	36955	22692	2.2
1	LSBK	2.5	127	127	0.02	15	2.4	4.8	1905	1905	4572	4572	3048	3.0
1	SCP	2.5	20	20	0.00	15	0.6	2.0	300	300	180	180	30	2.0
1	BPL	2.5	25	25	0.00	18	0.6	1.1	450	450	270	270	NA	NA
5	DPL	12.5	4384	877	0.67	22	3.4	5.5	473472	94694	7954330	1590866	NA	NA
40	**Totals**		6569											

* Estimated Value

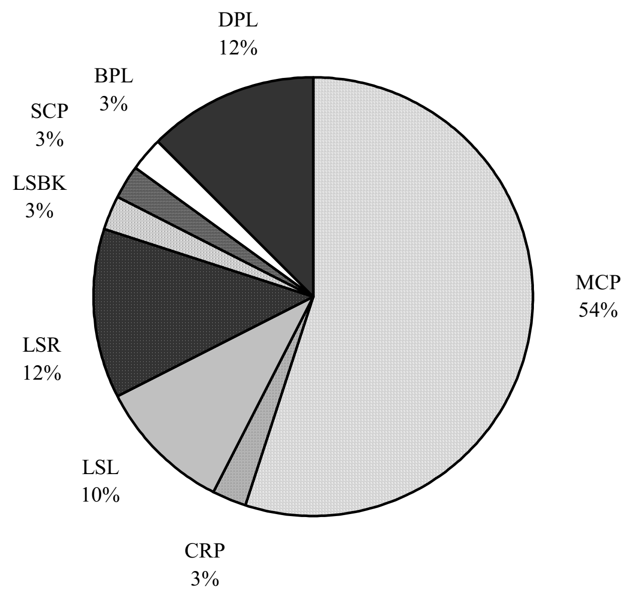


Figure 8. Level IV pool habitat types by percent occurrence for Salt Creek, lower Klamath River Sub-basin, California. Fall 2002.

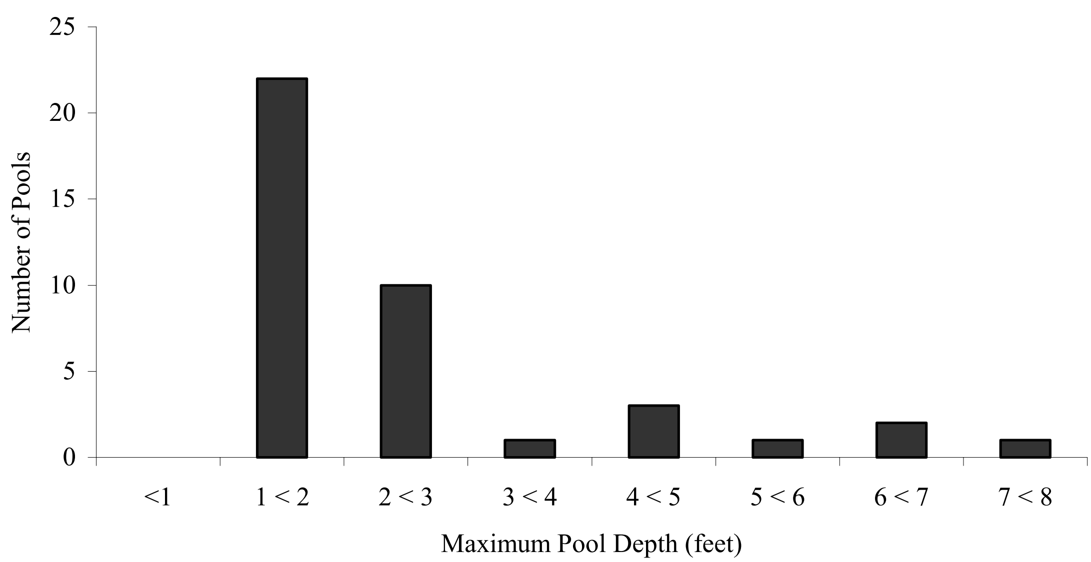


Figure 9. Summary of maximum pool depths measured during fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

Table 7. Summary of maximum pool depths measured using Level IV habitat inventory methods in fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

Total Units Measured	Habitat Type	Percent Occurrence	Total <1 ft Max Depth	% <1ft Occurrence	Total 1-<2 ft Max Depth	% 1-<2 ft Occurrence	Total 2<3 ft Max Depth	% 2<3 ft Occurrence	Total 3-<4 ft Max Depth	% 3-<4 ft Occurrence	Total 4-<5 ft Max Depth	% 4-<5 ft Occurrence	Total >4 ft Max Depth	% >4 ft Occurrence
22	MCP	55	0	0	16	73	4	18	0	0	1	5	1	5
1	CRP	3	0	0	0	0	1	100	0	0	0	0	0	0
4	LSL	10	0	0	4	100	0	0	0	0	0	0	0	0
5	LSR	13	0	0	1	20	3	60	1	20	0	0	0	0
1	LSBK	3	0	0	0	0	0	0	0	0	1	100	0	0
1	SCP	3	0	0	0	0	1	100	0	0	0	0	0	0
1	BPL	3	0	0	1	100	0	0	0	0	0	0	0	0
5	DPL	13	0	0	0	0	1	20	0	0	1	20	3	60
40	**Totals**	100	0		22		10		1		3		4	

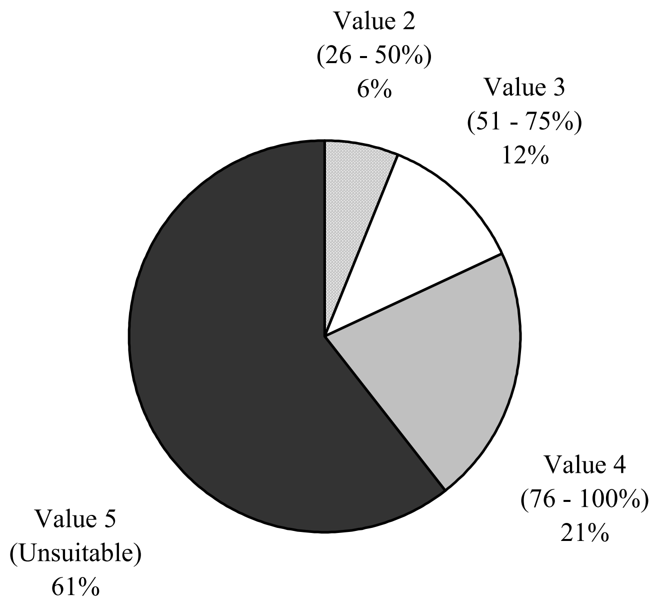


Figure 10. Summary of pool tail embeddedness for pool habitats classified during fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

Mean percent pool habitat shelter values and cover types are summarized in Table 8. Mean percent of habitat unit providing cover ranged from 35 percent in lateral scour pools formed by logs (n = 4) to 55 percent in a lateral scour pool formed by bedrock. Mean shelter values for pool habitats ranged from two to three (Table 8). These high values reflect the relatively complex shelter features present, especially in the beaver ponds. Dominant pool cover types were small woody debris, undercut banks, and root mass and were generally found together (Figure 11). The dominant substrate class observed in Salt Creek was silt/clay (93%) with gravel a distant second (6%) (Table 9).

Table 8. Summary of mean percent cover by pool types classified during fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

				Mean Percent									
Total Units Measured	Habitat Type	Mean Shelter Value	Dominant Pool Tail Substrate	% Unit Cover	Undercut Banks	SWD	LWD	Root Mass	Terrestrial Vegetation	Aquatic Vegetation	Bubble Curtain	Boulders	Bedrock Ledges
22	MCP	2	A/C	42	24	29	5	18	15	9	0	0	0
1	CRP	2	A	35	40	30	0	10	20	0	0	0	0
4	LSL	2	A	35	36	26	0	25	13	0	0	0	0
5	LSR	2	C	49	15	26	12	22	15	10	0	0	0
1	LSBK	3	C	55	20	10	5	10	20	20	0	5	10
1	SCP	2	C	30	10	40	10	30	10	0	0	0	0

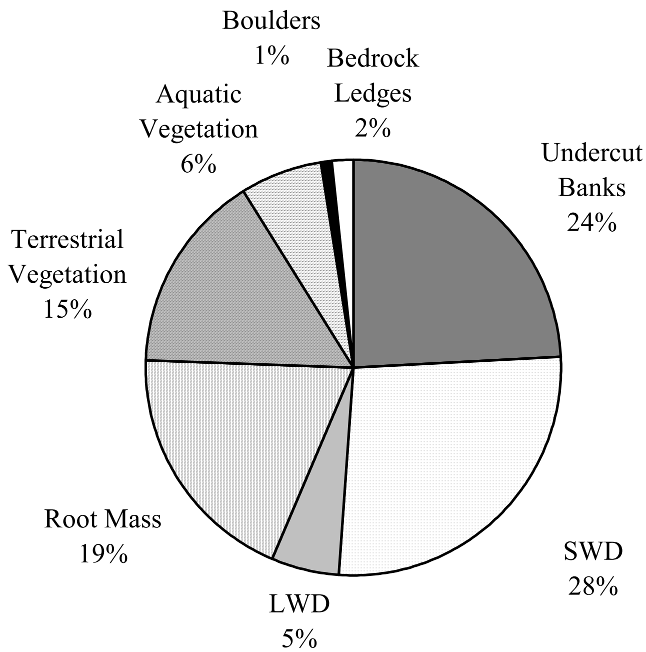


Figure 11. Summary of pool cover types classified during fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

Table 9. Dominant substrate classes by habitat types classified during fall 2002 in Salt Creek, lower Klamath River Sub-basin, California.

		Percent Total Dominant Substrate						
Total Units Measured	Habitat Type	Silt/Clay	Sand	Gravel	Sm Cobble	Lrg Cobble	Boulder	Bedrock
10	LGR	70	0	30	0	0	0	0
1	GLD	100	0	0	0	0	0	0
16	RUN	100	0	0	0	0	0	0
6	SRN	100	0	0	0	0	0	0
22	MCP	100	0	0	0	0	0	0
1	CRP	100	0	0	0	0	0	0
4	LSL	100	0	0	0	0	0	0
5	LSR	60	0	40	0	0	0	0
1	LSBK	100	0	0	0	0	0	0
1	SCP	100	0	0	0	0	0	0
1	BPL	100	0	0	0	0	0	0

Percent riparian canopy cover for all instream observations ranged from 5 to 95 with a mean of 50.9 (n = 72, S.D. = 37.0). A total of 13 units received a value of five percent for total canopy cover. Percent of canopy cover composed of deciduous tree species ranged from 90 to 100 with a mean of 98.9 percent (n = 72, S.D. = 3.0). Percent of canopy cover composed of coniferous tree species ranged from 0 to 10 with a mean of 1.1 percent (n = 72, S.D. = 3.0). A total of 63 units (88%) received values of zero for coniferous cover.

Percent vegetation cover for right bank units ranged from 40 to 95 percent with left bank values from 5 to 95. Mean vegetated values were 71.3 percent (n = 73, S.D. = 17.2) for right bank units and 50.8 percent (n = 73, S.D. = 28.1) for left bank units. The dominant elements comprising the stream banks of Salt Creek were silt/clay/sand (98%). The dominant vegetation type observed along instream units was brush (79%) with grasses (21%) subdominant.

High Prairie Creek

A total of 550 instream habitat units were classified in 21,425 feet of High Prairie Creek during July 2002. Pools and riffles were the most frequently encountered Level II habitats in both primary and secondary channel reaches surveyed (Figure 12). However, when total habitat lengths are considered, pool, riffle, and dry channel each comprised nearly one-third of the total survey length (Figure 13). Riffle habitat comprised over half of the total length surveyed in side channels of High Prairie Creek (Figure 13).

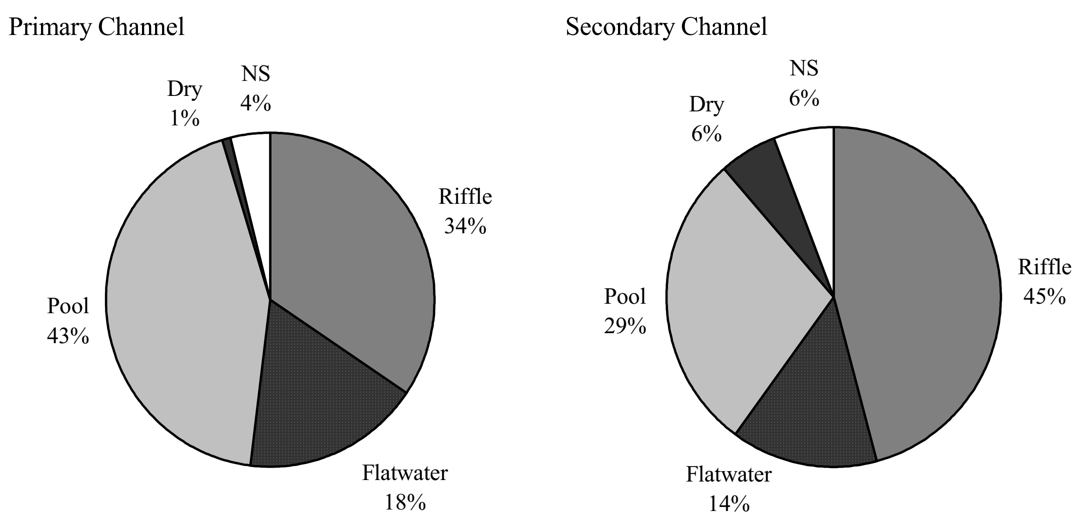


Figure 12. Summary of Level II habitat types by percent occurrence classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

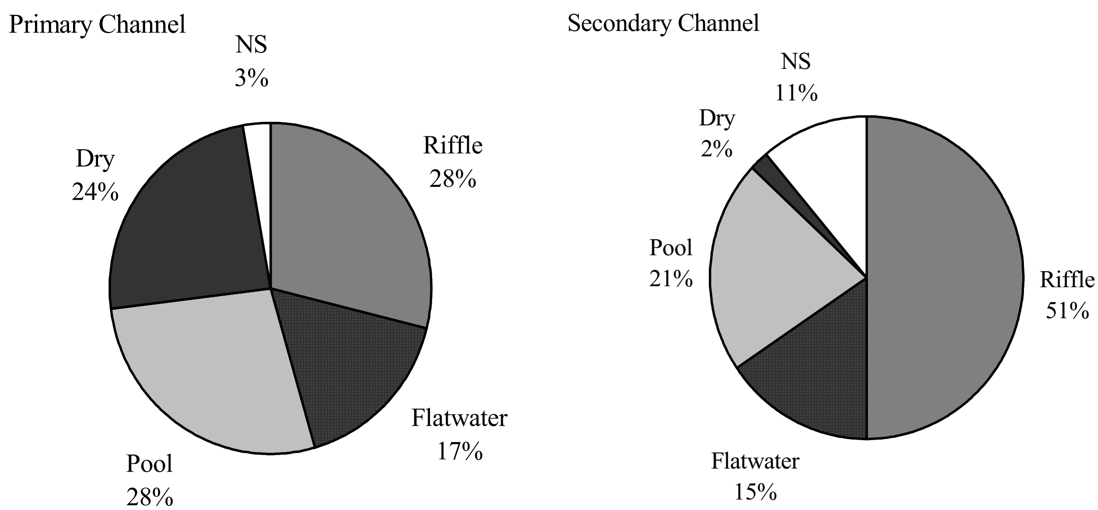


Figure 13. Summary of Level II habitat types by percent total length classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

A total of 16 different Level IV habitat types were identified in primary channel reaches (Table 10) and nine in secondary channel reaches of High Prairie Creek (Table 11). Low gradient riffles comprised one-third of the total Level IV habitat types identified within both primary channel and secondary channel reaches with mid-channel pools and runs being subdominant (Figure 14). In the primary channel, low gradient riffles also comprised nearly 30 percent of the total survey length with dry channel segments at 20 percent, and runs and mid-channel pools at 10 percent each (Figure 15). Low gradient riffles dominated in secondary channel reaches when habitat lengths were considered (Figure 15).

Table 10. Summary of habitat parameters measured using Level IV habitat inventory methods in July 2002 in the primary channel of High Prairie Creek, lower Klamath River Sub-basin, California.

Drainage: Salt Creek **Confluence Location:** Quad: Requa Latitude:41º 33' 57" Longitude: 124º 04' 14"

Total Units Measured	Habitat Type	Habitat Occurrence %	Total Length Ft	Mean Length Ft	Total Length %	*Mean Width Ft	*Mean Depth Ft	Max Depth Ft	*Total Area Ft^2	*Mean Area Ft^2	*Total Volume Ft^3	*Mean Volume Ft^3	*Mean Canopy %
170	LGR	33.0	5688	33	27.7	6	0.2	1.4	5857502	34456	227856843	1340334	67
5	HGR	1.0	204	41	1.0	11	0.3	1.0	10710	2142	13923	2785	74
2	CAS	0.4	43	22	0.2	5	0.4	1.6	452	226	361	181	73
1	GLD	0.2	44	44	0.2	4	0.6	1.0	176	176	106	106	0
69	RUN	13.4	2552	37	12.4	6	0.4	3.3	1136916	16477	30014582	434994	69
21	SRN	4.1	818	39	4.0	7	0.4	1.2	116156	5531	882786	42037	64
86	MCP	16.7	2231	26	10.9	10	0.6	3.5	1832543	21309	91260661	1061170	73
10	STP	1.9	255	26	1.2	6	0.6	2.2	14153	1415	77839	7784	72
32	LSL	6.2	686	21	3.3	7	0.8	2.8	149548	4673	3035824	94870	63
27	LSR	5.2	900	33	4.4	8	0.8	3.5	186300	6900	3819150	141450	73
26	LSBK	5.0	725	28	3.5	6	0.7	4.6	106213	4085	1805613	69447	65
4	LSBO	0.8	44	11	0.2	7	0.9	2.6	1210	303	4114	1029	66
34	PLP	6.6	627	18	3.1	11	0.5	4.0	229169	6740	4216700	124021	76
2	BPL	0.4	19	10	0.1	6	0.6	1.5	209	105	230	115	50
2	DPL	0.4	187	94	0.9	14	2.3	3.3	5236	2618	23562	11781	35
4	DRY	0.8	4917	1229	23.9	NA	NA	NA	NA	NA	NA	NA	89
20	NS	3.9	593	30	2.9	NA	NA	NA	NA	NA	NA	NA	62
515	**Totals**		20533										

* Estimated Value

Table 11. Summary of habitat parameters measured using Level IV habitat inventory methods in July 2002 within the secondary channel of High Prairie Creek, lower Klamath River Sub-basin, California.

Drainage: Salt Creek **Confluence Location:** Quad: Requa Latitude:41º 33' 57" Longitude: 124º 04' 14"

Total Units Measured	Habitat Type	Habitat Occurrence %	Total Length Ft	Mean Length Ft	Total Length %	*Mean Width Ft	*Mean Depth Ft	Max Depth Ft	*Total Area Ft^2	*Mean Area Ft^2	*Total Volume Ft^3	*Mean Volume Ft^3	*Mean Canopy %
15	LGR	42.9	436	29	48.9	2	0.2	0.8	15914	1061	41376	2758.427	72
1	CAS	2.9	10	10	1.1	4	0.1	0.4	35	35	4	3.5	70
3	RUN	8.6	48	16	5.4	3	0.3	1.1	432	144	432	144	75
2	SRN	5.7	90	45	10.1	3	0.3	0.8	450	225	270	135	68
3	MCP	8.6	46	15	5.2	5	0.4	1.4	690	230	759	253	83
3	STP	8.6	99	33	11.1	5	0.4	1.5	1485	495	1634	544.5	82
1	CRP	2.9	13	13	1.5	9	0.7	1.6	117	117	82	81.9	75
3	PLP	8.6	33	11	3.7	6	0.5	2.2	561	187	898	299.2	35
2	DRY	5.7	17	9	1.9	NA	NA	NA	NA	NA	NA	NA	80
2	NS	5.7	100	50	11.2	NA	NA	NA	NA	NA	NA	NA	65
35	**Totals**		892										

* Estimated Value

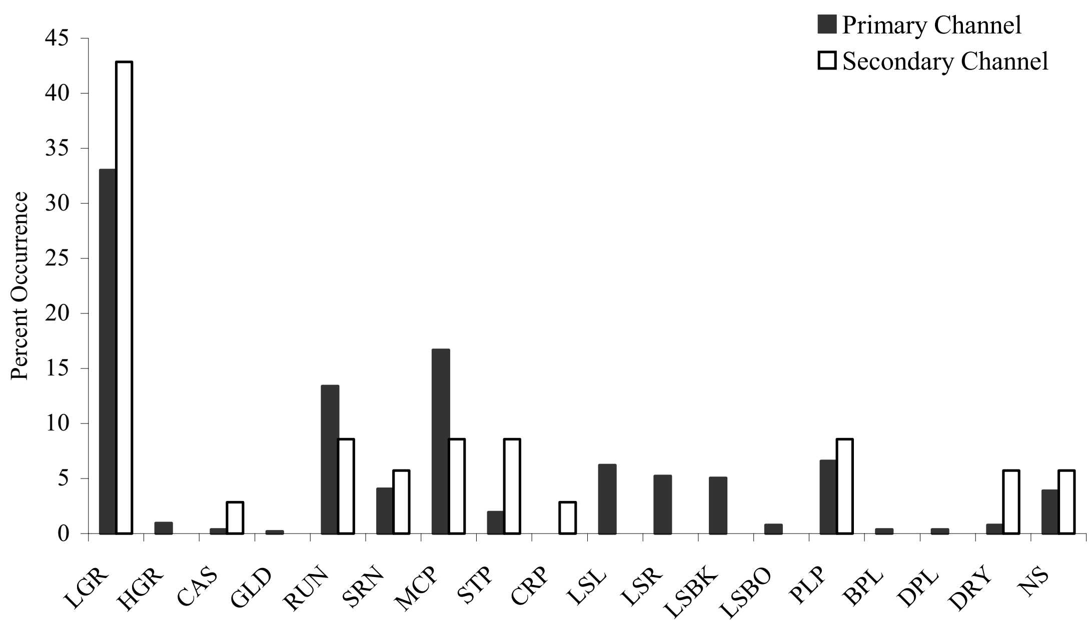


Figure 14. Summary of Level IV habitat types by percent occurrence classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

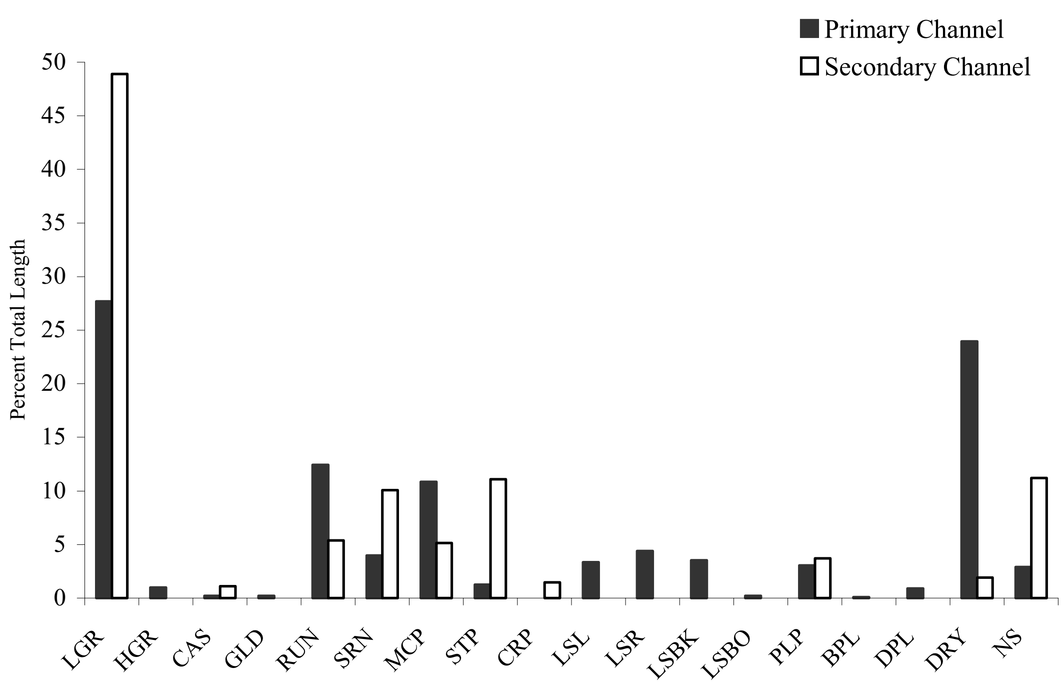


Figure 15. Summary of Level IV habitat types by total length classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

A total of 10 Level IV pool types were classified in High Prairie Creek (Table 12). Mid-channel pools were the most frequent pool type with lateral scour pools formed by bedrock and rootwads being subdominant (Figure 16). Maximum pool depths by pool type are summarized in Table 13. A total of 59 (26%) mainstem pools and two (20 %) secondary channel pools were deeper than two feet at the time of the survey (Figure 17). Over half of the pool tails observed in primary channel reaches received an estimated embeddedness value of two or 26 - 50 percent embedded with fine sediment (Figure 18). Fourteen percent of High Prairie Creek pool tails were classified as "unsuitable" for spawning generally due to large wood accumulations existing at these locations.

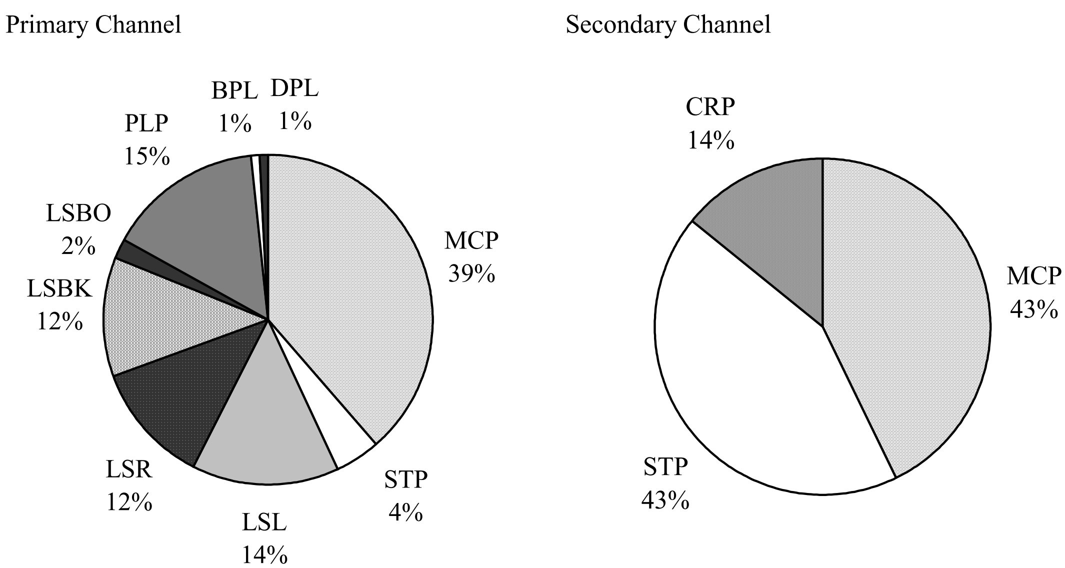


Figure 16. Level IV pool habitat types by percent occurrence for High Prairie Creek, lower Klamath River Sub-basin, California. July 2002.

Table 12. Summary of pool habitat parameters measured using Level IV habitat inventory methods in July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Drainage: Salt Creek **Confluence Location:** Quad: Requa Latitude:41º 33' 57" Longitude: 124º 04' 14"

Primary Channel Units

Total Units Measured	Habitat Type	Habitat Occurrence %	Total Length Ft	Mean Length Ft	Total Length %	*Mean Width Ft	*Mean Depth Ft	Max Depth Ft	*Total Area Ft^2	*Mean Area Ft^2	*Total Volume Ft^3	Mean Volume* Ft^3	*Mean Resid Volume Ft^3	*Mean Shelter Rating
86	MCP	38.6	2231	26	39.3	10	0.6	3.5	1832543	21309	91260661	1061170	410488	2.4
10	STP	4.5	255	26	4.5	6	0.6	2.2	14153	1415	77839	7784	4812	2.7
32	LSL	14.3	686	21	12.1	7	0.8	2.8	149548	4673	3035824	94870	44397	2.7
27	LSR	12.1	900	33	15.9	8	0.8	3.5	186300	6900	3819150	141450	72011	2.6
26	LSBK	11.7	725	28	12.8	6	0.7	4.6	106213	4085	1805613	69447	66979	2.0
4	LSBO	1.8	44	11	0.8	7	0.9	2.6	1210	303	4114	1029	540	2.7
34	PLP	15.2	627	18	11.1	11	0.5	4.0	229169	6740	4216700	124021	45160	2.7
2	BPL	0.9	19	10	0.3	6	0.6	1.5	209	105	230	115	56	2.0
2	DPL	0.9	187	94	3.3	14	2.3	3.3	5236	2618	23562	11781	11781	2.5
223	**Totals**		5674											

Secondary Channel Units

Total Units Measured	Habitat Type	Habitat Occurrence %	Total Length Ft	Mean Length Ft	Total Length %	*Mean Width Ft	*Mean Depth Ft	Max Depth Ft	*Total Area Ft^2	*Mean Area Ft^2	*Total Volume Ft^3	Mean Volume* Ft^3	*Mean Resid Volume Ft^3	*Mean Shelter Rating
3	MCP	30.0	46	15	24.1	5	0.4	1.4	690	230	759	253	69	2.0
3	STP	30.0	99	33	51.8	5	0.4	1.5	1485	495	1634	545	198	2.0
1	CRP	10.0	13	13	6.8	9	0.7	1.6	117	117	82	82	59	2.0
3	PLP	30.0	33	11	17.3	6	0.5	2.2	561	187	898	299	243	2.3
10	**Totals**		191											

* Estimated Value

Table 13. Summary of maximum pool depths measured using Level IV habitat inventory methods in July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Primary Channel Units

Total Units Measured	Habitat Type	Percent Occurrence	Total <1 ft Max Depth	% <1ft Occurrence	Total 1-<2 ft Max Depth	% 1-<2 ft Occurrence	Total 2<3 ft Max Depth	% 2<3 ft Occurrence	Total 3-<4 ft Max Depth	% 3-<4 ft Occurrence	Total 4-<5 ft Max Depth	% 4-<5 ft Occurrence
86	MCP	39	2	2	60	70	18	21	6	7	0	0
10	STP	4	0	0	6	60	4	40	0	0	0	0
32	LSL	14	1	3	22	69	9	28	0	0	0	0
27	LSR	12	1	4	13	48	11	41	2	7	0	0
26	LSBK	12	1	4	20	77	2	8	2	8	1	4
4	LSBO	2	0	0	3	75	1	25	0	0	0	0
34	PLP	15	1	3	17	50	13	38	2	6	1	3
2	BPL	1	1	50	1	50	0	0	0	0	0	0
2	DPL	1	0	0	0	0	1	50	1	50	0	0
223	**Totals**	100	7		142		59		13		2	

Secondary Channel Units

Total Units Measured	Habitat Type	Percent Occurrence	Total <1 ft Max Depth	% <1ft Occurrence	Total 1-<2 ft Max Depth	% 1-<2 ft Occurrence	Total 2<3 ft Max Depth	% 2<3 ft Occurrence	Total 3-<4 ft Max Depth	% 3-<4 ft Occurrence	Total 4-<5 ft Max Depth	% 4-<5 ft Occurrence
3	MCP	30	0	0	3	100	0	0	0	0	0	0
3	STP	30	0	0	3	100	0	0	0	0	0	0
1	CRP	10	0	0	1	100	0	0	0	0	0	0
3	PLP	30	0	0	1	33	2	67	0	0	0	0
10	**Totals**	100	0		8		2		0		0	

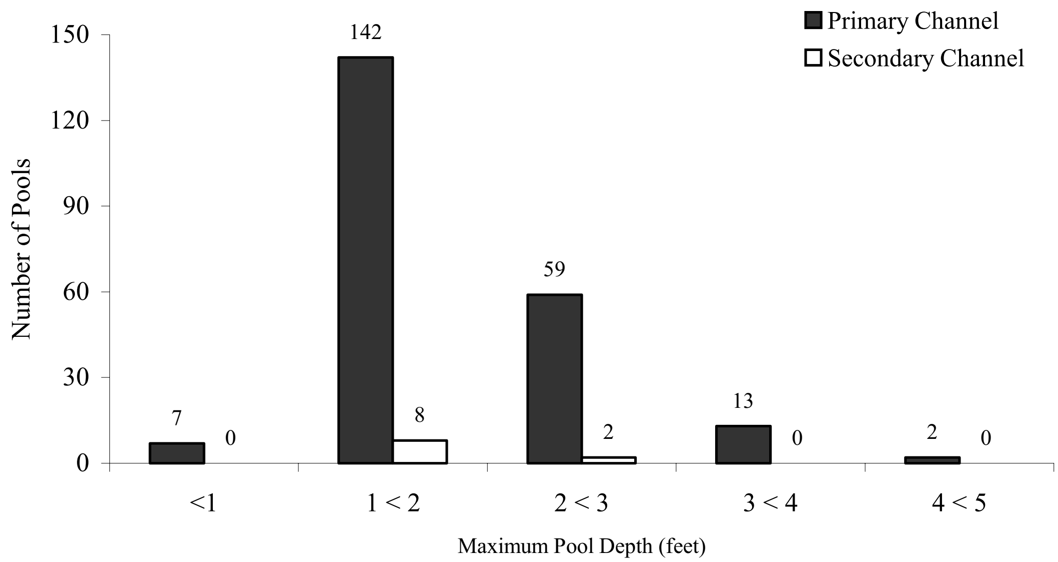


Figure 17. Summary of maximum pool depths measured during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

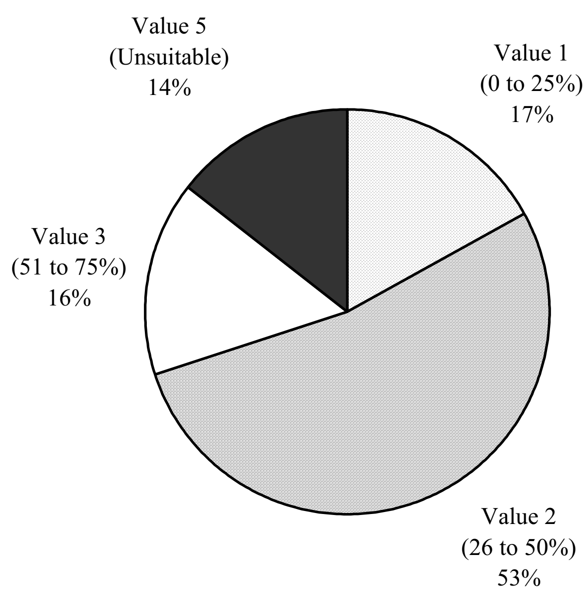


Figure 18. Summary of pool tail embeddedness values for pool habitats classified in July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Pool habitat shelter values and cover types are summarized in Table 14. Percent of habitat unit available for juvenile salmonid cover ranged in primary pool habitats from 30 percent in log formed backwater pools (n = 2) to 55 percent in lateral scour pools formed by boulders (n = 4). Mean shelter ratings ranged from two to three for pool habitats in both mainstem and side channel reaches (Table 14). These values reflect the high quantity and complexity of cover types available in individual pool habitats of High Prairie Creek. Dominant cover types in primary channel pools were boulder and small and large woody debris (Figure 19). Bedrock ledges and boulders were the dominant cover types in secondary channel pools (Figure 20). Dominant substrate class by habitat type is presented for primary channel reaches in Table 15 and for secondary channel reaches in Table 16. Gravel was the dominant substarte in primary channel reaches with small and large cobble being subdominant (Figure 21). Gravel and small cobble dominated secondary channel habitats (Figure 22).

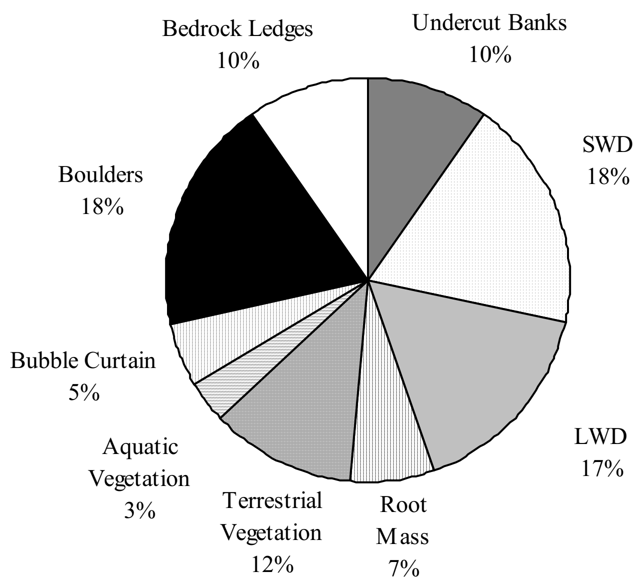


Figure 19. Summary of pool cover types classified during fall 2002 in primary channel reaches of High Prairie Creek, lower Klamath River Sub-basin, California.

Table 14. Summary of mean percent cover by pool types classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Primary Channel Units

				Mean Percent									
Total Units Measured	**Habitat Type**	**Mean Shelter Value**	**Dominant Pool Tail Substrate**	**% Unit Cover**	**Undercut Banks**	**SWD**	**LWD**	**Root Mass**	**Terrestrial Vegetation**	**Aquatic Vegetation**	**Bubble Curtain**	**Boulders**	**Bedrock Ledges**
86	MCP	2	C	40	7	18	18	6	6	0	7	26	12
10	STP	3	C	46	5	9	17	4	5	0	18	22	21
32	LSL	3	C	47	8	20	32	10	6	0	3	17	6
27	LSR	3	C	46	20	22	14	20	10	1	1	11	2
26	LSBK	2	C	33	29	16	11	9	8	0	1	14	13
4	LSBO	3	D	55	5	22	17	3	17	0	0	25	12
34	PLP	3	D	47	3	12	21	4	3	0	16	20	23
2	BPL	2	D	30	0	35	20	0	10	0	0	35	0
2	DPL	3	A	48	13	13	0	4	41	31	0	0	0
223	**Total**												

Secondary Channel Units

				Mean Percent									
Total Units Measured	**Habitat Type**	**Mean Shelter Value**	**Dominant Pool Tail Substrate**	**% Unit Cover**	**Undercut Banks**	**SWD**	**LWD**	**Root Mass**	**Terrestrial Vegetation**	**Aquatic Vegetation**	**Bubble Curtain**	**Boulders**	**Bedrock Ledges**
3	MCP	2	D	33	5	7	13	3	3	0	2	45	22
3	STP	2	D	63	0	3	13	0	0	0	27	13	43
1	CRP	2	C	50	30	30	10	10	10	0	0	10	0
3	PLP	2	D	27	3	15	28	8	0	0	10	13	22
10	**Total**												

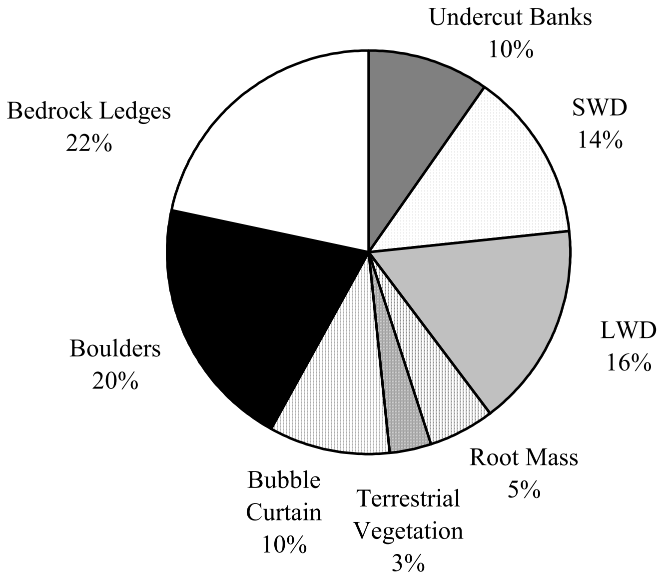


Figure 20. Summary of pool cover types classified during fall 2002 in secondary channel reaches of High Prairie Creek, lower Klamath River Sub-basin, California.

Table 15. Dominant substrate classes by habitat type for primary channel reaches classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

		Percent Total Dominant Substrate						
Total Units Measured	**Habitat Type**	**Silt/Clay**	**Sand**	**Gravel**	**Sm Cobble**	**Lrg Cobble**	**Boulder**	**Bedrock**
170	LGR	0	0	58	23	19	0	0
5	HGR	0	0	0	60	20	20	0
2	CAS	0	0	50	0	0	50	0
1	GLD	0	0	100	0	0	0	0
68	RUN	1	1	67	22	7	1	0
21	SRN	0	0	48	33	14	5	0
86	MCP	1	0	36	33	28	2	0
10	STP	0	0	20	20	50	10	0
32	LSL	0	0	63	28	6	3	0
27	LSR	0	4	81	11	4	0	0
26	LSBK	0	0	92	4	4	0	0
4	LSBO	0	0	25	25	50	0	0
34	PLP	0	0	21	24	50	3	3
2	BPL	0	0	100	0	0	0	0
2	DPL	100	0	0	0	0	0	0
4	DRY	0	0	100	0	0	0	0

Table 16. Dominant substrate classes by habitat type for secondary channel reaches classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

		Percent Total Dominant Substrate						
Total Units Measured	Habitat Type	Silt/Clay	Sand	Gravel	Sm Cobble	Lrg Cobble	Boulder	Bedrock
15	LGR	0	0	47	27	20	7	0
1	CAS	0	0	0	100	0	0	0
3	RUN	0	0	67	33	0	0	0
2	SRN	0	0	0	50	50	0	0
3	MCP	0	0	33	33	33	0	0
3	STP	0	0	0	0	0	100	0
1	CRP	0	0	100	0	0	0	0
3	PLP	0	0	50	50	0	0	0
2	DRY	0	0	50	50	0	0	0

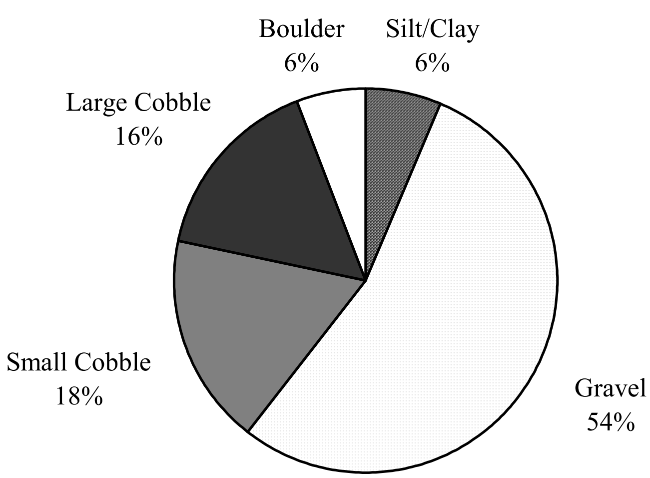


Figure 21. Dominant substrate types for primary channel habitats classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

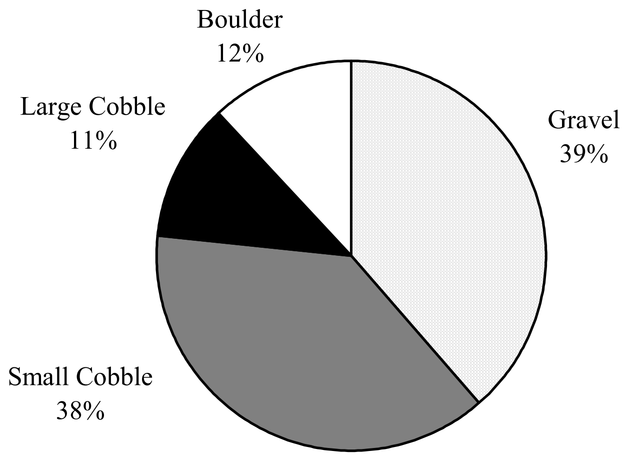


Figure 22. Dominant substrate types for secondary channel habitats classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Percent canopy cover for all habitats ranged from 0 to 98 with a mean of 68.6 (n = 545, S.D. = 22.5). A total of 12 units (2 %) received a value of zero for total percent canopy cover (Figure 23). Percent of canopy cover composed of deciduous tree species ranged from 10 to 100 with a mean of 61.7 percent (n = 545, S.D. = 26.1). Percent of canopy cover composed of coniferous tree species ranged from 0 to 90 with a mean of 36.0 percent (n = 545, S.D. = 25.0). A total of 54 units (10%) received values of zero for coniferous cover.

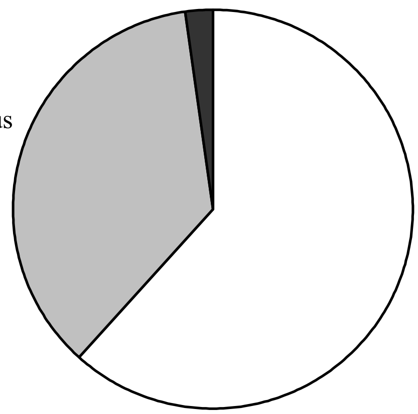


Figure 23. Stream bank canopy composition for habitats in High Prairie Creek, lower Klamath River Sub-basin, California.

Vegetation cover for all units observed ranged from 9 to 100 percent for both right and left banks. Mean vegetated values were 89 percent for both right and left banks (n = 542, Rt bnk S.D. = 7.88, Lf bnk S.D. = 8.04). The dominant element comprising the stream banks of High Prairie Creek was silt/clay/sand (73%) (Figure 24). The dominant vegetation type observed was brush (94%) with deciduous trees (4%) a distant second (Figure 25).

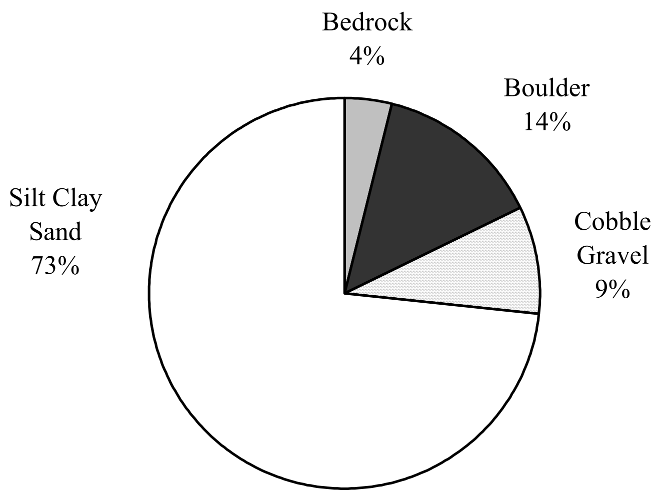


Figure 24. Stream bank composition classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

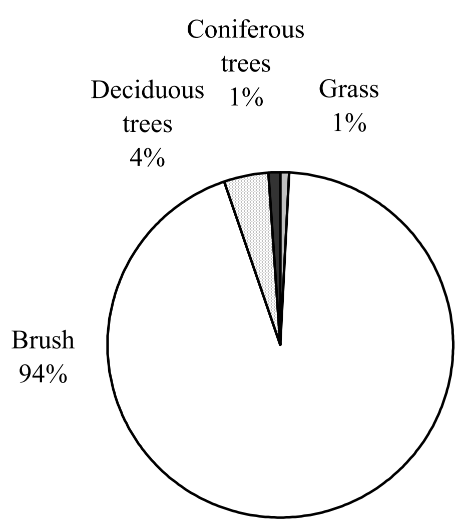


Figure 25. Stream bank vegetation composition classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Channel Type Surveys

A total of four different channel types were identified from channel survey data collected at seven cross section stations (Figure 26) (Table 17). Most of the reach surveyed was classified as an F4 channel type with select steeper reaches classified as B4. The F4 channels are gravel dominated, entrenched, meandering channels occupying deeply incised low gradient valley types (Rosgen 1996). The B4 channels are moderately steep and entrenched with sinuosity values greater than 1.2 (Rosgen 1996).

Table 17. Channel typing data collected in summer 2002 for High Prairie Creek, lower Klamath River Sub-basin, California.

Habitat Unit	Channel Type	Mean Depth Ft	Floodprone Width Ft	Bankfull Width Ft	Entrench Ratio	Width/Depth Ratio	Water Slope	Substrate Class	Reach Length	Habitat Unit Start	Habitat Unit End
34	F4	1.85	33.0	30.5	1.08	16.5	0.01	4	3211	015	034
57	F4	1.79	24.6	23.0	1.07	12.8	0.02	4	5110	034	090
190	B4	1.31	20.7	12.5	1.66	9.5	0.03	4	6237	091	350
334	B4a	1.19	25.6	15.5	1.65	13.1	0.09	4	6237	091	350
355	F4b	1.24	31.0	23.0	1.35	18.6	0.02	4	1751	351	417
461	B4	1.21	26.2	16.6	1.58	13.7	0.02	4	1642	418	469
504	F4	1.16	22.0	19.0	1.16	16.3	0.01	4	1589	470	514
								Total	19540		

Cross section locations are displayed in Figure 26. A total of 26 elevations were surveyed over 63.3 feet at HP_XS1 on 2 August 2002 (Figure 27). Bankfull elevation was estimated at 90.08 feet based on a break to a more gradual slope located on the right bank. High flow indicators (scour line, debris deposits) were observed at elevation 92.04 feet in December 2003 after a significant storm event. Mean particle size in this reach was 35.87 mm with a D_{84} at 57.87 mm (Figure 28) (Table 18).

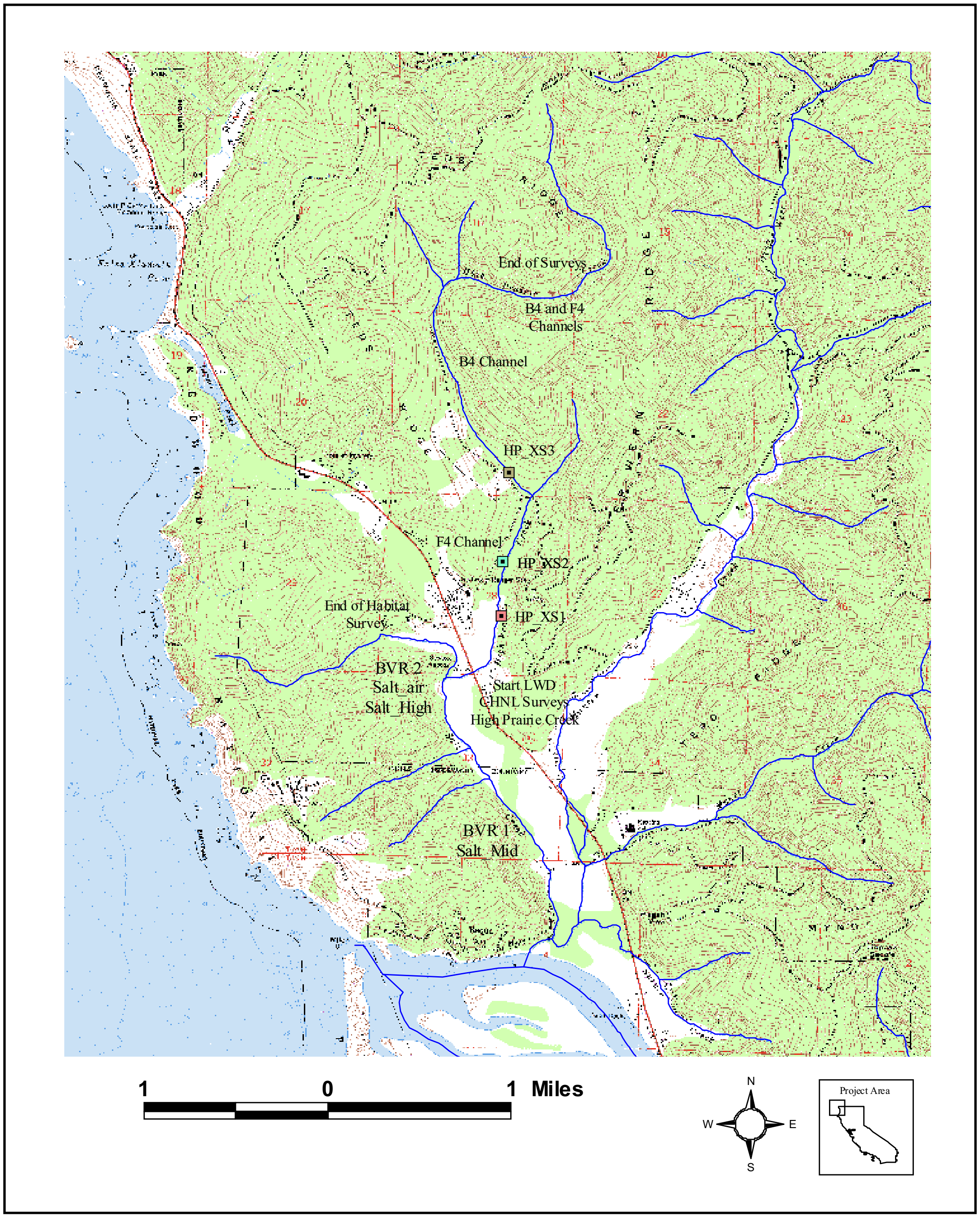


Figure 26. Map depicting cross section locations and general stream channel types in the Salt Creek watershed, lower Klamath River Sub-basin, California.

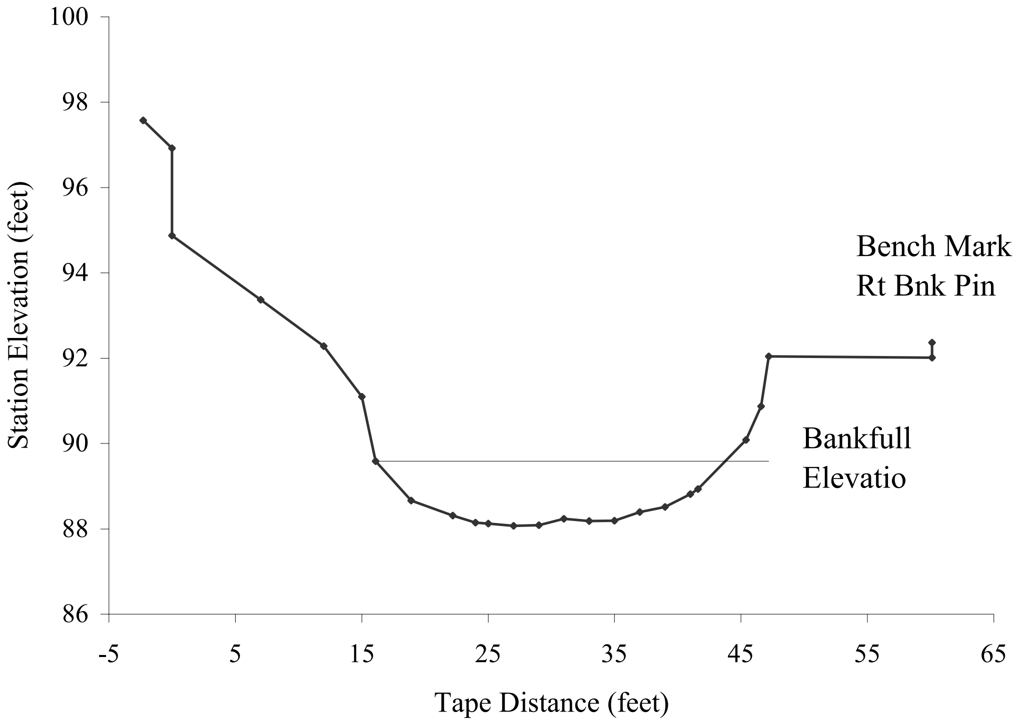


Figure 27. Cross section at HP_XS1 surveyed in August 2002 in lower High Prairie Creek, lower Klamath River Sub-basin, California.

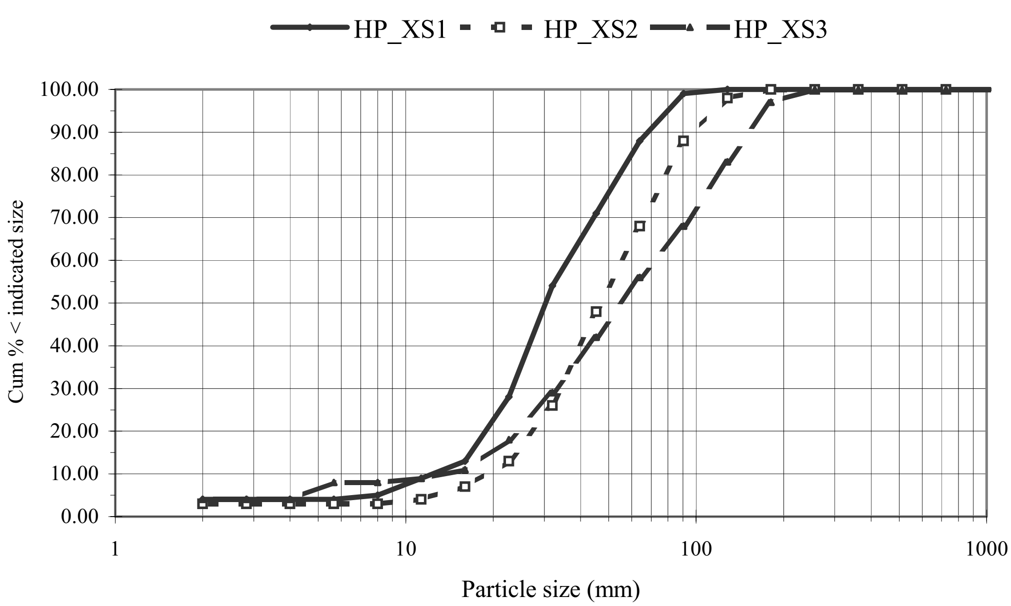


Figure 28. Size distribution of bed material from three reaches of lower High Prairie Creek, lower Klamath River Sub-basin, California.

Table 18. Summary of Wolman pebble count data collected in three survey reaches of lower High Prairie Creek lower Klamath River Sub-basin, California.

Parameter	HP_XS1	HP_XS2	HP_XS3
Mean Diameter mm	35.87	52.30	69.83
Standard Deviation	21.17	30.08	51.72
+/- 95% CI	4.20	5.97	10.26
Max Diameter mm	94	145	235
n	100	100	100
D_{84}	57.9	79.4	129.9
D_{65}	39.8	58.4	82.7
D_{50}	30.4	45.3	55.2
D_{16}	17.4	23.4	20.7

Twenty-four elevations were surveyed over 62.7 feet at HP_XS2 on 3 August 2002 (Figure 29). Three additional elevations extended beyond the right bank pin to incorporate terrace topography. Flood prone elevation was estimated at – 6.95 feet and bankfull at – 9.16 feet based on channel, substrate, and vegetation indicators located on the both banks. Mean particle size within this reach was 52.30 mm with a D_{84} at 79.36 mm (Figure 28) (Table 18).

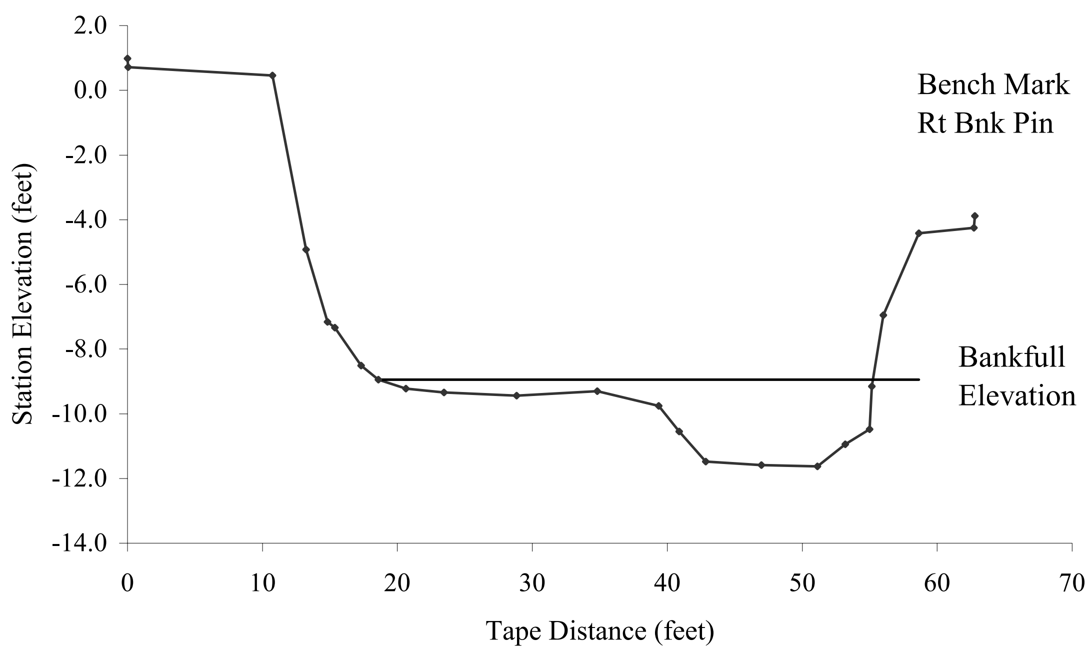


Figure 29. Cross section at HP_XS2 surveyed in August 2002 in lower High Prairie Creek, lower Klamath River Sub-basin, California.

Twenty-five measurements were taken at HP_XS3 over 52.3 feet on 3 August 2002 (Figure 30). Bankfull elevation was estimated at – 6.54 feet based on breaks in slope and vegetation elevations expressed along both banks. On average particles were the largest in this upper cross section reach with a mean diameter of 69.83 mm and a D_{84} of 129.94 mm (Figure 28) (Table 18).

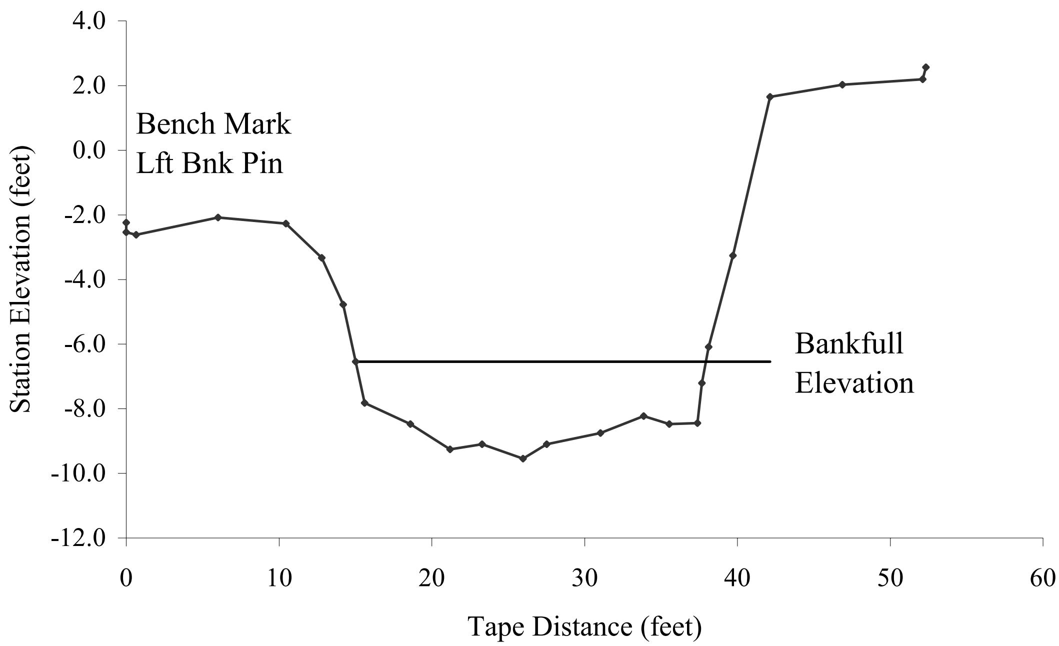


Figure 30. Cross section at HP_XS3 surveyed in August 2002 in lower High Prairie Creek, lower Klamath River Sub-basin, California.

Large Woody Debris Survey

A total of six reaches were surveyed for large woody debris (LWD) during August 2002. The number of pieces per mile in the stream ranged from 27.9 in Reach 1 to 364.8 in Reach 4 (Figure 31). Instream LWD in the first diameter class (1 – 2 feet) increased consistently from Reach 1 to Reach 6 (Figure 32). Reach 4 contained the majority of instream LWD greater than two feet in diameter and the largest component of LWD with diameters greater than four feet (Figure 32). The majority of instream LWD observed was 6 to 20 feet long with diameters between 1 – 2 feet (Figure 33).

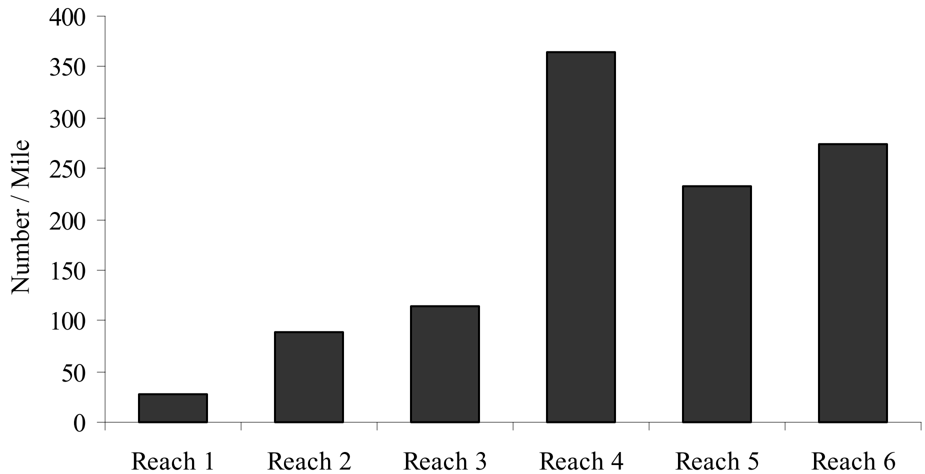


Figure 31. Summary of instream large woody debris enumerated during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

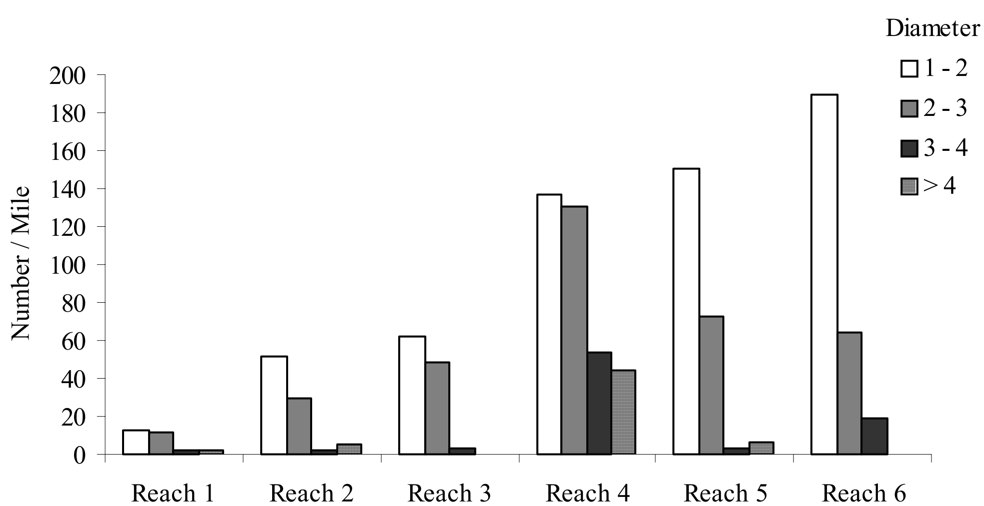


Figure 32. Summary of instream large woody debris classified by diameter during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

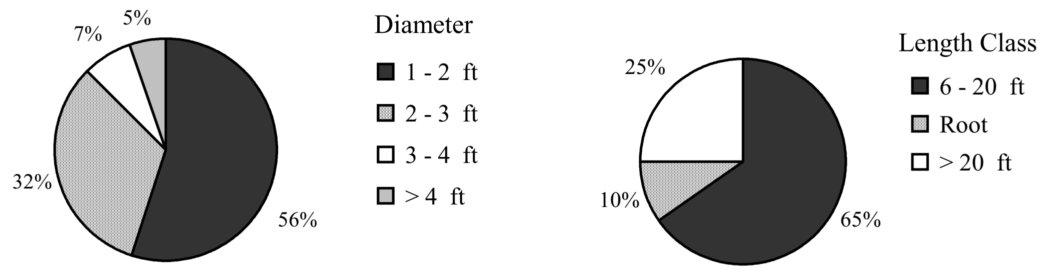


Figure 33. Summary of instream large woody debris classified by diameter and length class during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

The number of pieces of dead and down LWD in the potential recruitment zone was greatest in Reach 4 with 258.2 pieces per mile and lowest in Reach 1 and Reach 6 (Figure 34). Reach 4 also contained the most downed pieces of LWD per mile within each diameter class (Figure 35). The majority of downed LWD observed was 6 to 20 feet long with diameters between 1 – 2 feet (Figure 36).

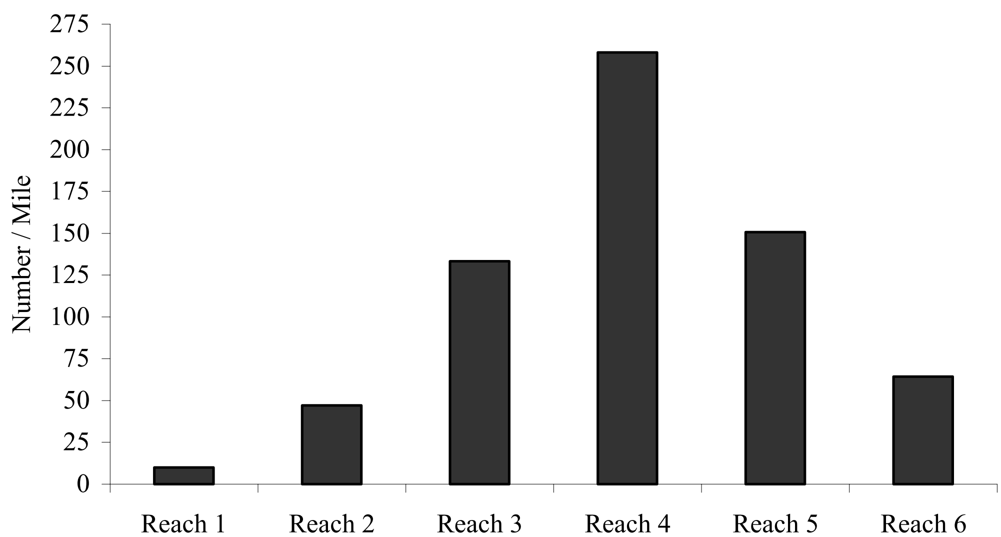


Figure 34. Summary of dead and downed large woody debris enumerated during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

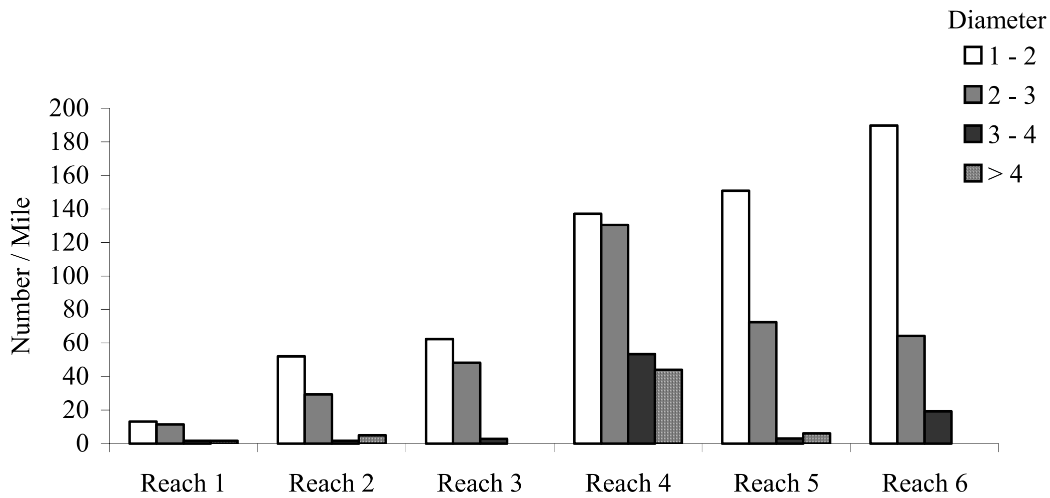


Figure 35. Summary of dead and downed large woody debris classified by diameter during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

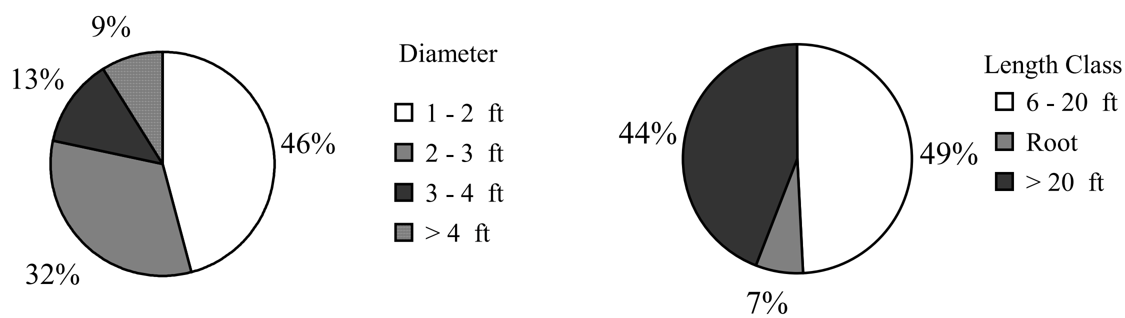


Figure 36. Summary of dead and downed large woody debris classified by diameter and length class during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

The number of live conifers per mile ranged from 25.7 in Reach 6 to 249.4 in Reach 3 (Figure 37). The number of live deciduous trees per mile decreased from 307.4 in Reach 1 to under 100 in Reach 5 and Reach 6 (Figure 37). Total number of live trees per mile was greatest in Reach 1 (416 trees/mile) and least in Reach 6 (115 trees/mile). The majority of live trees observed were in the first diameter class (1 - 2 feet) with less than 20 percent with diameters larger than two feet (Figure 38).

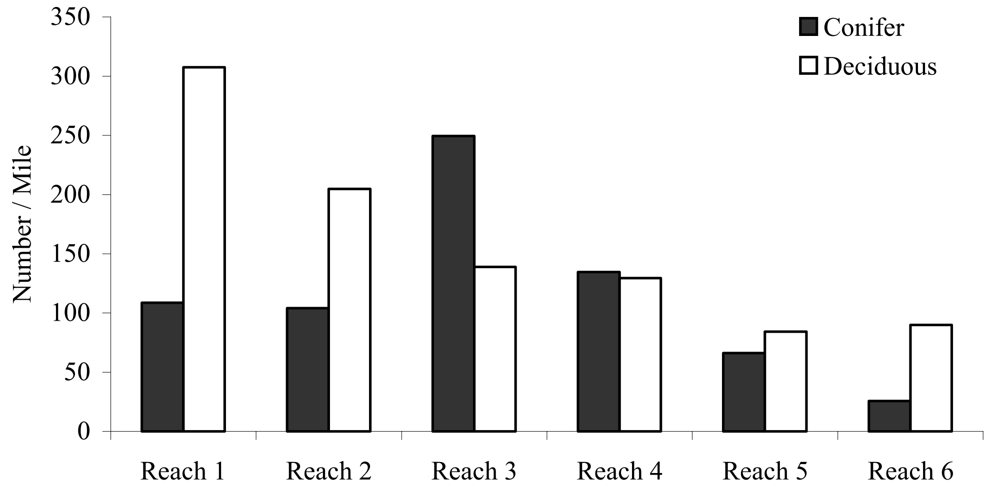


Figure 37. Summary of live trees enumerated during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

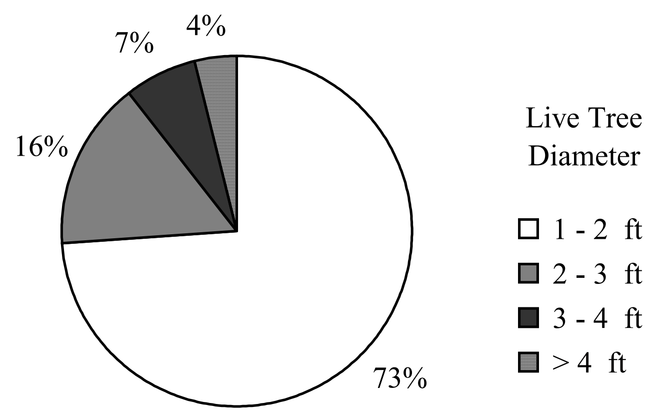


Figure 38. Summary of live trees classified by diameter during fall 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Fish Migration Barrier Assessment

A summary of identified fish barriers and associated parameters are presented in Table 19. Barrier types encountered in the Salt Creek watershed included:

- Marsh – A eutrophic stream reach with no defined channel that presents a significant hindrance to migration under most flow conditions;
- Beaver Dam – Beaver dams are accumulations of small vegetation and fine substrate constructed to back flood select stream reaches and often inhibit migration during low flow periods,
- Braided Channel – A stream reach with excessive channel braiding such that migration is inhibited or prevented under most flow conditions;
- Subsurface Flow – A stream reach where no surface flows exists;
- Log Jam – An excessive accumulation of woody debris that inhibits or prohibits migration;
- Boulder Jam – An accumulation of boulders that inhibits or prohibits migration; and
- Gradient – A sustained high gradient stream reach that inhibits or prohibits migration.

Locations of individual barriers are presented in Figure 39. Descriptions of individual barriers are discussed for each barrier below. Treatment recommendations are discussed in the restoration recommendation section.

Table 19. Summary of fish passage barriers in the Salt Creek watershed located in the lower Klamath River Sub-basin, California.

Sub-Watershed	Barrier ID	Legal Location Description	Barrier Type	Distance* Feet	Status	Treatable	Treatment Status	Treatment Date
Salt Creek	ST1	T14N, R1E, SE1/4 of SE1/4 Sec 33	Marsh	3,600 - 3,900	Seasonal	Yes	In Planning	
	ST2	T14N, R1E, SE1/4 of SE1/4 Sec 33	Beaver Dam	5,500	Seasonal	Yes	In Planning	
	ST3	T14N, R1E, SE1/4 of SE1/4 Sec 33	Marsh	8,200 - 9,100	Seasonal	Yes	In Planning	
	ST4	T14N, R1E, SE1/4 of SE1/4 Sec 33	Beaver Dam	9,200	Seasonal	Yes	Seasonal	1998, 2002, 2003
	ST5	T14N, R1E, SE 1/4 of SE 1/4 Sec 33	Marsh	10,400 - 12,900	Seasonal	Yes	In Planning	
High Prairie Creek	HP1	T14N, R1E, SE 1/4 of SE 1/4 Sec 33	Subsurface Flow	850 - 8,120	Seasonal	Unknown	In Planning	
	HP1b	T14N, R1E, SE 1/4 of SE 1/4 Sec 33	Log Jam/Beaver	300				
	HP2	T14N, R1E, SW 1/4 of SE 1/4 Sec 21	Log Jam	8,994	Partial	Yes	Complete	Fall 2003
	HP3	T14N, R1E, SW 1/4 of SE 1/4 Sec 21	Log Jam	9,554	Seasonal	Yes	Complete	Fall 2003
	HP4a	T14N, R1E, SW 1/4 of SE 1/4 Sec 21	Boulder Jam	9,955 - 10,307	Complete	Yes	In Progress	Fall 2003
	HP4b	T14N, R1E, SW 1/4 of SE 1/4 Sec 21	Gradient	9,955 - 10,307	Complete	Unknown	In Planning	
	HP5	T14N, R1E, SW 1/4 of SE 1/4 Sec 21	Log Jams	10,307 - 14,637	Partial	Yes	In Planning	
	HP6	T14N, R1E, NW 1/4 of NW 1/4 Sec 21	Log Jams	14,931 - 15,052	Partial	Yes	In Planning	

Distance* - Cummulative hip chain distance from mouth of sub-watershed

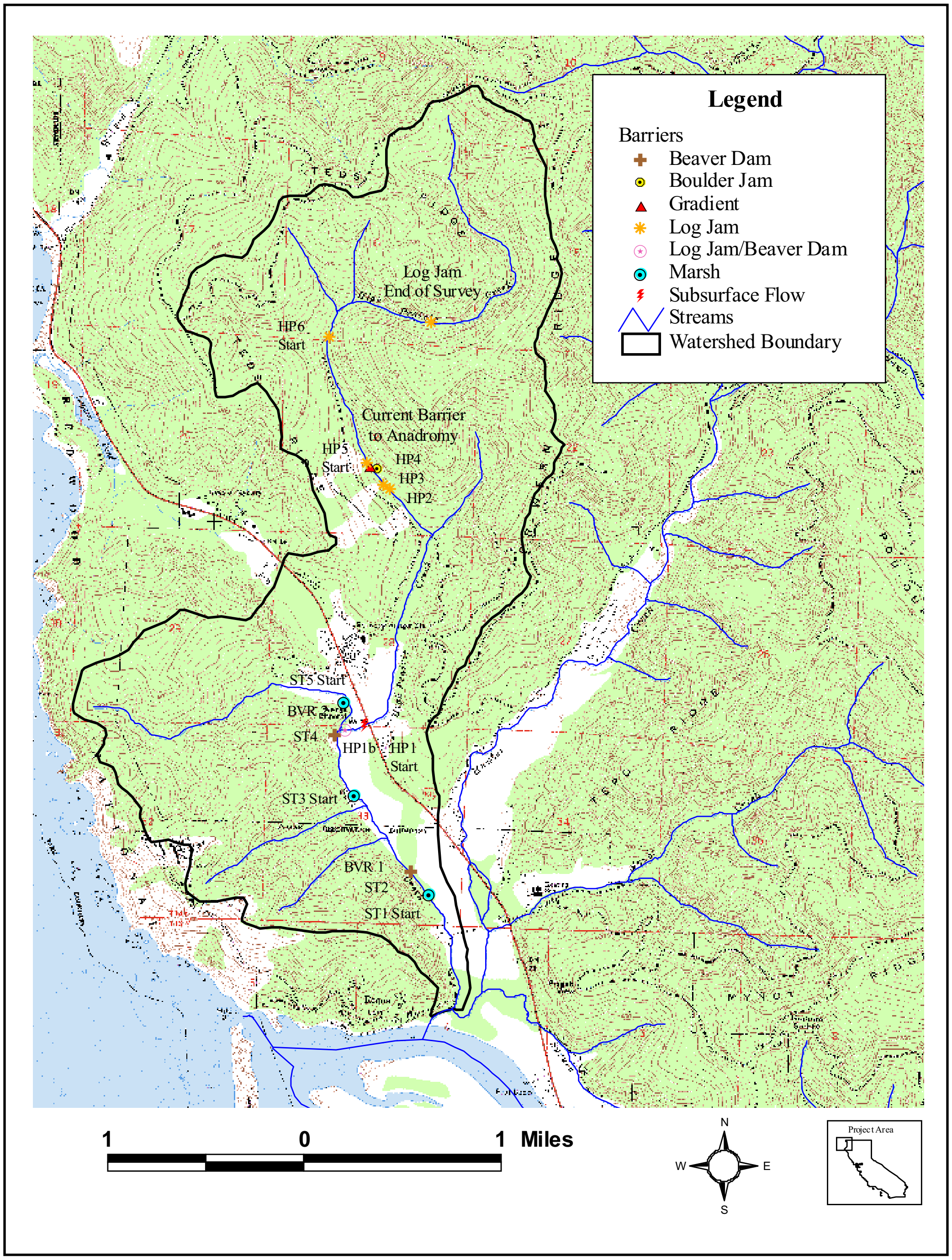


Figure 39. Map of fish passage barriers in the Salt Creek watershed located in the lower Klamath River Sub-basin, California.

Salt Creek

ST1 – This reach has been heavily grazed allowing excessive vegetation (creeping buttercup, rushes, and sedges) to establish in the active channel that inhibits fish migration during low flow periods.

ST2 – Beavers have consistently used this location to construct dams that may present seasonal migration hindrances to salmonids.

ST3 – This reach is comprised of braided channels and marsh habitats clogged by aquatic vegetation and dense growths of sedges, grasses, and cattails. At most flow levels these conditions make migration through this reach extremely difficult for all salmonid life stages (Figure 40).

Figure 40. Marsh habitats located in the Salt Creek valley, lower Klamath River Sub-basin, California. January 2002.

ST4 – Beavers have also consistently used this location to construct their dams (Figure 41). Treatment strategies for this site should be developed in conjunction with barrier ST2.

Figure 41. Photograph of multiple small beaver dams located in Salt Creek, lower Klamath River Sub-basin, California. 18 December 2003.

ST5 – This reach lacks a defined stream channel with water flowing around dense mats of sedges, grasses, cattails, and alder. Large volumes of standing water exist year-round in this reach however, their connectivity with flowing reaches of Salt Creek is poorly understood.

High Prairie Creek

HP1 – This stream reach is consistently subsurface during summer and fall months (Figure 42). This condition may result from a combination of factors including excessive sedimentation, confinement of the channel by levees, and reductions in the local water table resulting from Klamath River flow management.

Figure 42. Looking upstream at the dry channel bed from the thalweg at the site HP_XS1 located in lower High Prairie Creek on 2 August 2002.

HP1b – This reach is highly constricted by levees existing along lower High Prairie Creek. The reach is consistently blocked by small wood and debris deposited during initial high flow events occurring in late fall/early winter (Figure 43). Complicating this issue are the beaver who continually use this site to construct their dams (Figure 44). When debris clogs this reach, flows top the levees and spill into adjacent grasslands and marsh habitats. This results in a significant loss of attracting flows to mainstem Salt Creek during peak salmonid spawning migration periods.

Figure 43. Looking upstream at the wood accumulations formed at HP1b in December 2003 with High Prairie Creek spilling into adjacent marsh habitats located on the left side of the photograph.

Figure 44. Looking upstream at the beaver dam at HP1b in December 2003 in High Prairie Creek. The beaver dam is located in the center of the photograph with wood accumulating upstream near the top of the Photograph.

A similar debris jam was described at this location during a 1996 survey of High Prairie Creek (Voight 1996). In 1998, the California Conservation Corps (CCC) and California Department of Fish and Game (CDFG) removed this large gravel and woody debris deposit from this site High Prairie Creek. The material was relocated from the channel to reinforce the existing downstream levee. The channel was open during the habitat assessment survey in July 2002 but reformed in the winters of 2002 and 2003.

HP2 – This wood jam consists of a few pieces of large wood and accumulations of small woody debris just upstream of a live maple tree spanning the active channel (Figure 45). This barrier presents a migrational hindrance under some low flow conditions.


Figure 45. Looking upstream at the log jam HP2 on 25 March 2003 in High Prairie Creek. Wood is accumulating upstream of the live maple tree spanning the channel.

HP3 – This barrier consists of two old growth logs that span the creek creating a migrational hindrance to upstream migrating salmonids under low flow conditions (Figure 46a to 46c). Juvenile coho salmon were observed upstream of this barrier in summer of 2002. During high winds in winter 2003, another old growth redwood toppled directly upstream of the old growth spanners, further complicating fish passage conditions at this site (Figure 46c).


Figure 46a. Looking upstream at the log jam HP3 during the habitat assessment survey conducted in High Prairie Creek in July 2002.


Figure 46b. Looking upstream at the log jam HP3 In High Prairie Creek on 25 March 2003.


Figure 46c. Looking upstream at the recently fallen old growth redwood in the channel of High Prairie Creek just upstream of barrier HP3. 25 March 2003.

HP4 – This reach is comprised of several barriers and was previously described as one barrier complex in Gale (2003). This complex is further described as follows.

> **HP4a** – This barrier is a boulder jam formed from a fairly recent rockslide occurring on the left bank. Large boulders clog the pour over and no jump pool exists (Figure 47a and 47b).

Figure 47a. Looking upstream at the boulder jam HP4a in High Prairie Creek in July 2002.

Figure 47b. Looking upstream at the boulder jam HP4a in High Prairie Creek on 25 March 2002.

HP4b – This reach is comprised of multiple wood jams and braided channels with gradients over four percent. No anadromous salmonids have been observed upstream of this complex. More detailed geomorphic assessment and monitoring is required to understand sediment routing through this reach and to determine treatment options that will maintain the beneficial functions of instream large wood while providing for fish passage to upstream habitat.

HP5 – This ~0.9 mile reach is relatively low gradient (2%) and has the potential to provide excellent salmonid spawning and rearing habitat. Several wood jams exist in this reach that may hinder salmonid migration (Figure 48). Wood jams located in this reach were only described during the habitat assessment of High Prairie Creek (Table 20). Future surveys of this reach should be conducted during high flows to better document fish passage at individual barriers.

Figure 48. Examples of log jams located in barrier reach HP5 in High Prairie Creek. The photograph on the left is habitat unit 137 during July 2002 and the photograph on the right depicts Habitat unit 133 during March 2003.

Table 20. Summary information for woody debris accumulations located in upper High Prairie Creek, lower Klamath River Sub-basin, California.

Hab Unit #	Barrier ID	Barrier Type	Distance* Feet	Height Feet	Length Feet	Width Feet	Treatment Status
137	HP5a	LWD	10,450	5	20	30	Partial
140	HP5b	LWD	10,522	10	25	20	Complete (?)
152	HP5c	LWD	10,877	11	38	30	Partial
155	HP5d	LWD	10,950	11	11	30	Complete (?)
164	HP5e	LWD	11,215	12	25	30	Complete (?)
169	HP5f	LWD	11,407	15	38	40	Partial
211	HP5g	LWD	12,387	12	120	30	Complete (?)
213	HP5h	LWD	12,443	10	20	20	Partial
275	HP5i	LWD	13,922	9	40	70	Complete (?)
311	HP6a	LWD	14,703	5	8	15	Partial
319	HP6b	LWD	14,856	8	10	20	Complete (?)
324	HP6c	LWD	14,952	4	10	20	Partial
338	HP6d	LWD	15,052	8	20	30	Partial

Distance* - Cumulative hip chain distance from mouth of High Prairie Creek

Fish Distribution

Salt Creek

In 1997 an electrofishing survey was conducted in Salt Creek beginning at the confluence with High Prairie Creek and proceeding upstream (Figure 49). Due to deep water and other hazards only ~150 feet were actually surveyed within this reach. A total of six coastal cutthroat trout (*Oncoryhnchus clarki clarki*) ranging in size from 60 to 121 mm, and one unknown trout fry were captured (Appendix 1).

A total of 33 salmonids were captured from three electrofishing reaches located in lower Salt Creek on 7 May 2002 (Figure 49). Cutthroat trout were the most numerous species sampled and ranged in size from 88 to 152 mm fork length (Appendix 2). A total of nine juvenile coho salmon (*O. kisutch*) were captured ranging in size from 47 to 117 mm fork length. Juvenile steelhead trout (*O. mykiss*) and unknown trout fry were also sampled in low numbers within these reaches. A short electrofishing reach was conducted on 13 May 2002 in Salt Creek upstream of the upper marsh (Figure 49). Nine cutthroat trout ranging from 84 to 172 mm fork length and three trout fry were captured (Appendix 2). Other species present during these surveys included three-spined stickleback (*Gasterosteus aculeatus*), lamprey species (*Lampetra* spp.), and sculpin species (*Cottus* spp.).

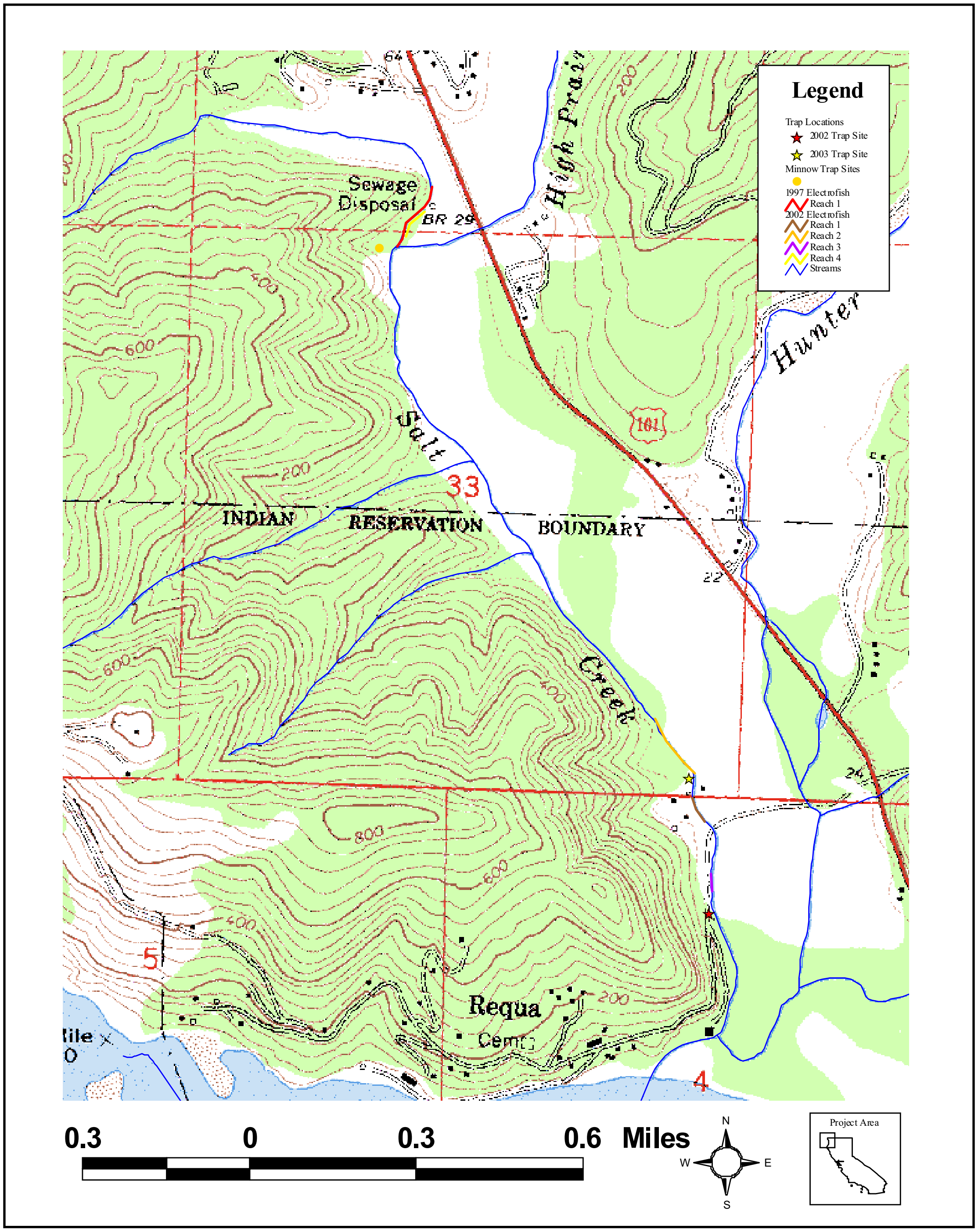


Figure 49. Map of fish monitoring locations in Salt Creek located in the lower Klamath River Sub-basin, California.

Hook-and-line sampling was used in Salt Creek beaver ponds on 27 March 2003 (Figure 49). Two anglers fished from a two-person kayak for approximately one hour and captured four cutthroat trout and seven juvenile coho (Appendix 3). Coho ranged in size from 97 to 127 mm and appeared to be in their final stages of smoltification. Cutthroat captured were significantly larger than captured coho, ranging from 150 to 210 mm fork length.

On this same date, three minnow traps were baited with salmon roe and set in different locations at site BVR 2 located in upper Salt Creek (Figure 49). The traps were placed five feet underwater and fished for 45 to 60 minutes. The only species encountered during these sets were sculpin and stickleback. In the last two years, YTFP has attempted using these traps at the mouth of Salt Creek and at several locations in the Klamath River estuary and slough habitats with virtually no success in capturing juvenile salmonids.

Salt Creek Migrant Trap

A total of 15 salmonids were captured during eight outgoing tide sets using the lower Salt Creek migrant trap in 2002 (Figure 49) (Table 21). Cutthroat trout were the most numerous salmonid captured in the trap and fish ranged in size from 83 to 158 mm. Only three steelhead trout and two coho were captured during sampling efforts. Other species captured included three-spined stickleback, lamprey, sculpin, sucker (*Catostomus* sp.), and speckled dace (*Rhinichthys osculus*).

The lower Salt Creek migrant trap was operated for a total of 26 capture dates in spring 2003 (Figure 49). During this period, one chinook salmon (*O. tshawytscha*) smolt, 121 cutthroat trout, 136 steelhead, and 284 juvenile coho were captured (Appendix 4). Length-frequency data for all salmonid species captured are presented in Figure 50.

Table 21. Summary of salmonids captured during eight outgoing tide sets of a downstream migrant trap located in lower Salt Creek, lower Klamath River Sub-basin, California.

Date	Species Code	Fork Length mm	Condition Code	Development Code*
30-Apr-02	OC	158	2	P/S
30-Apr-02	OC	158	2	P/S
30-Apr-02	OC	155	2	P/S
01-May-02	OC	148	1	P/S
01-May-02	OC	147	1	P/S
01-May-02	OC	144	1	P/S
01-May-02	OC	143	2	P/S
01-May-02	OC	133	2	P/S
02-May-02	OC	130	2.5	P/S
02-May-02	OC	83	1.5	P/S
01-May-02	OK	132	-	1+
06-May-02	OK	125	3	1+
01-May-02	OM	116	2	P/S
30-Apr-02	OM	113	2	P/S
01-May-02	OM	88	1	P/S

* P/S - Parr/Smolt
1+ - Age 1 fish

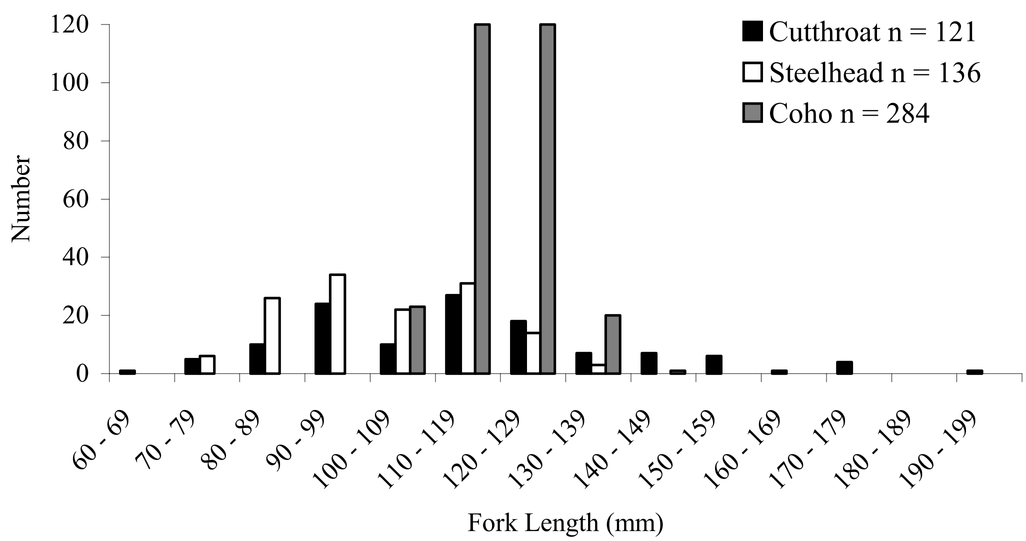


Figure 50. Length frequency for salmonids captured during 26 sets of a downstream migrant trap in lower Salt Creek, lower Klamath River Sub-basin, California. Spring 2003.

Non-salmonid species captured in large numbers included speckled dace, sculpin, and three-spined stickleback (Table 22). Species observed in low numbers included green sunfish (*Lepomis cyanellus*), brown trout (*Salmo trutta*), golden shiner (*Notemigonus crysoleucas*), pacific giant salamanders (*Dicamptodon ensatus*), rough skinned newts (*Taricha granulose*), and frog larvae (Appendix 4).

Table 22. Summary data for non-salmonids captured during 26 sets of a downstream migrant trap in lower Salt Creek, lower Klamath River Sub-basin, California. Spring 2003.

Species	Total Captured
Speckled Dace	3,142
Sculpin species	2,191
Three-spined Stickleback	1,387
Sucker	753
Brook Lamprey	165
Pacific Lamprey	9

High Prairie Creek

In September 1997, YTFP conducted electrofishing surveys in lower and upper High Prairie Creek (Figure 51). In the lower reach, 18 cutthroat trout were captured ranging in size from 71 to 152 mm (Appendix 5). A total of sixty-six cutthroat trout, one steelhead (FL 133 mm), and an unknown trout fry (FL 57 mm) were captured in the upper High Prairie Creek reach (Appendix 5). Cutthroat ranged in size from 54 to 222 mm fork length with a mean of 97.9 (S.D. = 36.18) (Figure 52).

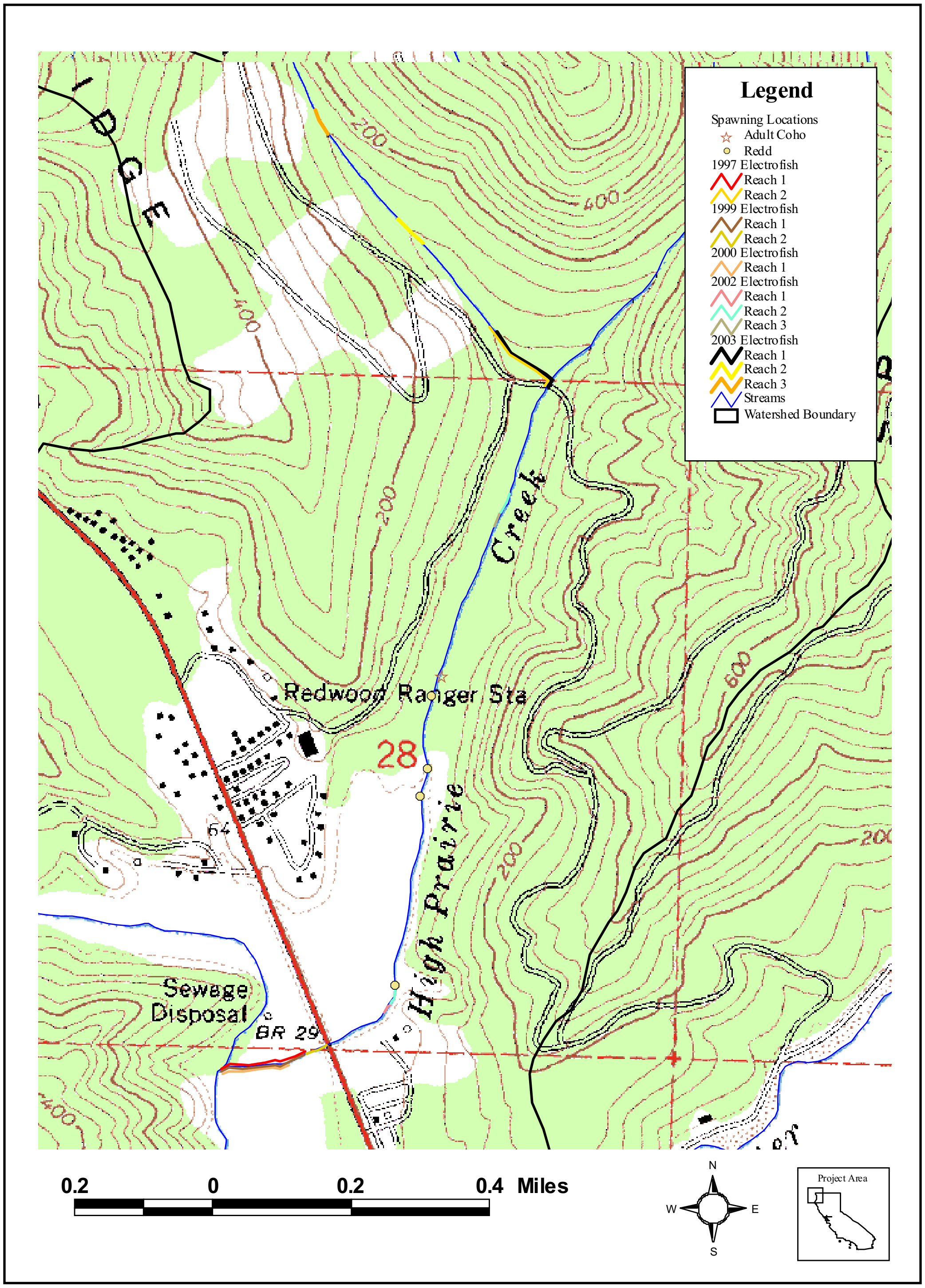


Figure 51. Map of fish monitoring locations in High Prairie Creek located in the lower Klamath River Sub-basin, California.

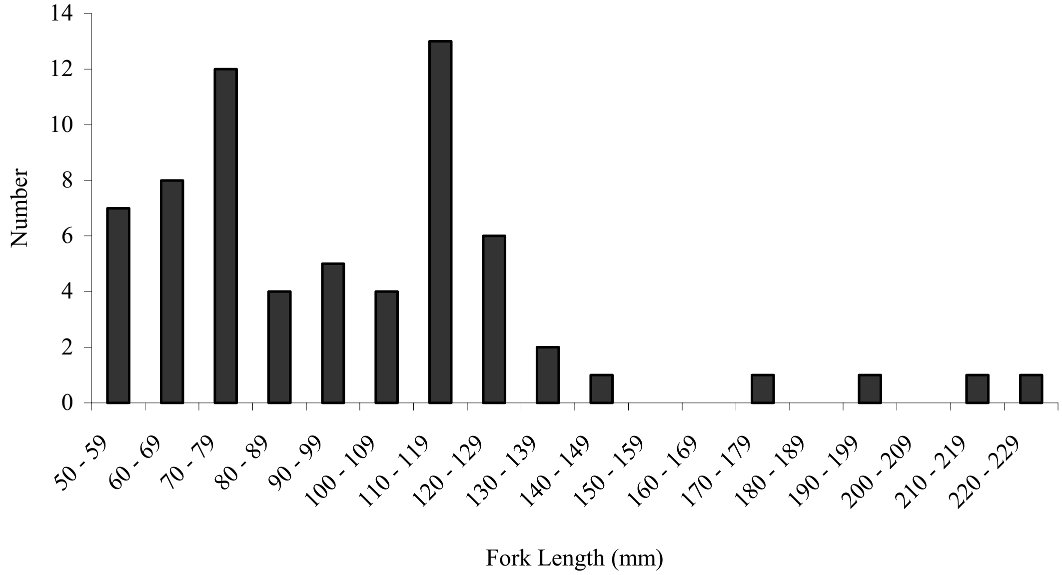


Figure 52. Length frequency of cutthroat trout captured during an electrofishing survey on 16 September 1997 in upper High Prairie Creek, lower Klamath River Sub-basin, California.

In 1999 and 2000, YTFP conducted electrofishing surveys in lower High Prairie Creek to assess fish presence in the vicinity of the CDFG/CCC fish access restoration site (Figure 51). A total of eight cutthroat trout, 16 steelhead trout, and an unknown trout fry were captured in 1,536 feet of lower High Prairie Creek in 1999 (Appendix 6). In 2000, three cutthroat trout, seven steelhead, and three unknown trout fry were captured in 475 feet beginning at the mouth of High Prairie Creek (Appendix 7).

Electrofishing surveys conducted in four reaches of High Prairie Creek during May 2002 yielded 114 salmonids (Figure 51) (Appendix 8). Coho salmon were the most numerous species sampled with juveniles ranging in size from 37 to 79 mm (Figure 53). This was the first time YTFP has documented coho presence in High Prairie Creek. Cutthroat trout fork lengths ranged from 55 to 137 mm with steelhead trout ranging from 34 to 125 mm. Trout fry fork lengths ranged from 25 to 65 mm.

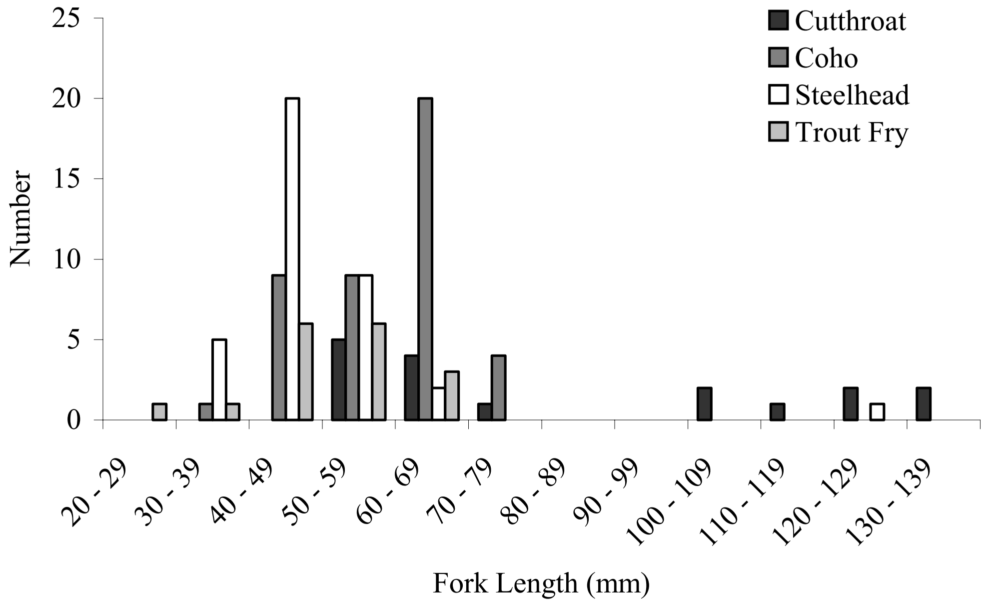


Figure 53. Length frequency of salmonids captured in four electrofishing reaches during May 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Permanent electrofishing reaches were established in High Prairie Creek in June 2003 to document fish distribution downstream and upstream of perceived fish migration barriers (Figure 51). A total of 20 cutthroat trout, one steelhead, and 71 unknown trout fry were captured in Reach 1 located upstream of the USFS bridge (Appendix 9). The largest fish captured in Reach 1 was a juvenile steelhead that weighed 16.8 g at 108 mm fork length. Trout fry fork lengths ranged from 38 to 63 mm with weights ranging from 0.5 to 2.5 g. Cutthroat trout fork lengths ranged from 60 to 104 mm with weights ranging from 2.4 to 12.9 g. Least-squares regression was used to determine the line of best fit relating individual cutthroat fork length (60 mm or greater) and individual weight (R^2 = 0.96, P value = 7.3e-015) (Figure 54).

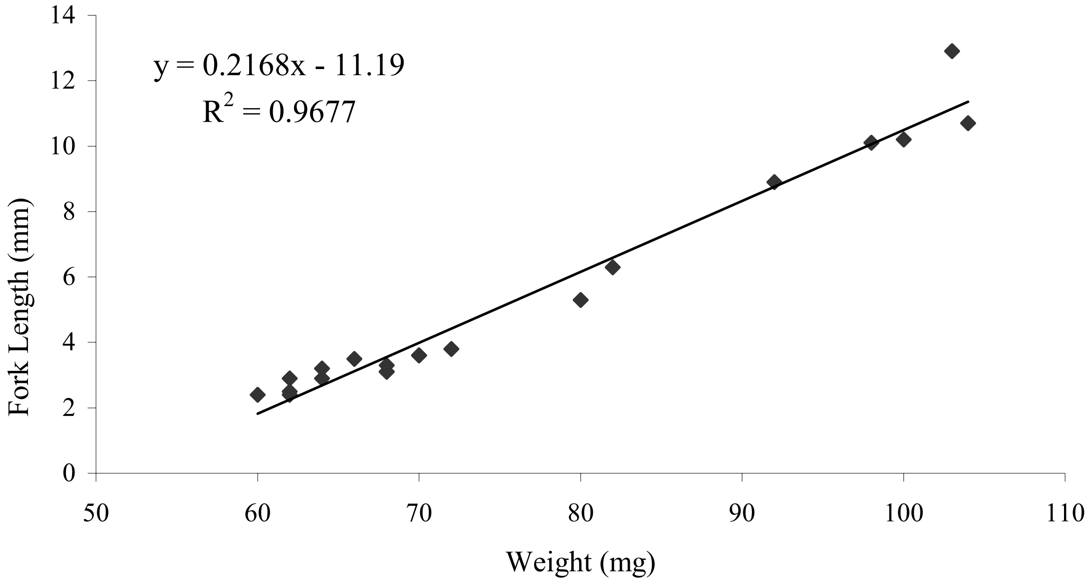


Figure 54. Relationship of individual cutthroat trout length and body weight for fish captured on 17 June 2003 in High Prairie Creek, lower Klamath River Sub-basin, California.

Reach 2 was conducted in 260 feet of channel located just downstream of barrier HP2 (Figure 44). Ninety-four unknown trout fry ranging in size from 29 to 70 mm were captured during this survey (Appendix 9). A total of 32 cutthroat and seven steelhead trout were also captured. Cutthroat trout fork lengths ranged from 62 to 138 mm with steelhead ranging in size from 75 to 151 mm.

Reach 3 was conducted in 206 feet of channel located upstream of a complex high gradient barrier (HP4b) thought to prohibit upstream migration to all salmonid species and age classes (Figure 51). A total of 25 cutthroat trout and 22 unknown trout fry were captured in this reach (Appendix 9). Cutthroat trout fork length ranged from 77 to 156 mm with trout fry fork length ranging from 40 to 74 mm. No steelhead trout were captured from this reach.

Since lower reaches of High Prairie Creek dry up in late spring/early summer YTFP conducted small-scale rescues of salmonids from these habitats. On 21 June 2002, a total of 40 coho, 36 cutthroat trout, and 32 trout fry were captured from drying pools via electrofishing (Appendix 11). Fish were released into perennial flowing stream reaches. On 30 May 2003, a total of 16 salmonids were rescued using electrofishing gear and small seine nets (Appendix 11). Juvenile coho salmon ranged in size from 115 mm (19 grams) to 129 mm (29 grams). Fish were released into a flowing section of upper Salt Creek.

CDFG Ten-Pool Protocol

A total of 18 pools were surveyed using direct observation methods in High Prairie Creek on 1 August 2002 (Table 23). The CDFG ten-pool protocol was conducted from habitat unit 058 upstream to unit 103 located just upstream of HP3. In the ten-pool reach, the number of juvenile coho per pool ranged from 10 to 96 with a mean of 35.2 coho per pool (S.D. = 26.9) (Table 23). Pool densities were obtained by determining the number of coho per total habitat unit length. Densities ranged from 0.28 to 1.8 juvenile coho per foot with a mean of 1.04 (S.D. = 0.55). Additional pools were surveyed upstream to assess coho distribution downstream and upstream of barrier HP4a. A total of 14 juvenile coho were observed in pool units (103 – 116) located between barriers HP3 and HP4a with no coho observed upstream of HP4a (units 181.1 – 132) (Table 23).

Table 23. Summary of salmonids observed during direct observation surveys conducted on 1 August 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Habitat Unit	Length Ft	Mean Width Ft	Direct Observer	Juvenile Coho	Trout 1+	Trout 2 +	Trout 0+	Coho Density # / foot
058.0	40	7.5	SB	34	>20	2	y	0.85
067.0	28	6.5	SB	28	>20	3	y	1.00
071.0	56	10.0	SG	96	--	--	--	1.71
075.0	23	10.0	SB	24	0	4	n	1.04
080.0	31	12.0	SG	24	--	--	--	0.77
085.0	26	15.0	SB	47	2	0	y	1.81
087.0	20	12.0	SG	14	--	--	--	0.70
092.0	35	15.0	SB	63	>20	5	y	1.80
101.0	27	10.0	SG	12	--	--	--	0.44
103.0	35	14.0	SG	10	--	--	--	0.29
106.0	11	10.0	SB	3	>10	8	y	0.27
110.0	16	10.0	SG	0	--	--	4	0.00
112.0	26	9.0	SB	0	8	3	y	0.00
114.0	16	12.5	SB	1	10	5	y	0.06
116.0	21	20.0	SG	0	0	1	5	0.00
118.1	19	5.0	SB	0	2	0	5	0.00
130.0	10	5.5	SG	0	--	--	--	0.00
132.0	21	15.0	SB	0	>15	5	y	0.00

-- Data not collected
SB Sarah Beesley
SG Scott Gibson

Spawning Surveys

A total of 11 spawner surveys were conducted in the anadromous reaches of High Prairie Creek from 17 December 2002 through 8 May 2003 (Figure 51) (Table 24). One unknown adult salmonid was observed in a lateral scour pool just downstream of HP_XS2 on 8 January 2003 (Figure 51). This adult fish was observed near an active redd and was presumed an adult female coho due to the sore tail and mouth/body coloration.

Table 24. Spawning survey data collected during 2002 – 2003 in High Prairie Creek, lower Klamath River Sub-basin, California.

Date	Spawner	Redds	Carcasses	Start	Stop	Crew	Visibility (ft)	Weather
17-Dec-02	0	0	0	BAR2	101 Bridge	SB, SG	2	cloudy, rainy
30-Dec-02	0	0	0	101 Bridge	BAR2	SG, DJ	2	rainy
2-Jan-03	0	0	0	USFS Bridge	Klamath	SG, DJ	3	
8-Jan-03	1	4	0	101 Bridge	BAR2	SB	5	clear, breezy
14-Jan-03	0	0	0	101 Bridge	USFS Bridge	PL, AM	2	
17-Jan-03	0	0	0	101 Bridge	BAR2	SB, RF	5	clear, cold
4-Feb-03	0	0	0	101 Bridge	BAR2	SB, BL	5	clear, crisp
24-Feb-03	0	0	0	Salt Creek	BAR2	SB	5	clear
13-Mar-03	0	0	0	Salt Creek	BAR2	SB	4	overcast, rain
21-Apr-03	0	0	0	Salt Creek	BAR2	SG	5	overcast
8-May-03	0	0	0	Salt Creek	BAR2	SG, ZG	5	clear

On this date, two other possible redds were observed downstream of the adult fish (Table 25). On 24 February 2003, juvenile coho (>80 mm) were observed during direct observation surveys conducted near the confluence with Salt Creek. Brook lamprey and newly constructed redds were observed on 21 April and 8 May 2003 in lower High Prairie Creek.

Table 25. Salmonid redd data collected during spawning surveys (2002 – 2003) conducted in High Prairie Creek, lower Klamath River Sub-basin, California.

		Depth (inches)		Size (feet)		Habitat	Fish	
Date	Location #	Pit	Mound	Length	Width	Type	Present	Comments
8-Jan-03	R-1	16	12	6	2.0	RIFFLE	No	Pot hole shape, test?
8-Jan-03	R-2	12	2	5	2.5	RIFFLE	No	Pot hole shape, test?
8-Jan-03	R-3	16	1	5	2.5	RIFFLE	No	Pot hole shape, test?
8-Jan-03	R-4	16	1	7	3.0	TAILOUT	Yes	F-1 on REDD

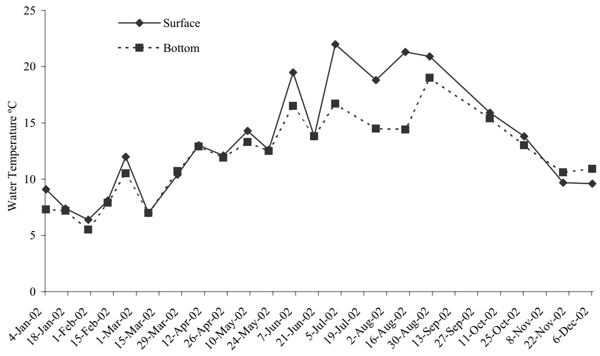
Water Quality

Salt Creek Slough

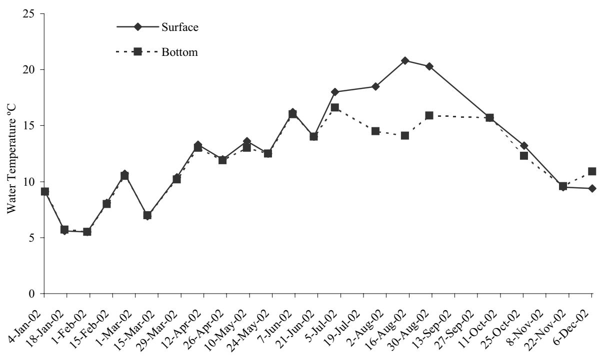
The maximum water temperature recorded in the Salt Creek slough was a surface reading of 22.0 ºC at Station 1 on 1 July 2002 (Figure 55). Maximum surface water temperatures at the other stations occurred on 13 August and were 20.8 ºC at Station 2, 20.5 ºC at Station 3, and 19.7 ºC at Station 4. Station 5 had the lowest maximum surface temperature of 15.2 ºC recorded on 13 August. Minimum surface temperatures were 5.5 ºC for Stations 2, 3, 4, and 5 and 6.4 ºC at Station 1 on 30 January. Stratification of water temperature occurred at all stations beginning in July and extending into October – November presumably when air temperatures cooled (Figure 55).

Surface and bottom dissolved oxygen (DO) concentrations varied the most at Station 1 and Station 2 during the sampling period (Figure 56). Maximum surface DO concentrations occurred at most stations in December and January. Minimum surface DO concentrations were 3.99 mg/L at Station 5 on 13 August and 4.87 mg/L at Station 3 on 25 October. Concentrations were consistently lower near the channel bottom during the study period. Minimum concentrations were recorded at Station 1 (3.00 mg/L) and at Station 2 (1.09 mg/L) on 8 April and at Station 5 (2.30 mg/L) on 13 August. Maximum concentrations were recorded during high flow periods at all stations and ranged from 9.70 mg/L at Station 5 to 10.42 mg/L at Station 1.

Conductivity was directly related to salinity concentrations in the slough, therefore only salinity data is discussed here. Surface salinity concentrations were nearly zero for the entire study period (Figure 57). Bottom salinity concentrations peaked in early winter at all stations with a maximum concentration of 24.9 ppt at Station 1 on 6 December. These increased concentrations are believed a result of salt water entering the creek during high tides.



Station 1



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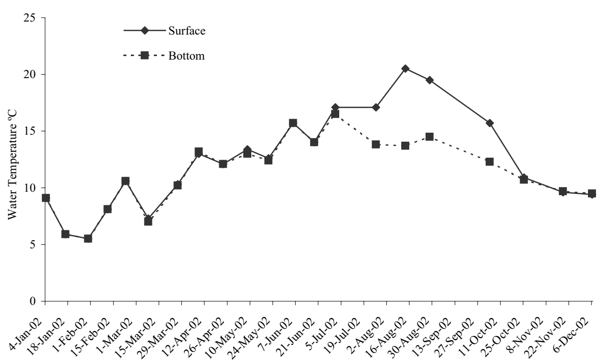

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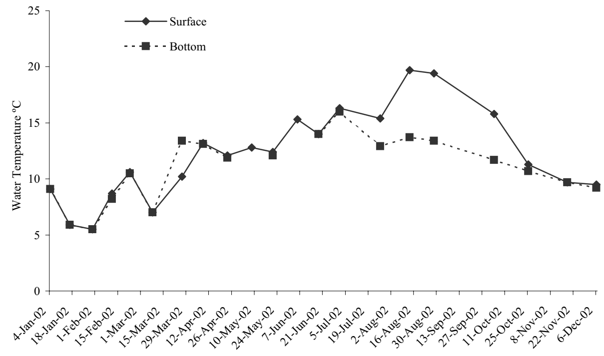

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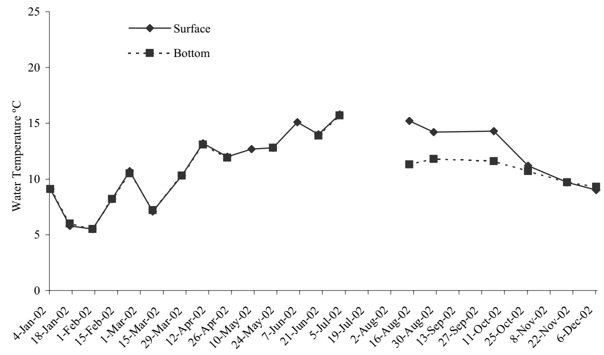
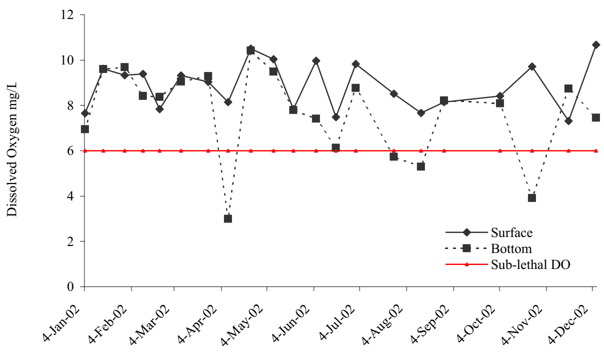
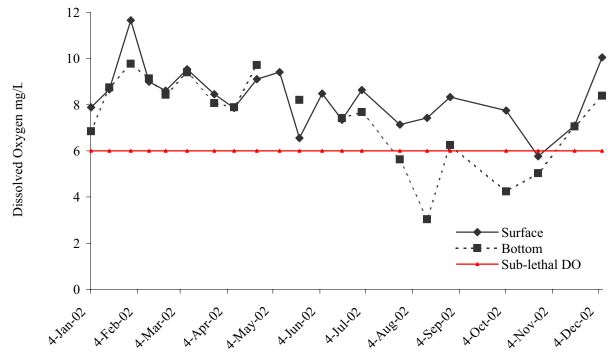


Station 5

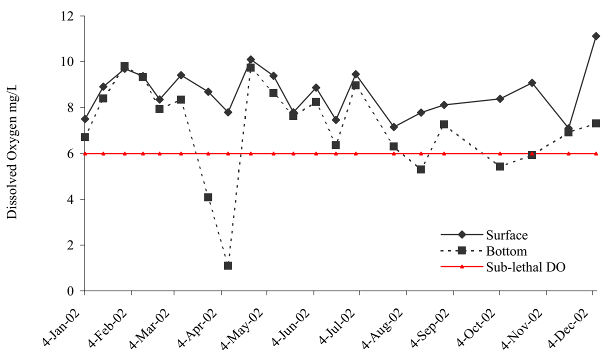
Figure 55. Surface and bottom water temperatures measured at stations located in lower Salt Creek, lower Klamath River Sub-basin, California.



Station 1



Station 1



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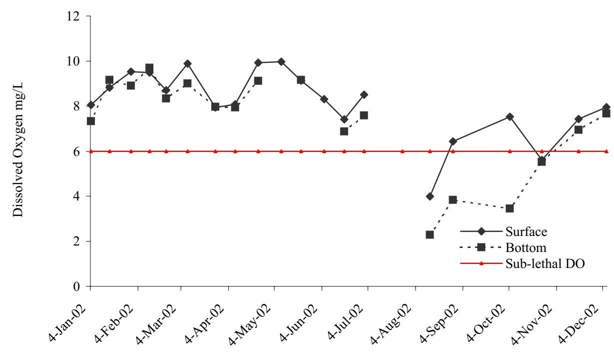
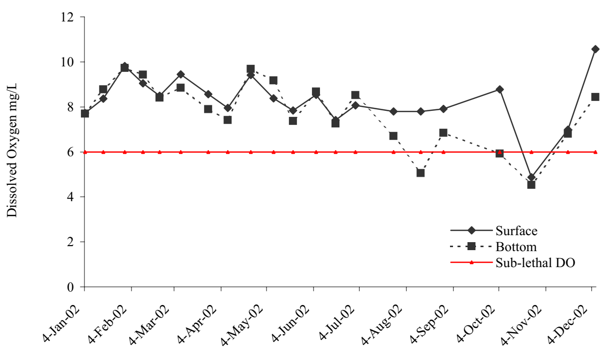
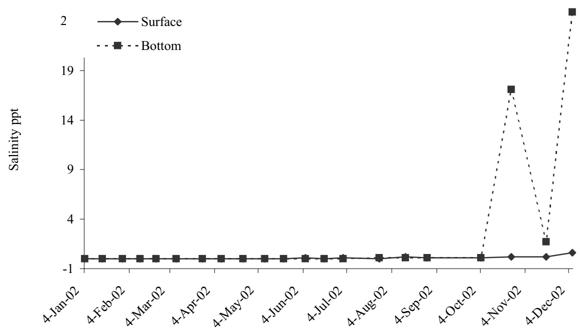


Station 1

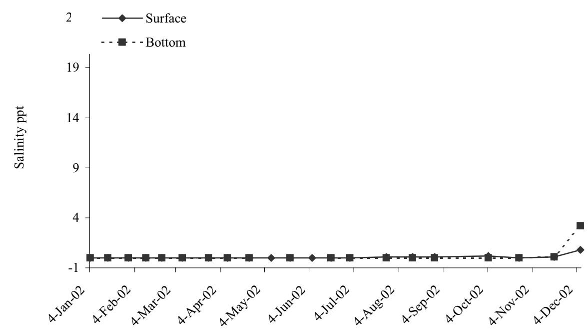


Station 1

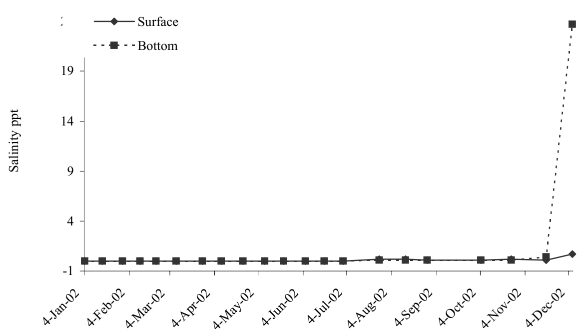
Figure 56. Surface and bottom dissolved oxygen concentrations measured at stations located in lower Salt Creek, lower Klamath River Sub-basin, California.



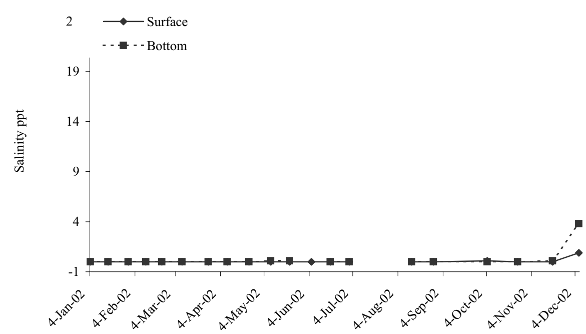
Station 1



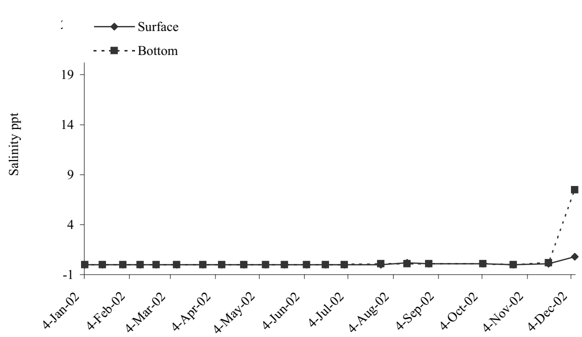
Station 1



Station 1



Station 1



Station 1

Figure 57. Surface and bottom salinity measured at stations located in lower Salt Creek, lower Klamath River Sub-basin, California.

Upper Salt Creek

Water temperatures recorded by the YSI Meter at the four upper watershed locations tracked fairly close during the study period. Water temperature patterns observed are presumably a result of the local air temperature regime and fluctuation in discharge (Figure 58). Temperatures were lowest during fall (October) through early spring (March) and began climbing in early May, peaking at different times during the dry season (June – September). The highest water temperatures occurred during September at Lower High Prairie (18.3ºC) and Upper Salt (17.0 ºC). Maximum water temperature for Salt_High was 16.3 ºC in August and 12.9 ºC for Upper High Prairie in June. The lowest water temperatures were recorded in December with 8.9 ºC at Upper Salt, 9.4 ºC at Salt_High, and 9.9 ºC at Lower High Prairie. The minimum temperature recorded for Upper High Prairie was 9.6 ºC in November.

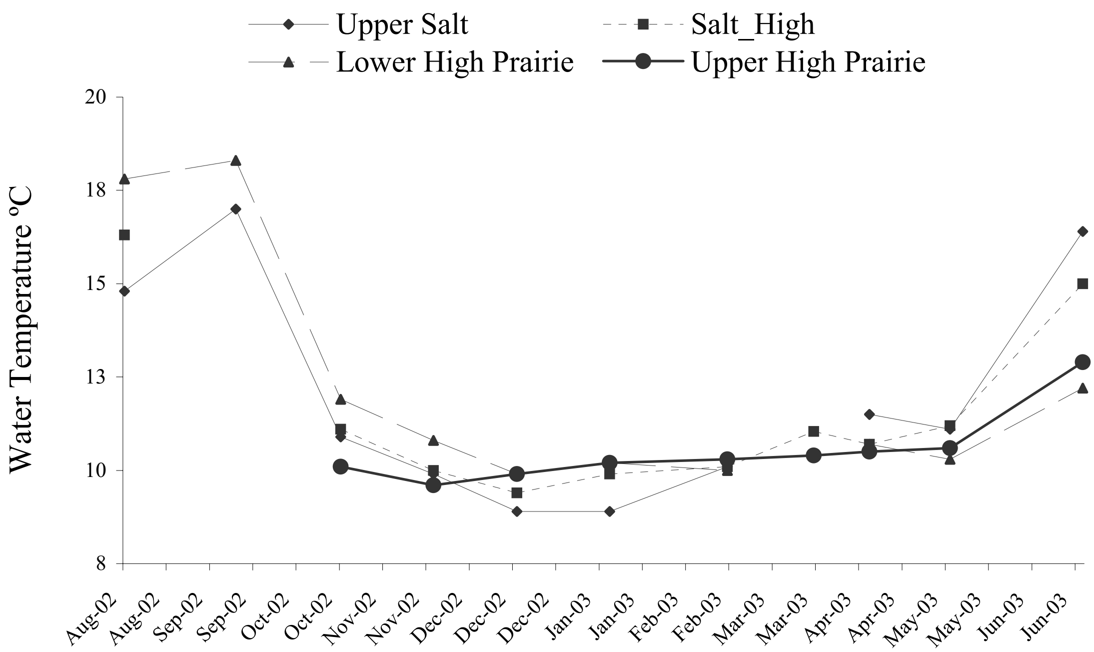


Figure 58. Surface water temperatures measured using a YSI Meter at four monitoring locations in the Salt Creek watershed, lower Klamath River Sub-basin, California.

Dissolved oxygen (DO) concentrations varied greatly among the four sites during the period and were presumably related to discharge and temperature (Figure 59). Maximum DO concentrations occurred during peak flows (January – April) and minimum values during the dry season. Data for Lower High Prairie clearly displayed the positive relationship of DO concentration and discharge. Lower High Prairie Creek lost surface flows during summer through fall. The water sampled at Lower High Prairie during this time was ponded water from Salt Creek and DO concentrations were extremely low. However, when flow resumed in High Prairie Creek DO remained near saturation. Concentrations at Upper High Prairie were consistently high ranging from 8.49 mg/L in June to 14.23 mg/L in January. Upper Salt DO concentrations were highest during winter flows but never climbed above 6.39 mg/L. Concentrations at Salt_High were strongly influenced by High Prairie Creek flows and ranged from 3.39 mg/L in October to 10.65 mg/L in April. During low flow periods DO concentrations were extremely low at both Salt Creek stations.

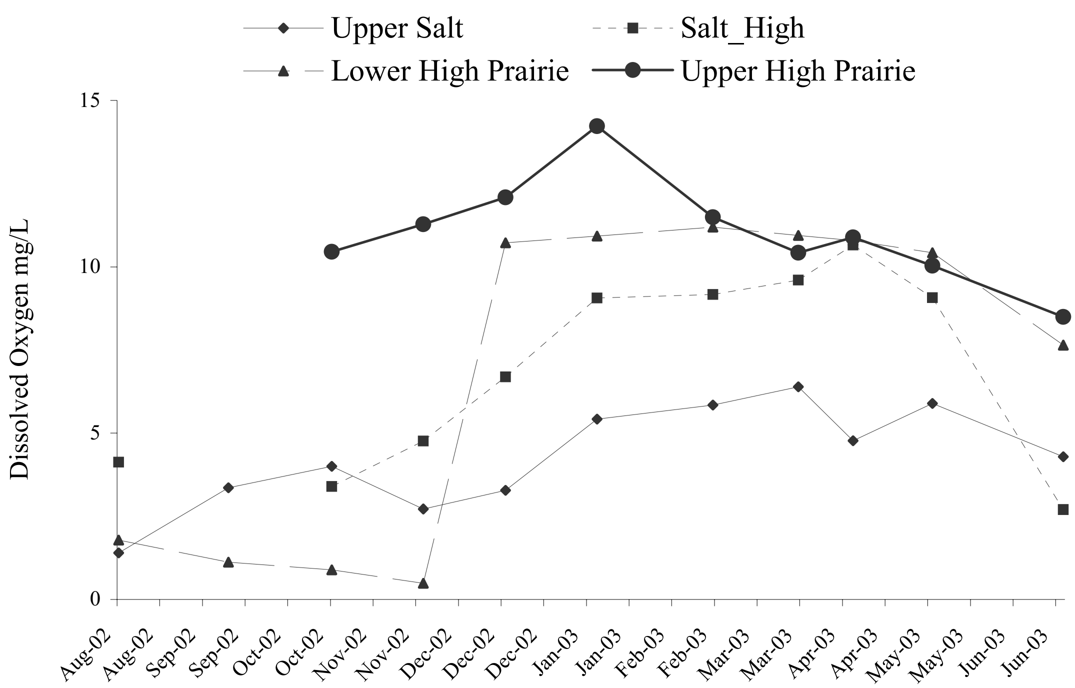


Figure 59. Dissolved oxygen concentrations measured using a YSI Meter at four monitoring locations in the Salt Creek watershed, lower Klamath River Sub-basin, California.

Specific conductance values for most sites mirrored those of dissolved oxygen with high values occurring during low flows and minimum values during high flows (Figure 60). Maximum specific conductance values were 106.8 µs s/cm at Lower High Prairie in September, 79.3 µs/cm at Upper Salt, 81.5 µs/cm at Salt_High, and 54.1 µs/cm at Upper High Prairie. Conductivity decreased at Salt_High only after significant flow had resumed in High Prairie Creek in late November. From December through May, conductivity at the four sites ranged between 60 µs /cm at Upper Salt and 35.3 µs/cm at Salt_High.

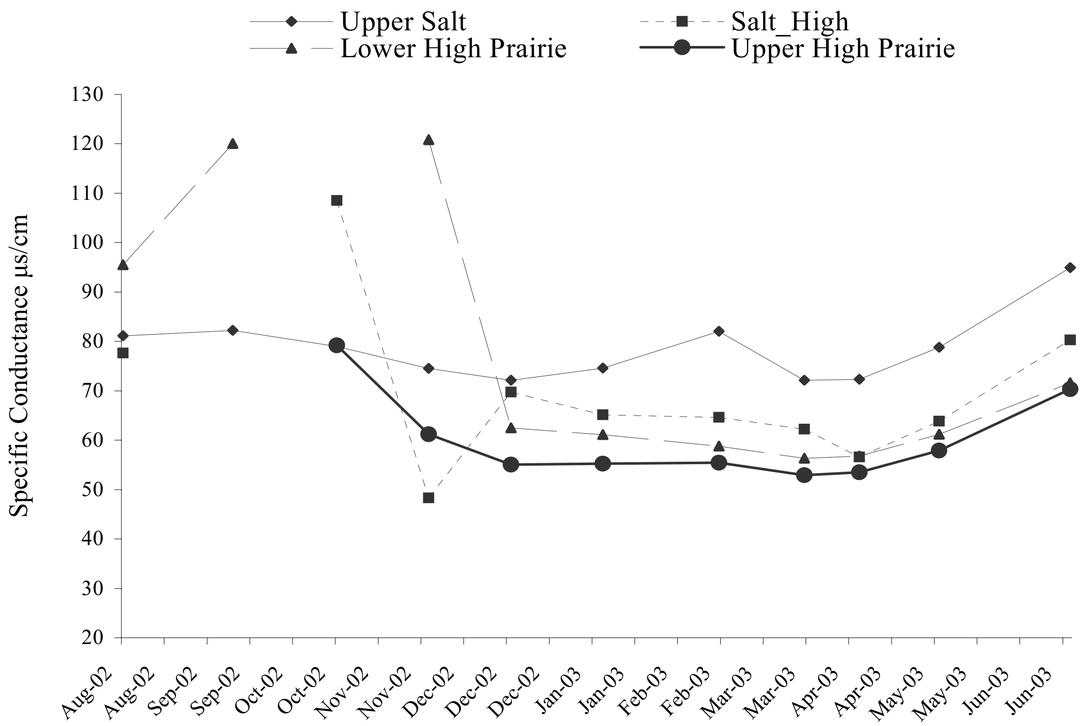
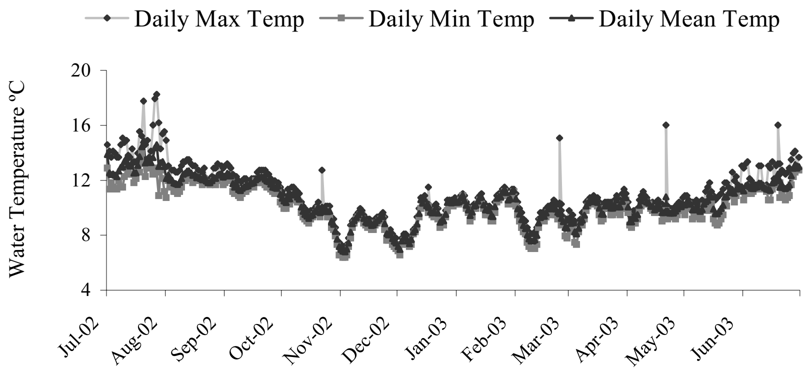


Figure 60. Specific conductance measured using a YSI Meter at four monitoring locations in the Salt Creek watershed, lower Klamath River Sub-basin, California.

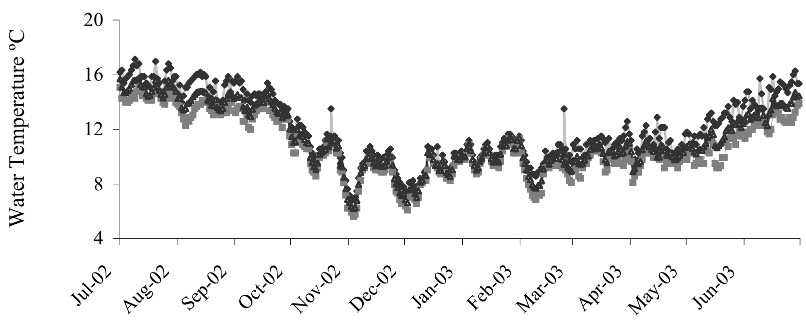
Salinity was zero at most sites during the monitoring period. Salinity registered 0.1 (ppt) only at Salt_High in October and at Lower High Prairie in September and November just prior to high flows.

Temperature Monitoring

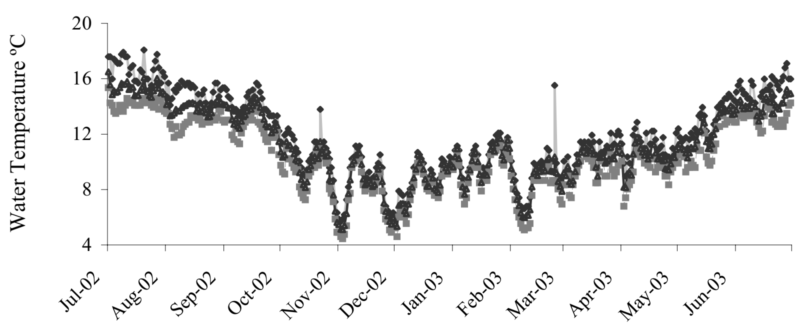
Daily mean, maximum, and minimum water temperatures for the three sites are presented in Figure 61. Mean annual water temperatures were 11.3 ºC (S.D. = 2.32) for Salt_High, 11.1 ºC (S.D. = 2.71) for Salt_Mid, and 10.5 ºC (S.D. = 1.60) for Upper High Prairie. Maximum annual temperatures were recorded during July and were 18.2 ºC at Upper High Prairie, 18.1 ºC at Salt_Mid, and 17.1 ºC at Salt_High. Minimum annual temperatures were all recorded on 4 November with 4.4 ºC for Salt_Mid, 5.6 ºC for Salt_High, and 6.4 ºC for Upper High Prairie.



Upper High Prairie



Salt_High



Salt_Mid

Figure 61. Daily mean, maximum, and minimum water temperatures calculated from hourly data (July 2002 - June 2003) at three monitoring locations in the Salt Creek watershed, lower Klamath River Sub-basin, California.

Mean monthly water temperatures were at their maximum in July with values of 15.0 ºC (S.D. = 0.67) for Salt_High, 15.2 ºC (S.D. = 1.02) for Salt_Mid, and 13.2 ºC (S.D. = 1.12) for Upper High Prairie (Figure 62). Minimum monthly temperatures occurred in November with values ranging from 7.9 ºC (S.D. = 1.80) at Salt_Mid, 8.5 ºC (S.D. = 0.91) at Upper High Prairie, to 8.6 ºC (S.D. = 1.33) at Salt_High.

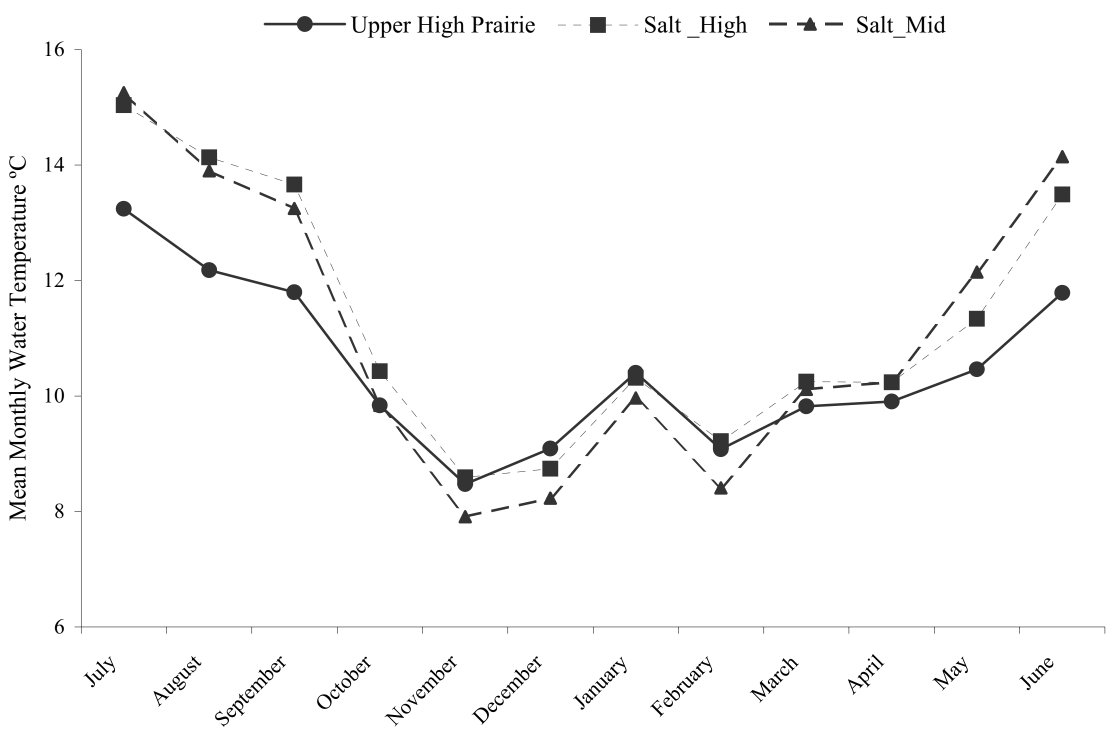


Figure 62. Mean monthly water temperatures calculated from hourly data (July 2002 - June 2003) at three monitoring locations in the Salt Creek watershed, lower Klamath River Sub-basin, California.

Annual degree days ranged from 4206 at Salt_High, to 4155 at Salt_Mid, to 3943 at Upper High Prairie. Periods of rapid degree accumulation were July and August 2002, and June 2003 at all three sites. Months of low degree accumulation were November 2002 and February 2003 at all three sites.

Daily average air temperatures at Salt_Air ranged from 7.5 ºC on 25 April to 19.2 ºC on 27 June 2003 (Figure 63). Mean air temperature for the study period was 14.0 ºC (S.D. = 2.20). A significant relationship was observed for daily average water temperature at site Salt_Mid and daily average air temperature (R^2 = 0.76, P value ~ 0) (Figure 64).

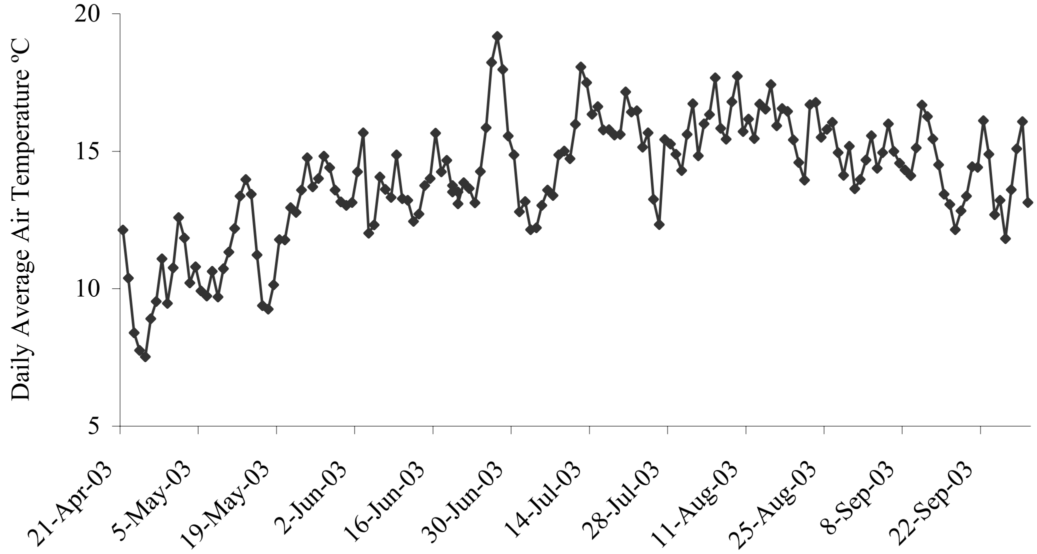


Figure 63. Daily average air temperatures calculated from hourly data (21 April 2003 - 30 September 2003) at a monitoring location in Salt Creek, lower Klamath River Sub-basin, California.

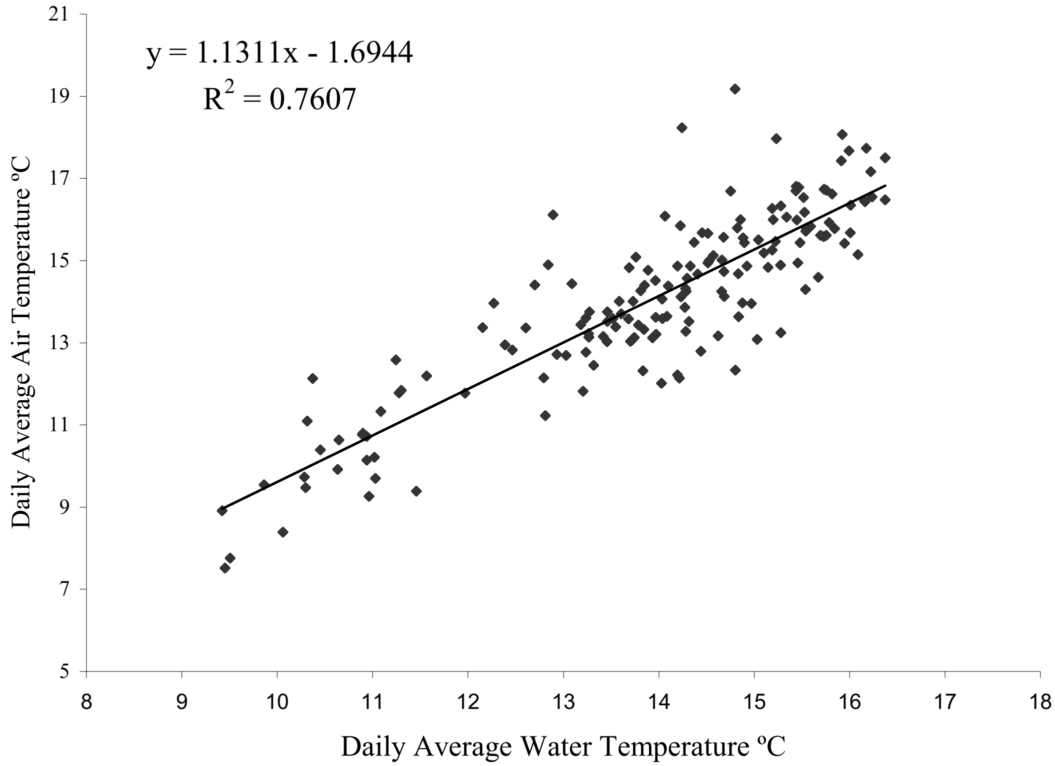


Figure 64. Relationship of daily average air temperature at station Salt_Air and daily average water temperature at station Salt_Mid (21 April – 30 September 2003) located in Salt Creek, lower Klamath River Sub-basin, California.

Hydro Lab Measures

April sampling periods were defined as 17 April at 16:00 hours – 19 April at 15:00 hours at BVR 1 (Figure 65) and 15 April at 12:00 hours – 17 April at 11:00 hours at BVR 2 (Figure 66). Water temperature and dissolved oxygen displayed diurnal patterns while conductivity and pH remained nearly steady at both BVR 1 and BVR 2.

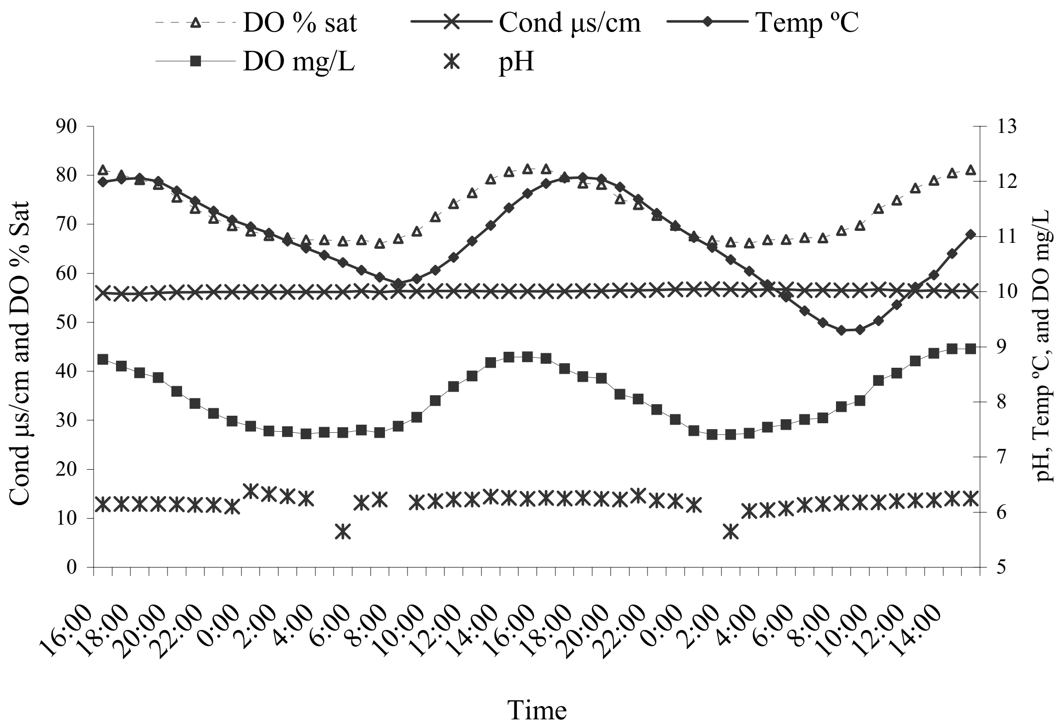


Figure 65. Water quality data collected from 17 April 2003 at 16:00 hours to 19 April 2003 at 15:00 hours at the monitoring station BVR1 in Salt Creek, lower Klamath River Sub-basin, California.

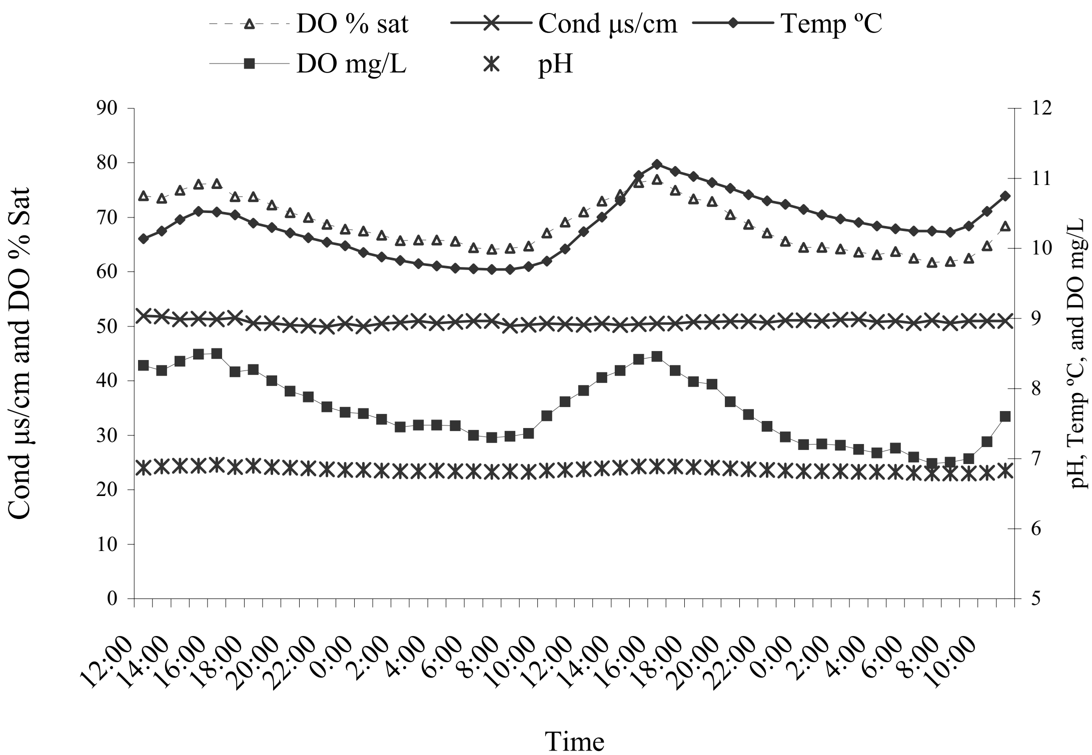


Figure 66. Water quality data collected from April 2003 at 12:00 hours – 17 April 2003 at 11:00 hours at the monitoring station BVR2 in Salt Creek, lower Klamath River Sub-basin, California.

Mean water temperatures at the two sites were very similar with 10.9 ºC (S.D. = 0.83) at BVR 1 and 10.3 ºC (S.D. = 0.40) at BVR 2. Minimum water temperatures occurred during morning hours with 9.3 ºC at BVR 1 and 9.7 ºC at BVR 2. Maximum temperatures occurred during late afternoon (16:00 to 18:00 hours) and were 12.1 ºC at BVR 1 and 11.2 ºC at BVR 2.

Highs and lows in dissolved oxygen (DO) correspond to those observed in water temperature for both sites. Mean concentrations were 8.06 mg/L (S.D. = 0.53) at BVR 1 and 7.69 mg/L (S.D. = 0.47) at BVR 2. Concentrations ranged at BVR 1 from 7.41 mg/L (66.4 % Sat) recorded at 02:00 hours to 8.96 mg/L (81.1% Sat) at 15:00 hours on 19 April. In BVR 2, DO ranged from 6.93 mg/L (61.7% Sat) at 7:00 hours on 17 April to 8.50 mg/L (76.2% Sat) at 16:00 hours on 15 April.

Mean specific conductance varied slightly among the sites with values of 56.4 µs/cm (S.D. = 0.23) at BVR 1, and 50.8 µs/cm (S.D. = 0.44) at BVR 2. Values ranged from 56.8 to 79.1 µs/cm at BVR 1, and from 49.9 to 51.9 µs/cm at BVR 2. Mean pH values ranged from 6.17 (S.D. = 0.13) at BVR 1 to 6.84 (S.D. = 0.03) at BVR 2.

June sampling periods were defined as 26 June at 17:00 hours – 28 June at 16:00 hours at Salt_Mid (Figure 67) and 30 June at 17:00 hours – 2 July at 16:00 hours at BVR 1 (Figure 68). Mean water temperatures were 14.8 ºC (S.D. = 1.25) at Salt_Mid and 14.4 ºC (S.D. = 0.69) at BVR 1. Water temperatures measured at Salt_Mid displayed the widest range with a minimum of 12.9 ºC at 07:00 hours and a maximum of 17.08 at 16:00 hours. Water temperatures measured at BVR 1 displayed less variation with a range from 13.4 ºC at 07:00 hours to 15.7 ºC at 16:00 hours.

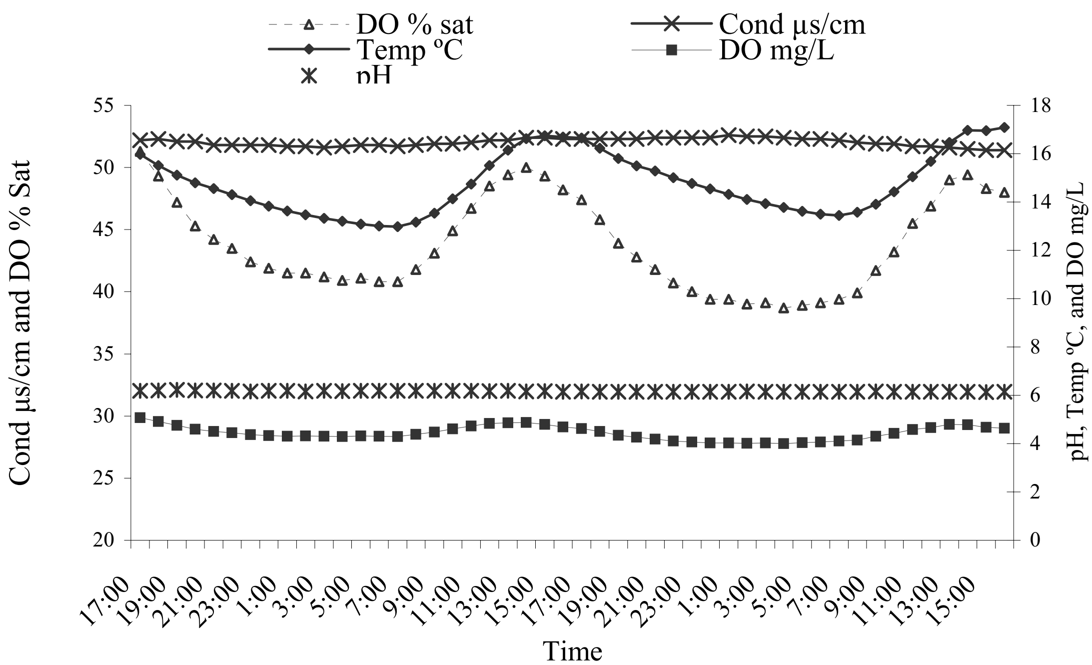


Figure 67. Water quality data collected from April 2003 at 17:00 hours – 28 June at 16:00 hours at the monitoring station Salt_Mid in Salt Creek, lower Klamath River Sub-basin, California.

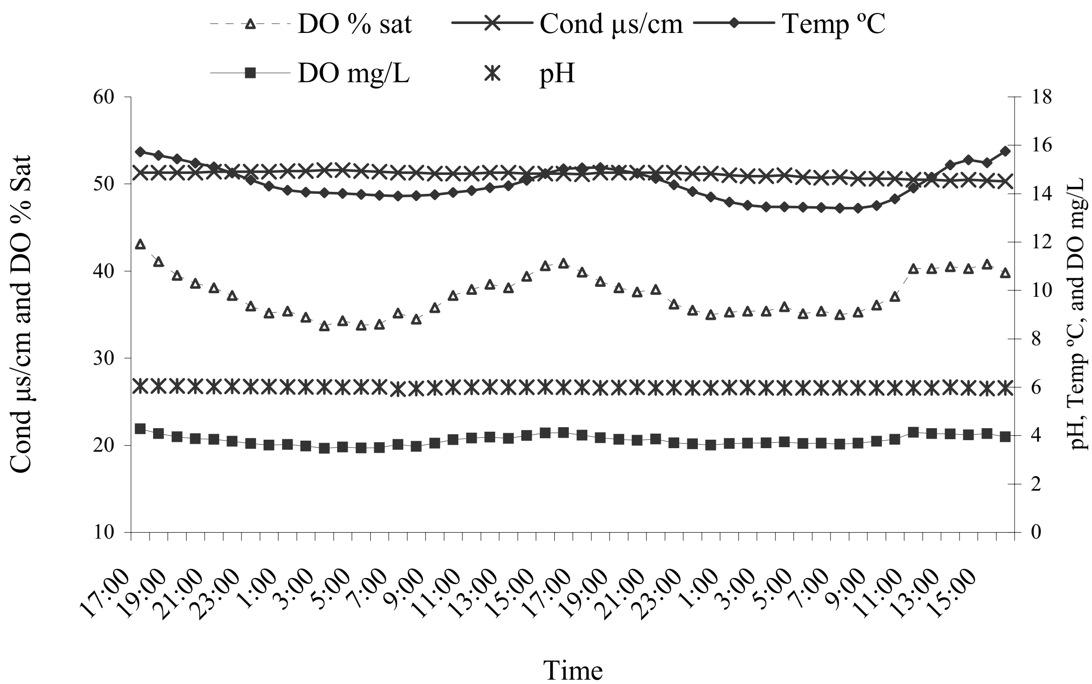


Figure 68. Water quality data collected from April 2003 at 17:00 hours – 28 June at 16:00 hours at the monitoring station Salt_Mid in Salt Creek, lower Klamath River Sub-basin, California.

Patterns in DO at both sites followed closely those observed in water temperature with highs occurring during late afternoon and lows during early morning. The highest concentrations were recorded at Salt_Mid with a mean of 4.43 mg/L (S.D. = 0.28) (43.8 % Sat) and a range from 4.00 to 5.07 mg/L. DO concentrations were significantly lower at BVR 1 with a mean of 3.81 mg/L (S.D. = 0.20) (37.3 % Sat) and a range from 3.47 to 4.28 mg/L.

Mean specific conductance values ranged from 51.1 µs/cm (S.D. = 0.35) at BVR 1 and 52.0 µs/cm (S.D. =0.32) at Salt_Mid. Values ranged from 50.3 to 51.6 µs/cm at BVR 1 and from 51.4 to 52.6 µs/cm at Salt_Mid. Mean pH values ranged from 6.00 (S.D. = 0.02) at BVR 1 to 6.16 (S.D. = 0.02) at Salt_Mid.

Changes in Land Cover and Channel Patterns, 1936 to 2001

This section provides an overview of changes in land cover and low gradient channel patterns for Salt Creek and lower Hunter Creek watersheds. Detailed spatial statistics can be generated by querying the ArcView GIS developed for this project.

Changes in upland land cover types are reported for Salt Creek watershed. Changes in valley bottom land cover types includes lower Hunter Creek valley (below Highway 101). The analysis of channel patterns includes Hunter Creek from approximately 200 feet above Highway 101 and the low gradient channel extent for Mynot, Panther, Spruce and Tepo Creeks.

Over the past 53 years the total acreage of the coniferous forest observed during the 1936-1948 period has been significantly reduced (Figures 69, 70 and Table 26). Most of the forests in Salt Creek were acquired for timber production and converted to second growth. Although, other land use activities includes conversion of upland forest to grasslands for livestock grazing, and clearing for residential and commercial uses. Between 1949 and 1972 approximately 48.2 percent of the pre-1936 forest was logged (Figure 71). Logging proceeded from areas most accessible within Salt Creek valley and via roads entering the west side of upper High Prairie Creek from Wilson Creek.

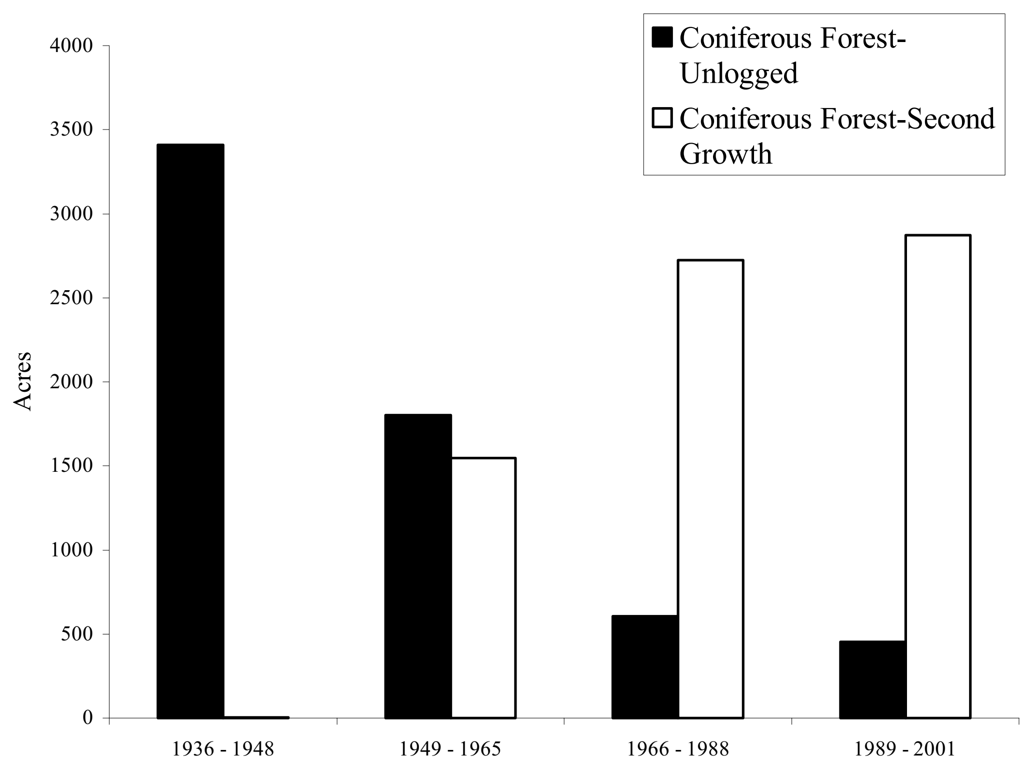


Figure 69. Distribution of second growth and unlogged coniferous forest for four time periods in Salt Creek watershed, lower Klamath Sub-basin, northern California.

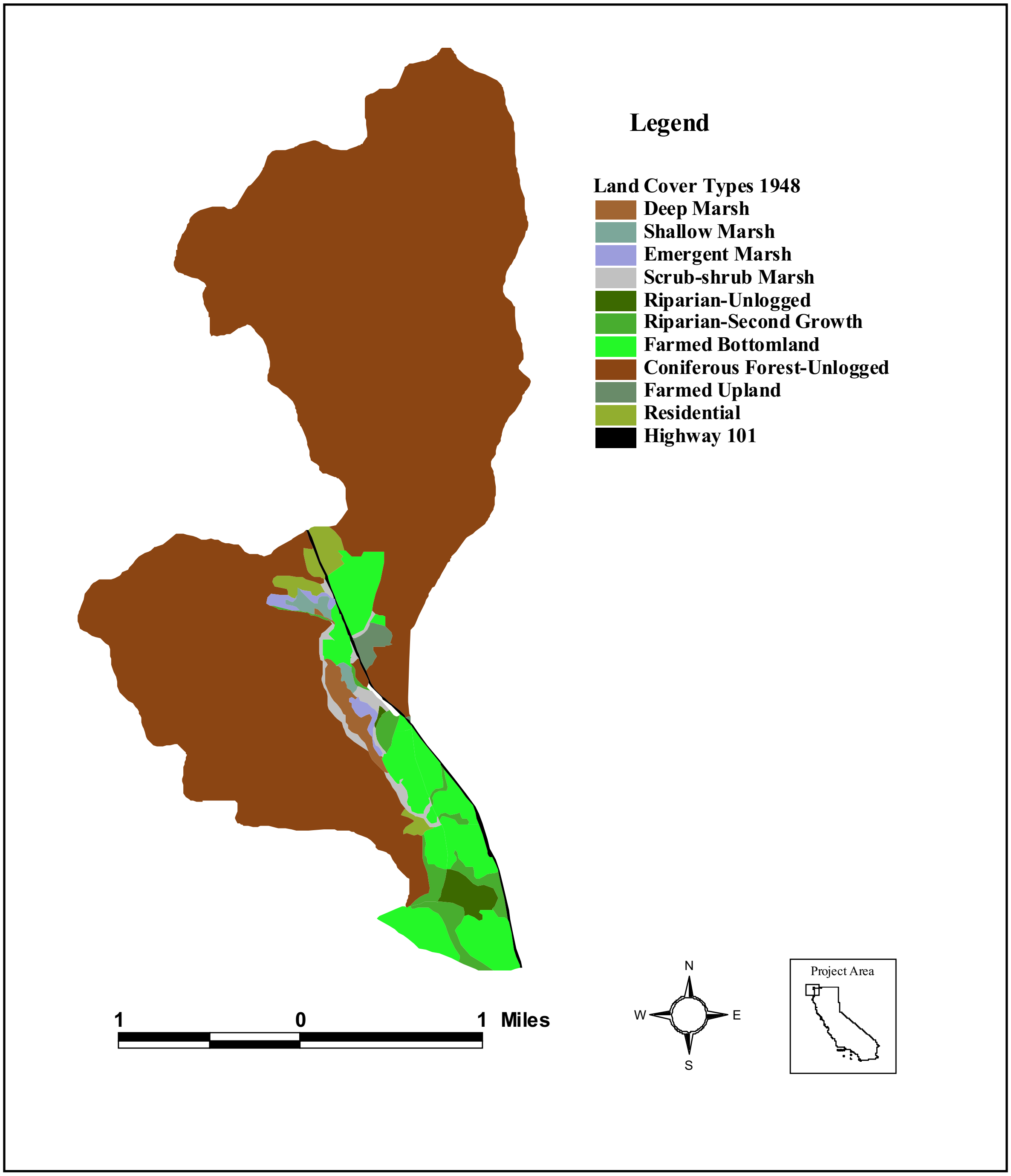


Figure 70. 1948 land cover types for Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

Table 26. Summary of dominant upland land cover types over four time periods in Salt Creek watershed, lower Klamath Sub-basin, northern California. The percentage comparing the unlogged coniferous in 1936-1948 forest is given in bold. Note: not all land cover types are shown, such as residential and commercial.

Land Cover Type	Acreage							
	1936 - 1948		1949 - 1965		1966 - 1988		1989 - 2001	
Coniferous Forest-Unlogged	3409	**100**	1801	**52.8**	605	**17.8**	455	**13.3**
Coniferous Forest-Second Growth	2.9	**0.09**	1545	**45.3**	2724	**79.9**	2872	**84.2**
Farmed Upland	19.1	**0.6**	13.2	**0.4**	17.0	**0.5**	17.7	**0.5**

The period between 1966 and 1988, 66.4 % of the remaining forest was logged; leaving 605 acres or 17.8 % of the pre-1936 forest – mainly as an isolated forest block in the center of High Prairie Creek (Table 26 and Figure 72). Most of the uncut forest exists within the Yurok Redwood Experimental Forest (USFS 1990) and has a limited extent along fish bearing streams.

Between 1988 and 2001 approximately 150 acres of the pre-1936 forest was logged within High Prairie Creek (Figure 73). Additionally, second and third entries to remove residual trees occurred during this period.

The current land cover within Salt Creek watershed and High Prairie Creek in particular is comprised of second growth coniferous forest with Alder (*Alnus* spp.) as the dominate tree species. Large riparian and upslope areas lack overstory vegetation and large diameter (>36” dbh) coniferous trees for recruitment as LWD.

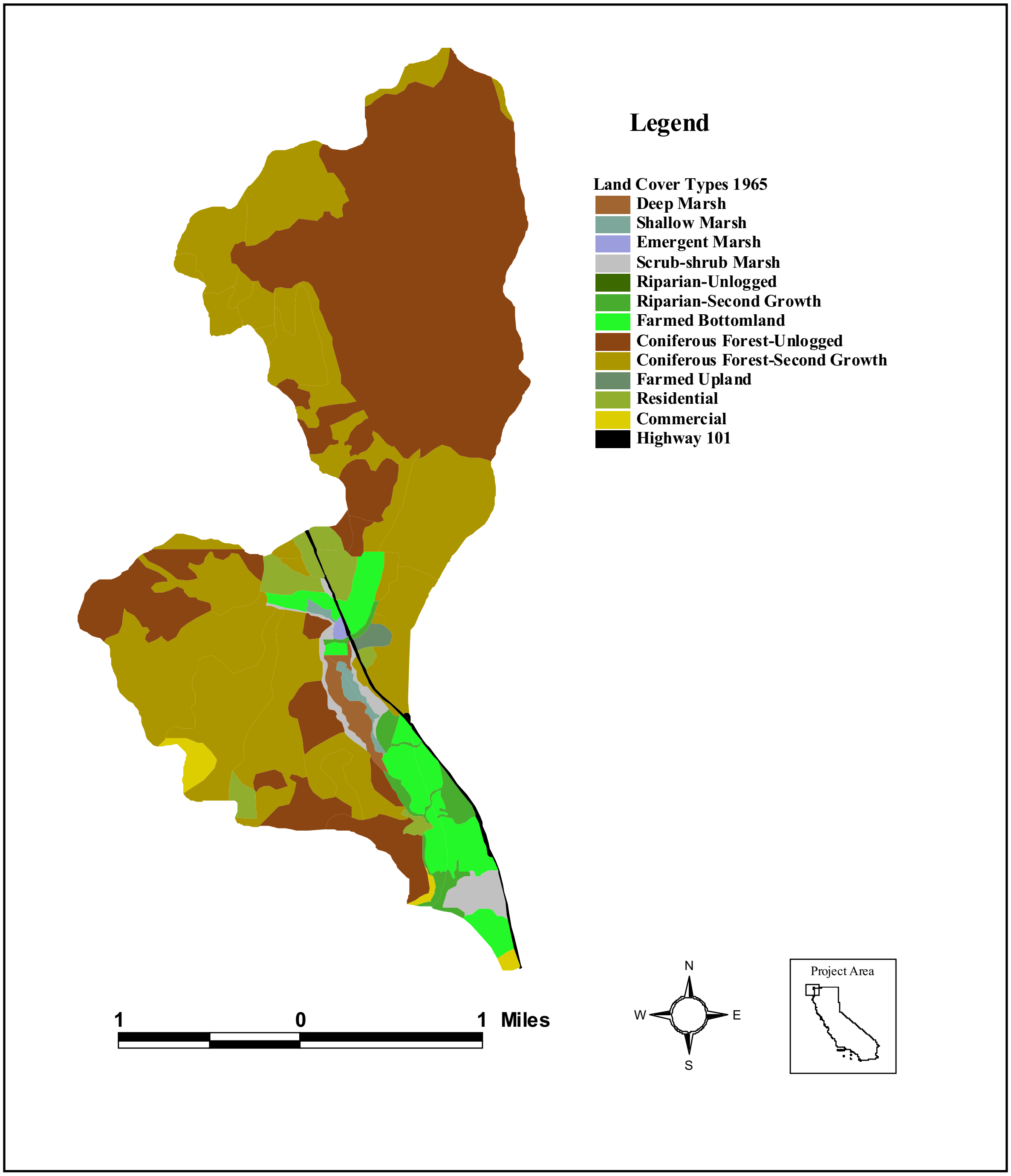


Figure 71. 1965 land cover types for Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

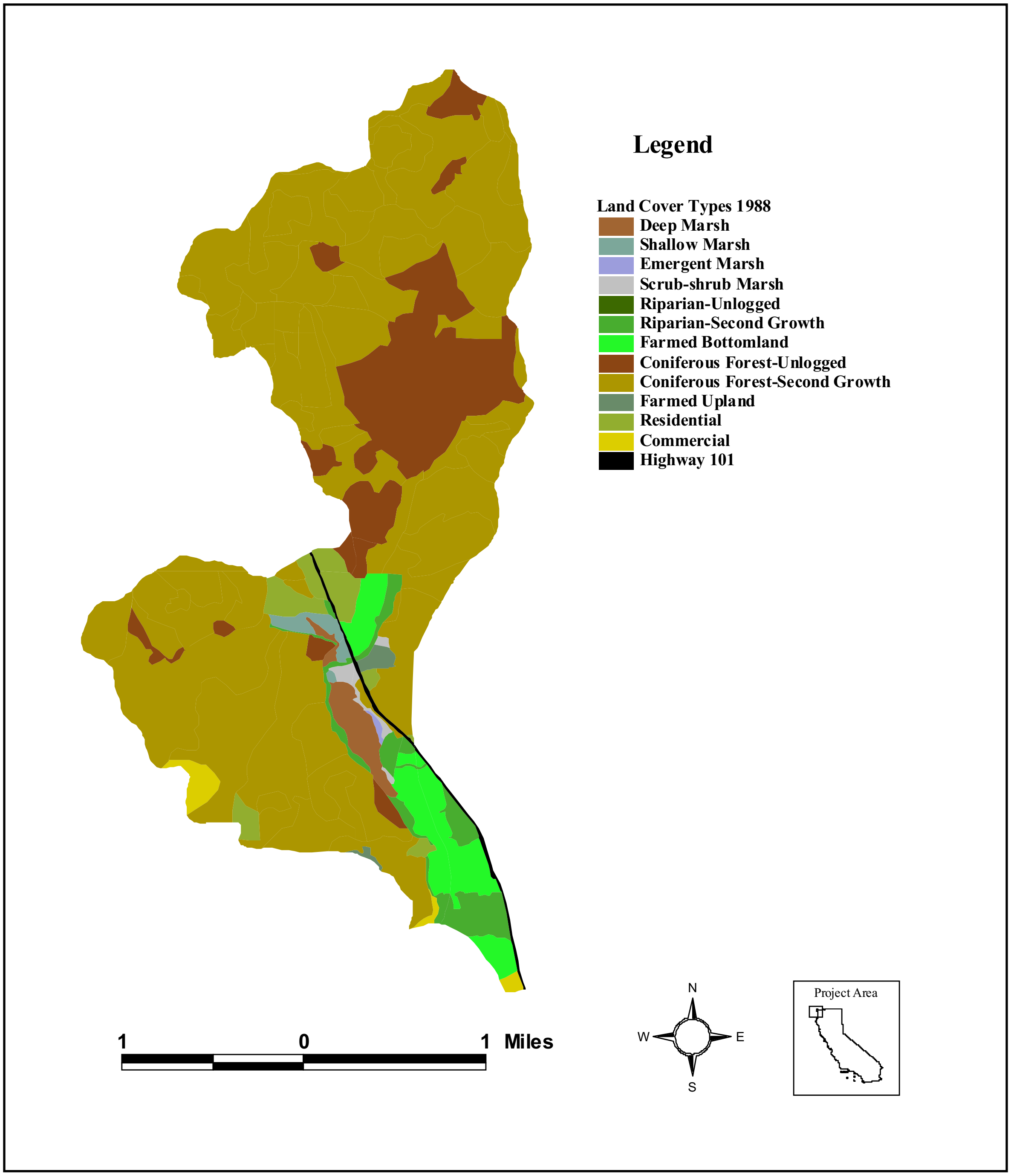


Figure 72. 1988 land cover types for Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

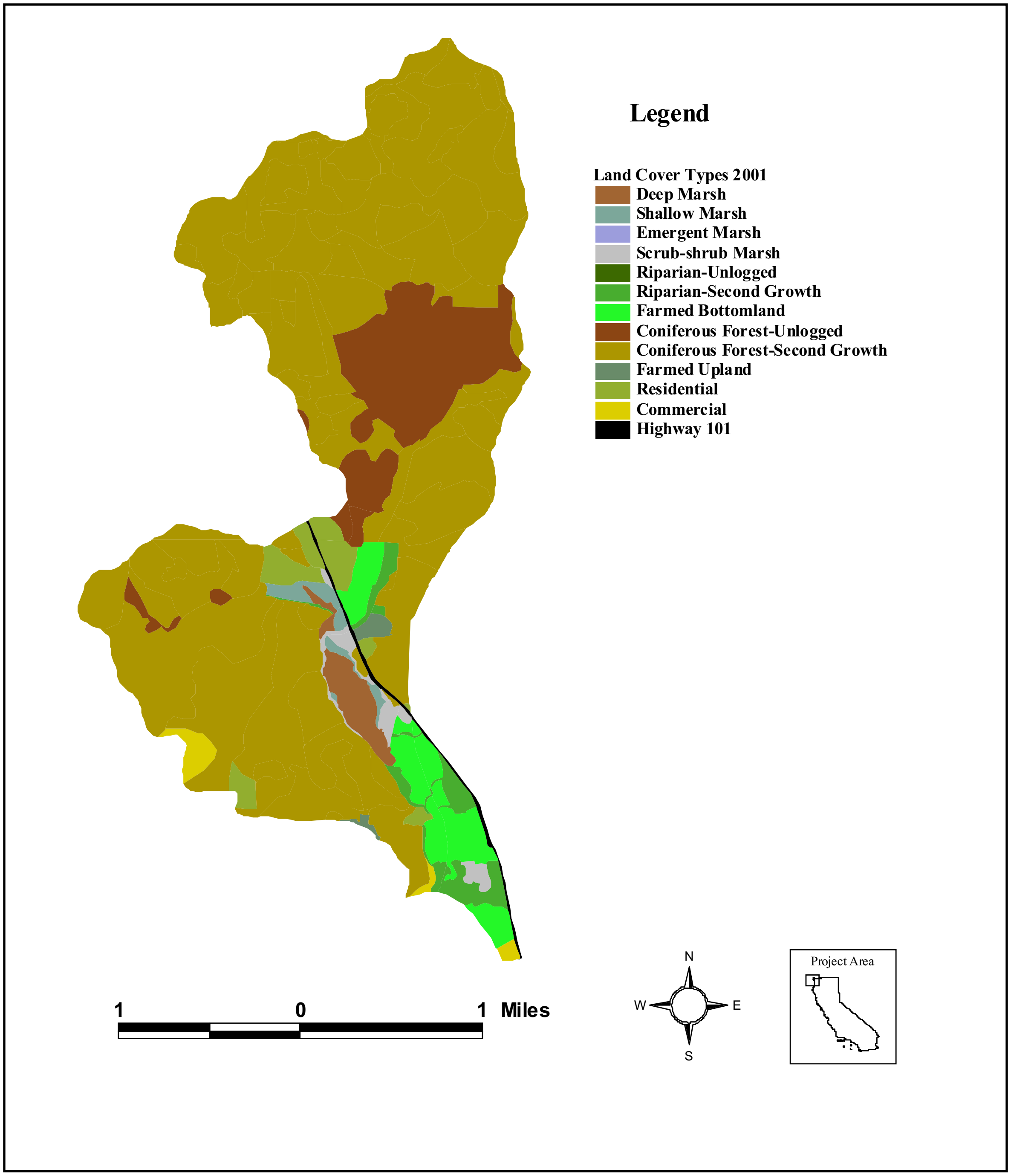


Figure 73. 2001 land cover types for Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

Large areas of riparian forest, within the valley of Salt Creek and lower Hunter Creek, were likely converted for agricultural purposes during the turn of the century. However, limited information regarding composition and distribution of the pre-1936 riparian forest can be inferred from the available from aerial imagery. A large area of unlogged riparian forest (~33.4 acres), in the lower valley of Salt and Hunter Creeks, is visible on the 1936 and 1948 aerial photographs (Figures 70 and 74 and Table 27). The composition appears to be dominated by large Redwood trees. By 1965 this remnant riparian grove was converted to second growth with portions maintained as grass and utilized for grazing.

The extent of second growth riparian forests appeared to be relatively stable (94.5 acres average) with an increase to 133 acres visible between 1965 and 1988; followed by a reduction to 95.8 acres, approaching historic levels, occurring between 1989 and 2001 (Figures 72, 73 and 74 and Table 27).

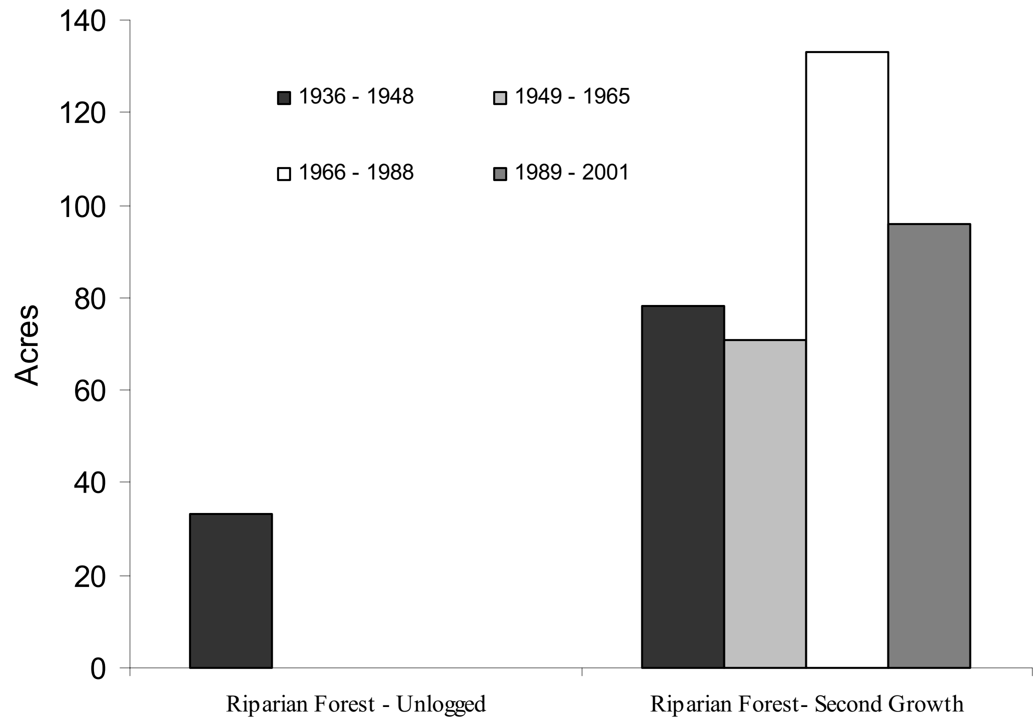


Figure 74. Distribution of second growth and unlogged riparian forest for four time periods in Salt Creek and lower Hunter Creek watershed, lower Klamath Sub-basin, California.

Changes in the marsh land cover within the valley bottom of Salt and lower Hunter Creeks was also notable. From 1936 to 2001 the area of valley bottom covered by deep marsh habitat increased to approximately 216%, from ~32.9 acres to ~71.2 acres. Similarly, the extent of shallow marsh and scrub-shrub marsh area increased (212 % and 112% respectively) while the emergent marsh area decreased to 11% over the same period (Table 27, and Figures 75 to 79).

Table 27. Summary of dominant valley bottom land cover types over four time periods in Salt Creek and lower Hunter Creek watersheds, lower Klamath Sub-basin, northern California. The percentage comparing types observed in 1936-1948 is given in bold. Note: not all land cover types are shown, such as residential and commercial.

Land Cover Type	Acreage							
	1936-1948		1949-1965		1966-1988		1989-2001	
Deep marsh	32.9	**100**	37.7	**114**	61.4	**186**	71.2	**216**
Shallow marsh	17.0	**100**	20.7	**122**	27.0	**159**	33.7	**198**
Emergent marsh	19.4	**100**	4.3	**22**	3.4	**17**	2.2	**11**
Scrub-shrub marsh	38.3	**100**	70.3	**184**	17.0	**44**	43.0	**112**
Farmed Bottomland	314.5	**100**	215.7	**69**	185.6	**59**	183.6	**58**
Riparian Forest - Unlogged	33.4	**100**	0.0	**0.0**	0.0	**0.0**	0.0	**0.0**
Riparian Forest-Second Growth	78.2	**100**	71.1	**91**	133.0	**170**	95.8	**123**

Concurrent with the increase in marsh habitats a decrease in the farmed bottomland extent was also noted; a change from ~314.5 acres in 1948 to ~183.6 acres in 2001 (Table 27, and Figures 75 to 79).

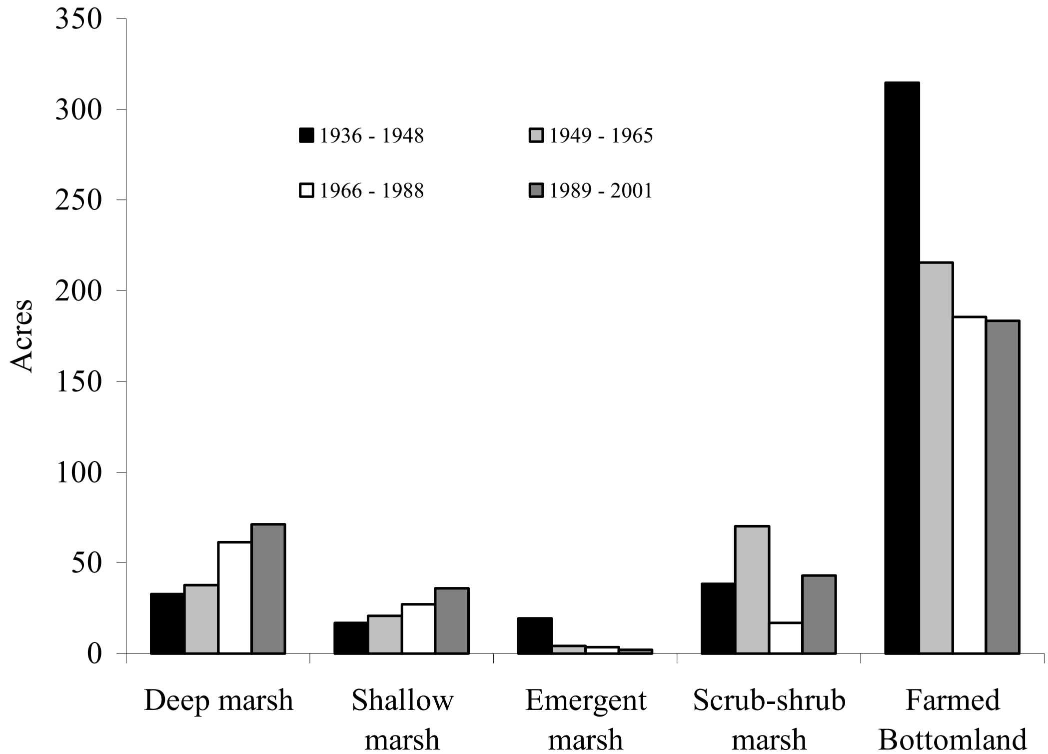


Figure 75. Distribution of valley bottom land cover types for four time periods in Salt Creek and lower Hunter Creek watersheds, located in the lower Klamath Sub-basin, California.

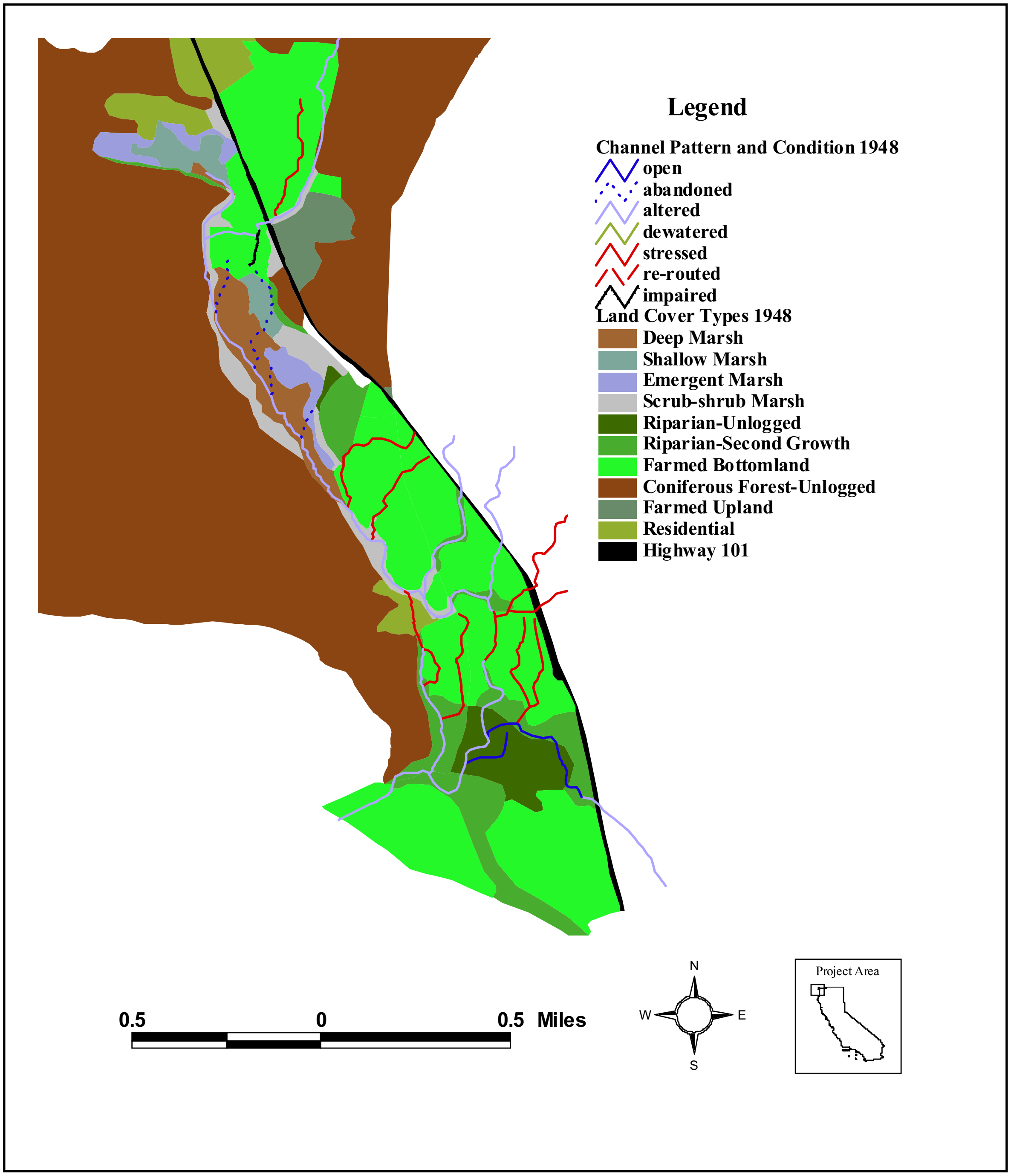


Figure 76. 1948 channel pattern, condition and land cover types for lower Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

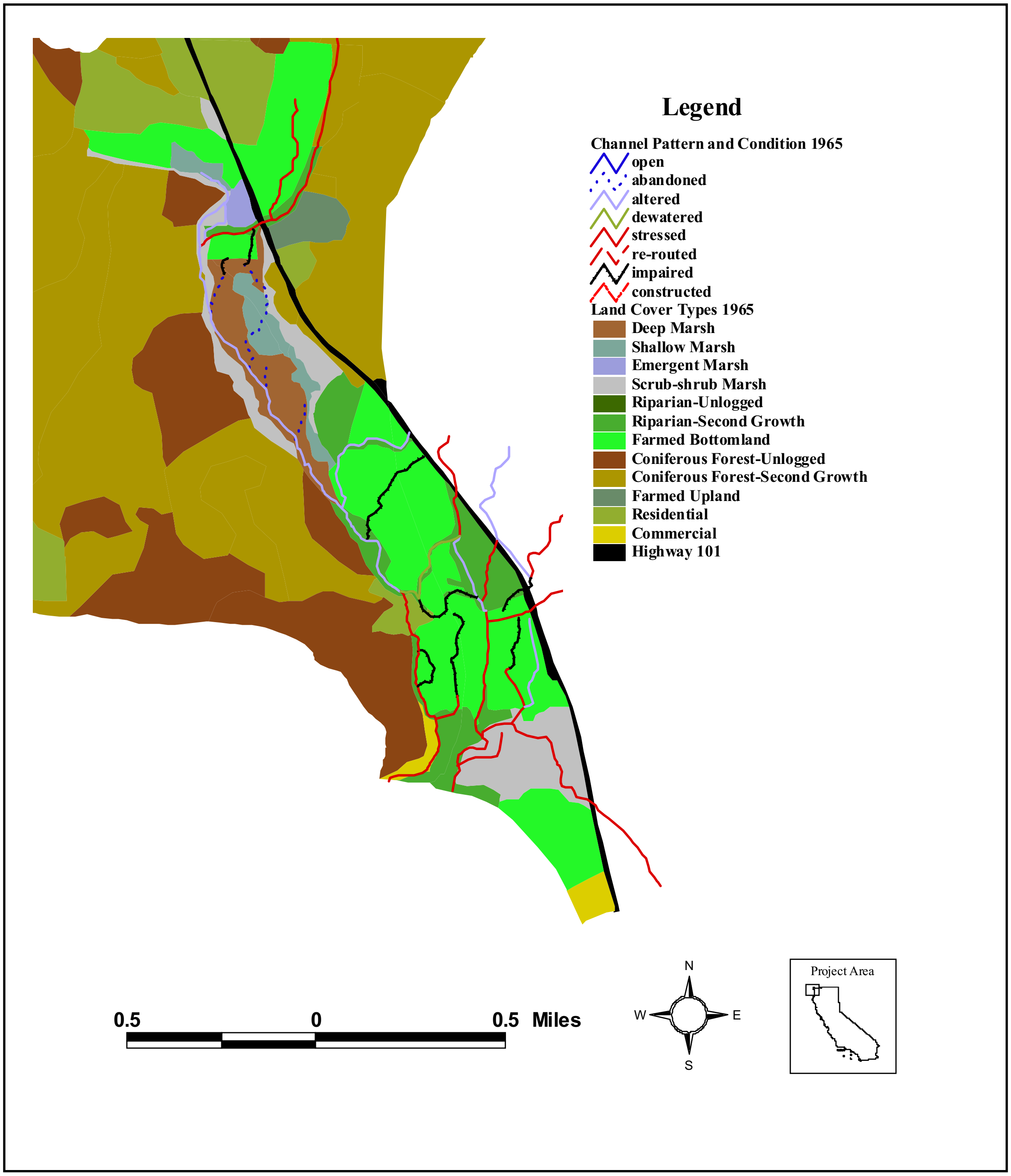


Figure 77. 1965 channel pattern, condition and land cover types for lower Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

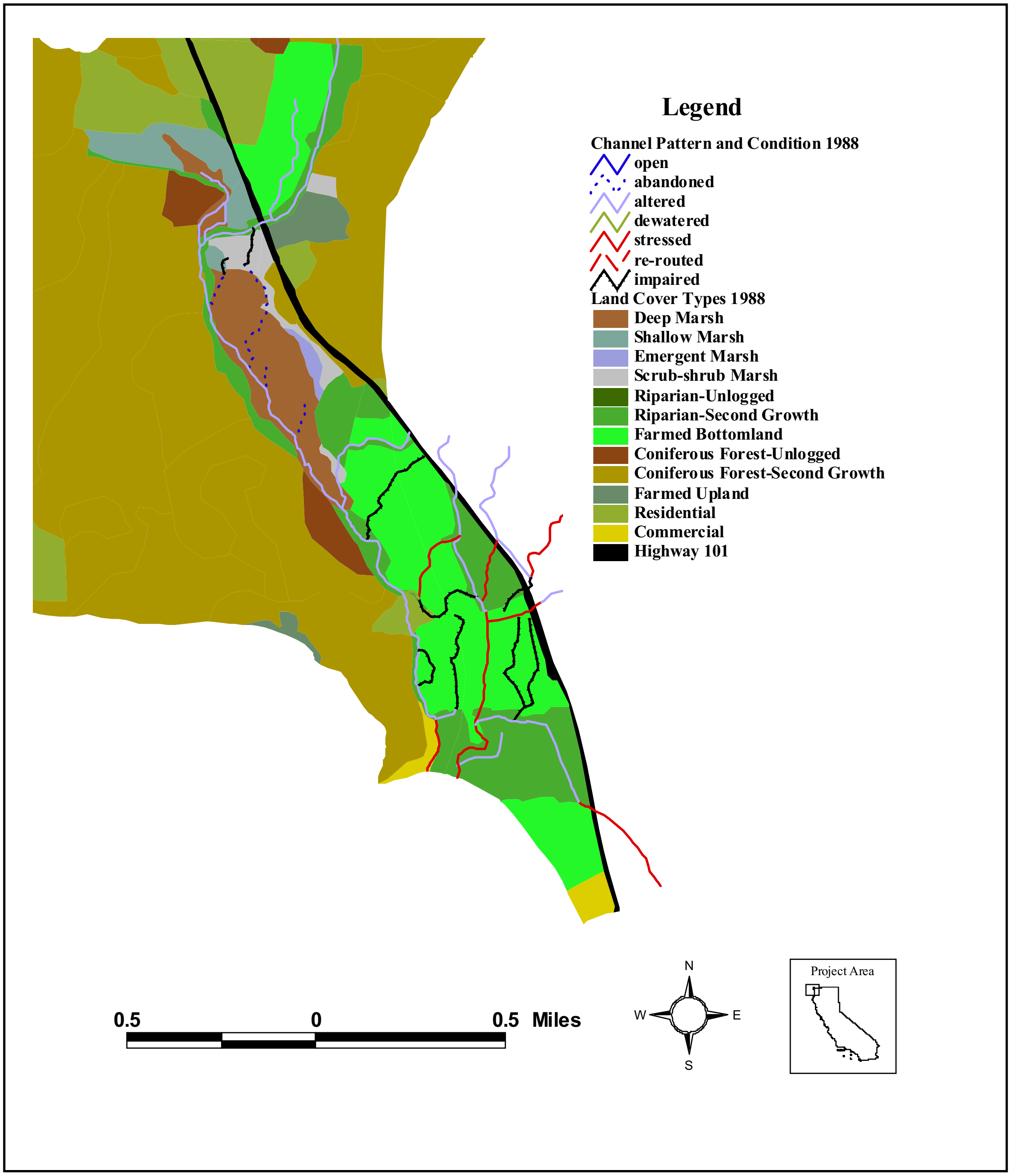


Figure 78. 1988 channel pattern, condition and land cover types for lower Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

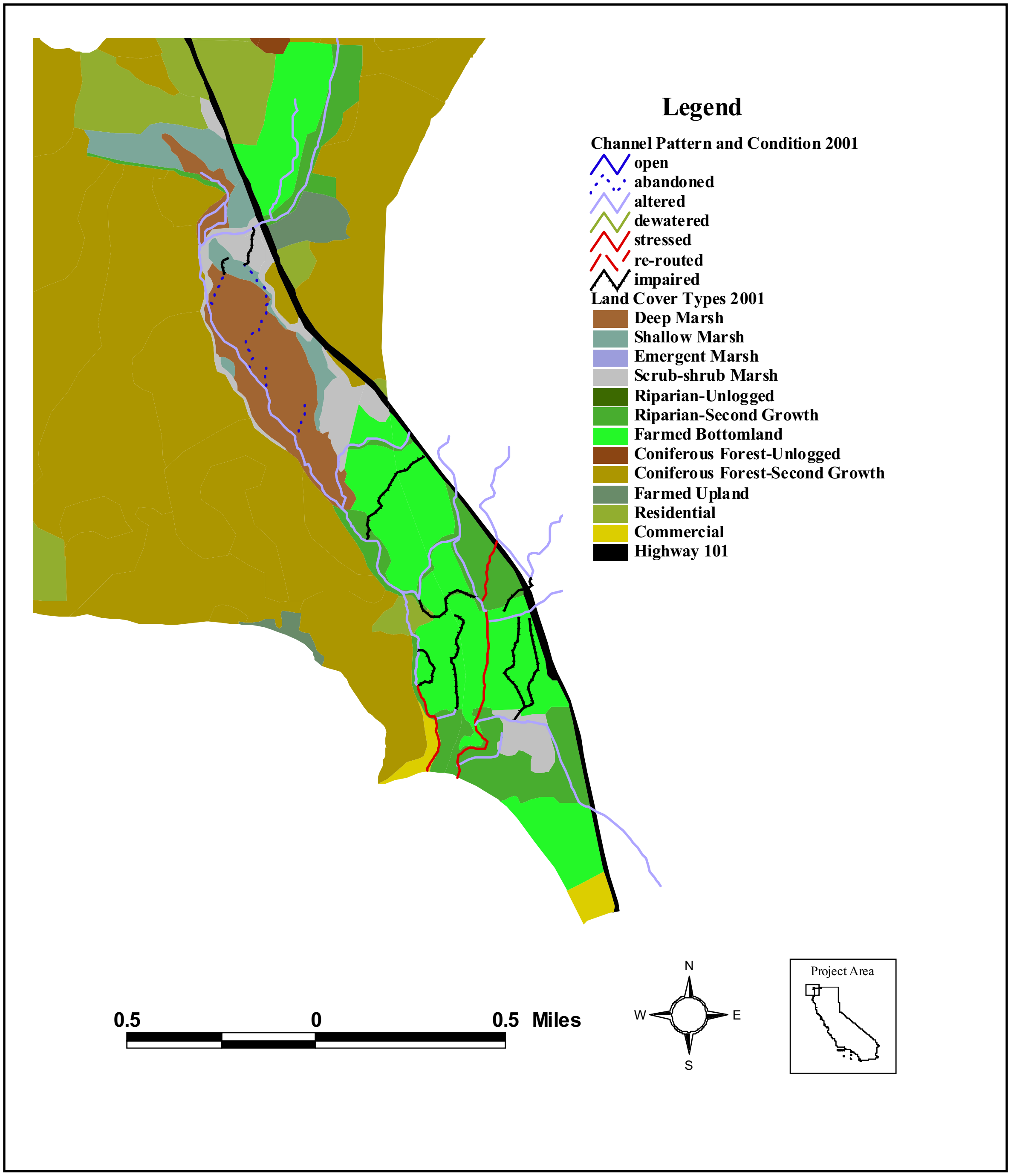


Figure 79. 2001 channel pattern, condition and land cover types for lower Salt Creek and lower Hunter Creek watersheds located in the lower Klamath River Sub-basin, California.

Changes in channel pattern and condition are summarized in Figures 76 to 80 and Table 28 (refer to Table 4 for a description of terms used in this section). The difference in total channel length, reported in Table 28, is mainly a function of channel simplification and re-alignment resulting from land use activities and river bank erosion that occurred at the confluence of Salt and Hunter Creeks with the Klamath River. The greatest amount of river bank erosion occurred during the 1964 flood (compare Figures 76 and 77).

Simplification of channel pattern and conditions degrading fish habitat and channel function were evident in the 1936 aerial imagery and continued with varying magnitudes through each period examined. The trend proceeded by a progression of vegetation modifications, channel dewatering and re-alignment (channelization) in association with natural events and land use activities occurring throughout Salt and Hunter Creek watersheds. By 1965 all of the low gradient channels mapped had some form of natural and / or anthropogenic perturbation affecting its form and function. The effects of channelization were some of the most obvious long term changes noted. From 1948 to 1965 a minimum of 13% of the pre-1936 channel network had become impaired, i.e. lost the form and function observed in the 1936 aerial imagery.

Channels in an altered condition were seen to re-adjust (to previous or conditions favorable for aquatic habitat) more rapidly following disturbances than those in a stressed condition. Impaired channels provide limited aquatic habitat function and may exacerbate flood effects on the stability of the remaining stream system. Overall, the channel system in 2001 had a high frequency of altered channels but a lower frequency of stressed channels compared to other photo periods observed.

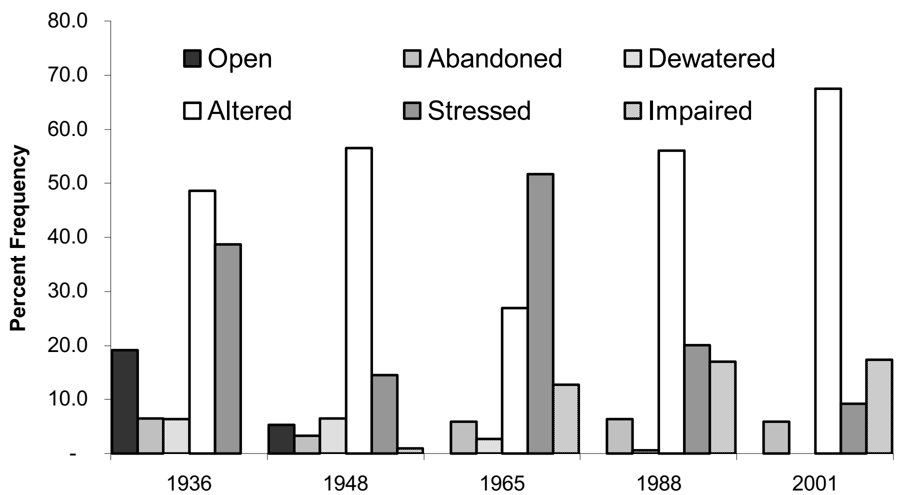


Figure 80. Channel condition over time assessed for low gradient streams within Salt Creek and lower Hunter Creek watersheds, located in the lower Klamath Sub-basin, California.

Table 28. Summary of channel condition over four time periods in Salt Creek and lower Hunter Creek watersheds, lower Klamath Sub-basin, northern California. The percentage comparing the channel condition length with the total length is given in bold.

	Stream Condition (feet)												
Year	**Open**		**Abandoned**		**Dewatered**		**Altered**		**Stressed**		**Impaired**		**Total**
1936	10,481	**19**	1,804	**3**	3,558	**6**	30,972	**57**	7,970	**15**	-	**-**	54,784
1948	2,937	**5**	3,576	**6**	3,558	**6**	26,980	**49**	21,492	**39**	522	**1**	55,506
1965	-	**-**	3,290	**6**	1,539	**3**	15,141	**27**	29,014	**52**	7,174	**13**	56,159
1988	-	**-**	3,553	**6**	326	**1**	31,017	**56**	11,090	**20**	9,374	**17**	55,360
2001	-	**-**	3,294	**6**	-	**-**	37,370	**68**	5,062	**9**	9,629	**17**	55,355

DISCUSSION

Habitat Assessment

Salt Creek

Characterizing aquatic habitat conditions in Salt Creek was extremely difficult using Level IV methodologies. Compounding the limitations of the protocol was the inability to physically access all areas of the drainage. The reaches observed were extremely variable with a diverse range in salmonid habitat available. The deep flatwater and beaver pond habitats provided excellent cover elements for juvenile salmonids, however a large portion of the system was in poor condition.

In 1990, the United States Fish and Wildlife Service conducted a survey in Salt Creek from the mouth to the confluence with High Prairie Creek to assess habitat and fish passage conditions (USFWS 1992). This survey described similar conditions as those presented in more recent surveys conducted by YTFP. They note that cattle had caused increased channel erosion in the lower two miles of Salt Creek and described two large beaver dams at 0.6 miles (11 m wide x 0.5 m high) and at 0.74 miles (40 m wide). They estimated that the second dam was retaining a six-hectare pond that extended upstream to river mile 1.4 (USFWS 1992). The channel upstream to the confluence with High Prairie Creek was comprised of flatwater habitat and contained three smaller beaver dams. Surveyors concluded that the beaver dams may limit seasonal fish migration, however there was no mention of the braided and marsh conditions that currently exist in the reach directly downstream of High Prairie Creek.

A 1996 survey conducted by YTFP also described the numerous beaver dams located in Salt Creek (Voight 1996). This survey documents the poor channel function occurring near the confluence with High Prairie Creek. Winter habitat mapping efforts were conducted by Kayak in winter 2002. Nearly 50 percent of the total length surveyed (7,881 ft) consisted of flatwater units and 30 percent consisted of a large beaver pond (YTFP Unpublished data 2002). Future habitat assessment efforts should include obtaining low altitude aerial photographs of the Salt Creek valley and conducting detailed geomorphic assessment throughout this drainage to assist restoration planning efforts.

High Prairie Creek

In general, High Prairie Creek had a diverse range of habitat units with most stream reaches containing substantial structural elements capable of providing shelter for juvenile salmonids. Riparian canopy conditions and composition were reasonable in most middle and lower reaches. Unfortunately, High Prairie Creek provides limited year-round anadromous rearing habitat for natal juvenile salmonids given the subsurface flow conditions and the proximity of the current barrier to anadromy (HP4b).

In July 1996 YTFP conducted a Level IV habitat assessment of 18,073 feet of mainstem High Prairie Creek (YTFP Unpublished data 1996). The number of habitat types classified during both 1996 and 2002 were very similar but differences exist when habitat frequency is considered (Figure 81). The increase in the low gradient riffle frequency and corresponding decrease in step run frequency in 2002 may have resulted from varied flow conditions at the time of the survey or may be a result of surveyor differences.

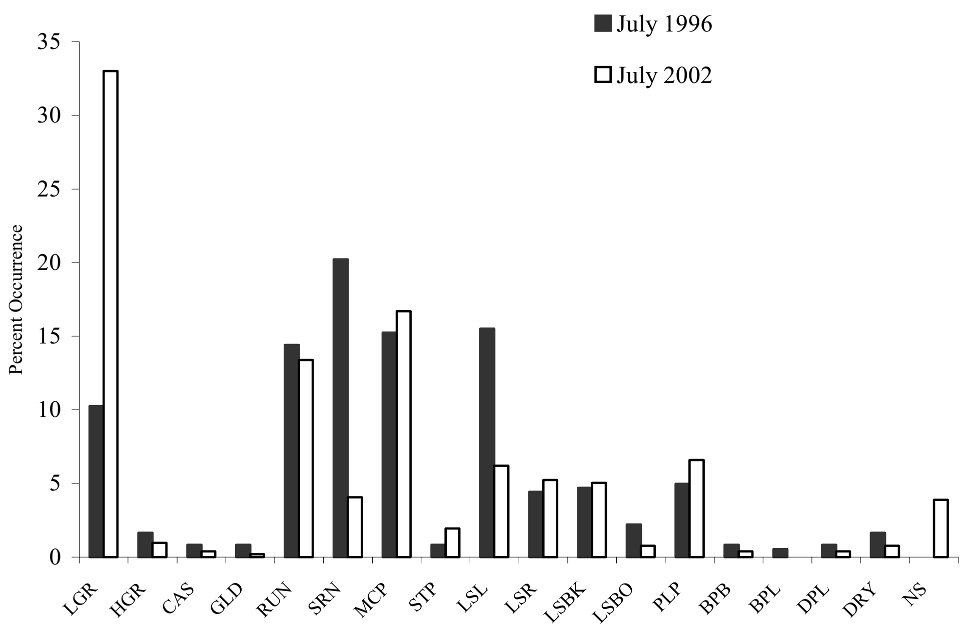


Figure 81. Summary of Level IV habitat types by percent occurrence classified during July 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

When total habitat lengths are considered for the two study years, the same pattern of increased low gradient riffles and decreased flatwater units in 2002 is displayed (Figure 82). Frequency and total length of dry habitat was very similar during both survey years. A substantial difference exists in the pool to riffle ratio calculated from the two data sets. In 1996 the pool to riffle ratio was 5.5 compared to 0.96 in 2002. This also may be due to surveyor differences.

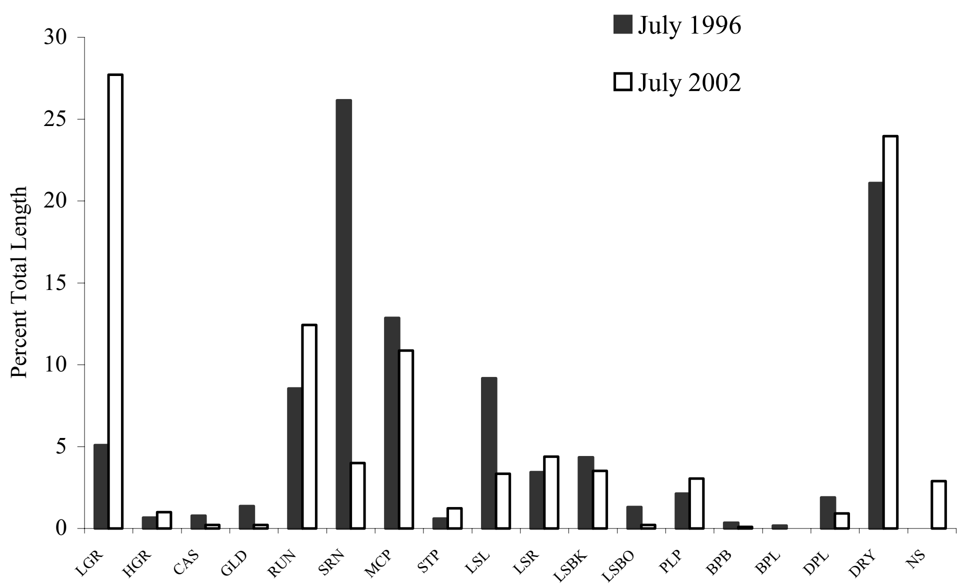


Figure 82. Summary of Level IV habitat types by total length classified during surveys conducted in July 1996 and 2002 in High Prairie Creek, lower Klamath River Sub-basin, California.

Large Woody Debris Survey

Mid-reaches of High Prairie Creek contain a significant volume of large wood in its channels and along its banks. Large wood is often a dominant structural component affecting the morphology of small, forested streams (Bilby and Likens 1980, Lisle 1986). The structural components in High Prairie Creek play a vital role in retaining large volumes of sediment thereby, reducing the delivery rate to downstream habitats. In mainstem High Prairie Creek large woody debris was observed to decrease the rate of pool drying and to preserve living space for juvenile salmonids during low flow periods. Lisle (1986) found that streams retaining large wood reduced degradation in recently clear-cut areas by storing significant volumes of sediment and helped maintain salmonid carrying capacity.

Unfortunately, only a small volume of large wood is available to stream reaches in the upper basin and for future downstream recruitment. Compounding this is timber harvest and road building activities occurring in the upper watershed. Only ~12 percent of the watershed is comprised of old growth forest and is mostly contained in the Natural Area of the Yurok Redwood Experimental Forest. Much of the remnant instream wood is structurally competent and of large enough size (2-3 foot diameter and >20 feet in length) to provide long-term benefits. However, modification of some large wood accumulations in lower High Prairie Creek could promote upstream access for adult salmonids. Where possible YTFP plans to improve upstream migration without losing the beneficial functions provided by these wood accumulations.

Fish Migration Barrier Assessment

Poor fish passage conditions existing in the watershed present a major limitation to salmonid production in Salt Creek. Adult steelhead and coho must travel 1.6 miles up Salt Creek to reach lower High Prairie Creek where the only significant spawning habitat exists. Improving year-round fish passage throughout Salt Creek would likely increase spawning success by allowing adults unimpaired passage to spawning grounds, as well as increase juvenile survival rates by allowing fish passage to preferred rearing habitats or to the Klamath River estuary on both seasonal and diurnal time scales.

Developing restoration strategies for improving stream function and fish passage in Salt Creek will require detailed geomorphic assessment of the valley. Marsh habitats have steadily increased over the last few decades possibly a result of the complex interaction of vegetation conversion occurring in the watershed, levee construction and channel alteration, and beaver activity. Pollock and others (2003) compiled research pertaining to the geomorphic effects of beaver dams and their influence on fish population in North America. They state that beaver dams measurably affect groundwater recharge rates and retention, increase summer flows, and elevate local water tables allowing the extent of riparian and marsh vegetation to expand. Beaver dams may retain enough sediment to cause substantial changes to valley floor morphology. In general they found salmonid productivity, especially for coho, was higher in stream reaches upstream of beaver dams than in reaches where dams were absent. They further stated that larger coho (age 1+) consistently used beaver pond habitats over all other available habitats.

The majority of fish passage barriers in High Prairie Creek consist of wood accumulations comprised of old growth timber. This remnant wood and the small component of old growth forest remaining in the watershed provides a unique setting to monitor changes in sediment retention and delivery associated with these structural elements. High quality spawning and rearing habitat was observed throughout the surveyed reaches of High Prairie Creek. Therefore, YTFP will work to improve passage conditions at select barriers to expand the amount of habitat available to salmonids while maintaining the critical functions provided by the large wood.

A significant portion of High Prairie Creek experienced subsurface flow during summer and fall months of 2002 and 2003. The condition is likely in part a function of excessive sedimentation occurring in stream channels of High Prairie Creek and extensive alterations to the stream channels of Salt Creek and High Prairie Creek. This issue may also be compounded by significant reductions in local water tables resulting from

Klamath and Trinity River water regulation. In fall of 2002 and 2003, the upper extent of subsurface flow was observed approximately 560 feet downstream of the current barrier to anadromy (HP4b). Nearly 90 percent of the stream length available for anadromous salmonid rearing in High Prairie Creek is subsurface during the dry season. Proposed treatments to aid in reducing these conditions are discussed in the restoration recommendations section.

Several lower Klamath River tributaries experience some period of subsurface flow (Gale and Randolph 2000). Currently, YTFP is monitoring year-round subsurface flow conditions in lower Klamath River tributaries, Klamath River and tributary flows, and precipitation events to determine what combination of river flow and precipitation are necessary to reestablish flow in select lower Klamath River tributaries. Future YTFP efforts will focus on determining how these variables relate to local tributary water tables and estimating the habitat lost to rearing fish in these tributaries during these periods.

Fish Distribution

Cutthroat trout are the most prolific species in the drainage inhabiting a majority of the available habitat. More data are needed to describe residency and seasonal distribution, especially in mainstem Salt Creek. Steelhead trout appear to be present in smaller numbers and use less of the drainage, however, distribution may vary year to year depending on flow and access conditions. More extensive surveys should be conducted throughout the watershed in future years. This will allow YTFP to track any changes in their abundance and distribution over time, and assess fish population structure changes resulting from ongoing and future fish passage and barrier treatment projects.

Salmon distribution is very limited in this system with only a short corridor of lower High Prairie Creek available for spawning and year-round rearing. Chinook salmon are not believed to spawn in this watershed due to its small size and its generally unsuitable substrate. Data collected at the lower Salt Creek trap in 2003 indicates that large numbers of non-natal juvenile salmonids including chinook immigrate to mainstem Salt Creek during winter and early spring when water quality conditions are optimal. Non-natal salmonids may enter Salt Creek during this time to escape high flows or possibly poor food availability conditions occurring in the Klamath River.

A monitoring plan addressing use of tidally influenced tributaries by non-natal salmonids should be developed for the Klamath River estuary. Monitoring objectives should include estimating the number of non-natal fish using the larger tributaries (Salt Creek, Hunter Creek, and Waukell Creek), determining timing and patterns of entry and emigration, and assessing habitat preferences of the non-natal immigrants. These efforts could demonstrate the importance of these watersheds to not only natal fish populations but to rearing salmonids emanating from other areas in the Klamath Basin. These areas may provide "last-chance" rearing opportunities to salmonids migrating to the ocean. Therefore, YTFP is committed to developing and implementing habitat restoration projects to improve the quantity and quality of the off-estuary habitats especially in lower Salt and Hunter Creeks. Monitoring fish status in these tributaries should be designed to provide the quantitative means to assess effectiveness of future restoration efforts. Use of Passive Integrated Transponder tags (PIT Tags) to individually mark fish and installing multiple antenna stations in tidally influenced tributaries would assist in these efforts.

Several species of lamprey including brook and Pacific lamprey are believed to inhabit the Salt Creek watershed. Pacific lamprey are an important species for the Yurok People who have harvested them for subsistence since time immemorial. Adult Pacific lamprey were not observed in this system and only a small number of juveniles are believed to have passed the outmigrant trap in lower Salt Creek in 2003. Large numbers of brook lamprey are believed to have passed the trap in 2003 with a peak occurring in mid-May. Brook lamprey are consistently observed in lower High Prairie Creek during spring and early summer building redds and rearing. Limited knowledge of lamprey phylogeny and population status exists for species in the Klamath Basin. Presumably fish passage improvements conducted in the watershed would also benefit lamprey populations.

Water Quality

Conditions for anadromous salmonids in the Salt Creek watershed are extremely variable depending on season and location in the drainage. YTFP considers persistent poor water quality conditions occurring in mainstem Salt Creek as one of the most significant factors currently limiting salmonid production in this system. Although YTFP has documented the presence of cutthroat trout year-round in mainstem Salt Creek, water quality conditions appear favorable to most salmonid species only during winter and spring.

Bjornn and Reiser 1991 report optimal water temperatures for steelhead at 10 – 13 ºC and 12 – 14 ºC for salmon with lethal upper limits at 25 – 27 ºC for all salmonids. Water temperatures at the three monitoring stations were often within the optimal range and never exceeded upper lethal limits. Water temperatures recorded in the tidally influenced reach of lower Salt Creek were slightly higher than those recorded in the upstream reaches. However, the highest temperatures occurring from July through September never exceeded 23 ºC. Consistent moderate to cool air temperatures of coastal northern California appear responsible for moderating stream temperatures in the watershed.

Dissolved oxygen (DO) concentrations are poor in mainstem Salt Creek and lower High Prairie Creek for a significant portion of the year. It has been demonstrated that salmonids remain unimpaired at DO concentrations at or above 8 mg/L (Alabaster et al. 1957, Bjornn and Reiser 1991). Davis (1975) found that DO deprivation and reductions in growth and food conversion efficiency began occurring in salmonids at concentrations below 6 mg/L (57-72 % Saturation). Concentrations below 6 mg/L persisted at most Salt Creek monitoring sites during low flow periods (June – November). Upper Salt Creek remained at or below this threshold year-round. Fortunately, water temperatures are not generally excessive and do not compound the effects of low DO concentrations.

It is unclear whether small-scale rehabilitation efforts will greatly affect DO concentrations in Salt Creek. Excluding cattle from the lower reaches of Salt Creek, rehabilitating riparian habitats, and removing encroaching vegetation from stream channels may decrease instream oxygen demands in select reaches. These efforts may also promote flow conditions that could lead to increased entrainment of oxygen. Monitoring Salt Creek water quality conditions should be continued and expanded to include additional 24-hour assessments of beaver pond habitats especially during the dry season. These data would provide a better understanding of seasonal and diurnal DO patterns, help in identifying refuge areas, and provide the means to assess restoration effectiveness.

RESTORATION RECOMMENDATIONS

Numerous factors currently limit salmonid production in the Salt Creek watershed. The most significant factors appear to be water quality in mainstem Salt Creek and fish access through the system resulting from poor stream function. Restoration recommendations were designed to address individual fish passage barriers and identified limiting factors at the reach scale (Figure 83). Recommendations were designed to be adaptive so that projects and priorities may be modified based on: 1) knowledge gained through comprehensive monitoring efforts, 2) the ability to obtain landowner consent to implement specific plans, and 3) the availability of funding to complete restoration objectives. This adaptive approach allows restoration and management activities to occur in a meaningful and cost-effective manner.

Fish Migration Improvement Strategies

Salt Creek

ST1 – Treatment efforts in this reach should focus on excluding cattle from riparian habitats, removing invasive vegetation from the thalweg, and planting native conifer and deciduous trees in riparian habitats.

ST2 – Routine assessments of beaver dam locations should be conducted to better describe year-round fish passage conditions at these sites and fish use in the beaver ponds. Seasonal modification of beaver dams may improve passage conditions for adult spawners in late fall and emigrating juveniles in late spring. Otherwise, YTFP believes beaver are vitally important to salmonid production in the Salt Creek watershed.

ST3 – This area will be included in a future large-scale geomorphic assessment of the Salt Creek valley to assist development of restoration prescriptions aimed at improving channel function and fish passage in this system.

ST4 – Monitoring and treatment strategies for this site should be developed in conjunction with barrier ST2.

ST5 – This reach may provide juvenile salmonids emigrating from High Prairie Creek with high quality over-wintering habitat and currently acts as a corridor to resident trout spawning and rearing in habitats located upstream. This area will also be considered in future geomorphic assessment and restoration planning activities in the Salt Creek valley.

Figure 83. Map depicting reaches recommended for future restoration in the Salt Creek watershed, lower Klamath River Sub-basin, California.

High Prairie Creek

HP1 – Seasonal subsurface flows likely result from a combination of factors including excessive sedimentation, confinement of the channel by levees, and reductions in the local water table resulting from Klamath and Trinity River flow management. Treatment efforts in this reach should include modifying existing levees to allow a more natural meander sequence to develop in High Prairie Creek and adding pool-forming elements such as large wood or boulders to increase residual pool depths to preserve living space for juvenile salmonids.

HP1b – Treatment strategies to deal with the chronic clogging of the channel at this location include: 1) setting back the levees located downstream of Highway 101 to allow High Prairie Creek to form a more natural meander sequence; 2) using annual debris deposits to create areas suitable for planting conifer and deciduous trees on valley surfaces adjacent to channel floodplains, and 3) removing vegetation established in the thalweg of Salt Creek directly downstream High Prairie Creek to increase channel capacity in this reach. Objectives include concentrating flow through this reach to provide migrating adult salmonids with adequate attracting flows and to improve localized sediment routing. Specific restoration designs should be developed through future geomorphic assessment and restoration planning activities.

HP2 – This wood jam was modified by YTFP during summer 2003. Treatment included removing the small debris and moving a select number of key pieces to increase passage. This site will be continually monitored and hand crews will manipulate the jam if it becomes impassible to salmonids.

HP3 – In summer 2003, YTFP used grip hoists to move a large section of the newly toppled tree from the channel to the left bank (Figure 84). The placement of this log has improved passage at HP3 by concentrating flows to a pour over on the right bank and away from a constricted, complex left bank channel (Figure 85). The concentrated flow has promoted scour in the jump pool, thereby improving passage at this barrier.

Figure 84. Looking downstream at a piece of large wood repositioned in High Prairie Creek by the Yurok Tribal Fisheries Program to direct flows over the pour over the log jam located directly downstream. 5 January 2004.

Figure 85. Looking upstream at barrier HP3 in High Prairie Creek depicting enhanced pour over conditions. 5 January 2004.

HP4a – Treatment recommendations for this boulder jam include moving the large boulders from the pour over area to downstream locations to promote jump pool formation. Major modification of this barrier should be conducted in conjunction with modification of HP4b due to their close proximity.

HP4b – More detailed geomorphic assessment and monitoring is required to understand sediment routing through this reach and to determine appropriate treatment options that will maintain the beneficial functions of instream large wood while providing for improved fish passage conditions.

HP5 – More detailed surveys of the wood jams existing in this reach should be conducted during high flow events to better document fish passage at individual barriers. Treatment of these barriers depends on the success of modifying barriers HP4a and HP4b.

HP6 – The primary objective of restoration in this reach should be reducing sediment delivery to stream channels by stabilizing hillslopes and riparian habitats. Remnant large wood is serving a critical function in this reach by storing large volumes of sediment and reducing the rate of delivery to downstream reaches. Therefore, wood jams in this reach should remain intact until sediment inputs are reduced to manageable levels.

Reach Scale Restoration Recommendations

Reach 1 - Salt Creek Downstream of Requa Road

Slough habitats of the Klamath River estuary provide essential habitat for native fish populations and may serve as critical refuge areas for Klamath Basin fish rearing in the estuary. Winter rearing habitat is considered a major factor limiting production of juvenile coho salmon in many coastal streams (Nickelson and Lawson 1998, Solazzi et al. 2000). High quality over wintering habitat for juvenile salmonids consist of deep, low velocity areas such as those found in beaver ponds and slough habitats (Bustard and Narver 1975, Bisson et al. 1988, Pollock et al. 2003). Therefore, YTFP considers improvement of channel, floodplain, and estuarine conditions in lower Salt Creek as a top restoration priority for the watershed.

Salt Creek and Hunter Creek were identified by YTFP as the watersheds most impaired by channelization activities in the lower Klamath River Sub-basin (Gale and Randolph 2000). Ideally these features should be removed from these systems and stream channels re-contoured to allow for natural stream meanders, floodplains and other geomorphic features. Logistical constraints such as potentially jeopardizing highway and road right-of-ways, increasing flooding potential of developed areas, and loss of pastureland would need to be addressed to ensure restoration success in these systems. Large-scale restoration may entail obtaining conservation easements or purchasing portions of private land along these stream reaches and cooperating with Cal Trans and Del Norte County to ensure continued stability of Highway 101 and county road stream crossings.

To address poor streambank, channel and riparian conditions in lower Hunter Creek and Mynot Creek, the California Conservation Corps (CCC) installed livestock exclusionary fencing around stream reaches downstream of Requa Road (Figure 83). These areas were then planted with native conifer and deciduous tree species. Over-steepened banks were feathered back and several bank stabilization structures were installed to increase channel stability and habitat diversity. These activities appear to have substantially improved instream habitat conditions and riparian functioning in this reach. However, this reach remains highly constricted with levees built along both banks limiting the stream's ability to occupy its floodplain during high flow events. The CCC plans to implement similar restoration techniques in Salt Creek downstream of Requa Road in summer of 2004 (Figure 83). A long-term goal of YTFP includes developing a multi-phase project to restore historic slough conditions by re-connecting Hunter Creek, Salt Creek, and Spruce Creek watersheds. Efforts will be aimed at increasing vital off estuary habitat for natal fish populations and for salmonids rearing in the Klamath River estuary.

Water quality data collected in this reach and lower Hunter Creek provide a quantitative baseline to help in assessing restoration effectiveness. Water quality monitoring of Salt Creek and Hunter Creek sloughs should be continued year-round on a monthly basis. Assessments of riparian species composition, vegetation density, and canopy cover should be conducted prior to restoration implementation to document pre-restoration conditions in this reach. Longitudinal and cross section surveys through mainstem Salt Creek and lower Hunter Creek would greatly assist restoration planning in this area.

Reach 2 - Salt Creek Upstream of Requa Road

Salt Creek from Requa Road upstream to the first beaver pond (BVR 1) has been degraded by decades of cattle grazing in stream channels and riparian habitats (Figure 83). Scott Bauer of the CCC has been coordinating with landowners to develop restoration strategies to improve stream and riparian habitats within this reach.

Efforts will include excluding cattle from a majority or all of the riparian habitats. Riparian habitats in this reach should be planted with deciduous and coniferous trees including willow and alder, with cottonwood and spruce on the higher surfaces. Reestablishment of mature conifers and cottonwoods in tributary riparian corridors will ensure future large wood recruitment to these reaches and aid in long-term channel stability. Hand removal of invasive terrestrial vegetation from the active stream channel may be necessary to improve fish passage and seasonal dissolved oxygen concentrations in this reach. Future larger scale efforts may include re-contouring sections of the channel in this reach to ensure long-term channel stability.

Habitat assessment data collected in Salt Creek provides critical baseline information regarding the condition of instream habitats within this reach. Longitudinal and cross section surveys should be conducted in Salt Creek to provide a more quantitative means to assess channel changes resulting from cattle exclusion and riparian restoration efforts. Baseline riparian assessment data should also be collected to increase our understanding of riparian restoration techniques in this reach.

Reach 3 - Salt Creek Beaver Pond and the High Prairie Creek Confluence

The hardest areas to assess during this study included the lower-most beaver pond in Salt Creek (BVR 1), the reach extending from the pond to the confluence with High Prairie Creek, and High Prairie Creek downstream of U.S. Highway 101 bridge (Figure 83). Although these are three very distinct areas they are considered here as one reach. Understanding how these three interconnected reaches function together is critical when developing reasonable restoration objectives and effective prescriptions. Therefore, YTFP is planning to coordinate with a professional geomorphologist to conduct a more comprehensive assessment of this reach to provide specific restoration recommendations and potential site designs. This work will directly tie into a larger-scale restoration assessment and planning effort for the lower floodplain habitats of Hunter Creek, Panther Creek, Mynot Creek, Spruce Creek, and Salt Creek.

Reach 4 - High Prairie Creek Upstream of Highway 101

High Prairie Creek from the Highway 101 bridge to 840 feet upstream of the water tank bridge has been significantly altered by the levee along its northern bank (Figure 83). This levee has resulted in a highly entrenched channel and has severely reduced channel sinuosity through this reach. Large wood and other habitat forming elements are virtually non-existent and the majority of live riparian trees are less than two feet in diameter.

The ultimate restoration objective for this reach would be to work with landowners and possibly Cal Trans and Del Norte County to remove or set back the existing levee and widen the Highway 101 overpass. This may entail purchasing adjacent private lands or establishing a conservation easement to compensate landowners for lost property. Other interim restoration strategies include installing multiple habitat structures designed to increase habitat complexity and preserve living space for juvenile salmonids during low flow periods. This reach is an F4 channel, therefore recommended structure types include bank placed boulders or large wood and structures such as weirs or deflectors that constrict the channel (Flosi et al. 1998). Large wood sources for these types of projects may be found on older terrace surfaces located upstream of this reach.

Monitoring peak flows at U.S. Highway 101, surveying additional cross sections and conducting a longitudinal profile through High Prairie Creek would greatly assist in developing restoration strategies for this reach and downstream of Highway 101.

Reach 5 - High Prairie Creek Upstream of Water Tank Bridge

High Prairie Creek from 840 feet upstream of the water tank bridge to barrier HP2 (habitat unit 080) is similar to reaches downstream (Figure 83). The channel oscillates between an F4 and B4 channel type with relatively high entrenchment ratios and low channel sinuousity. Large wood and other channel forming elements are also lacking in stream channels of this reach. Restoration efforts should focus on increasing pool frequency, residual pool depths, and cover elements for juvenile salmonids. A fair amount of downed large wood exists on terrace surfaces in this reach and may be used to construct instream habitat structures. Ideally, pieces selected for structures would be large enough not to require hard pinning. Stream channels could be accessed for structure installation from the road along the north bank and the terrace surface on the south bank.

Reach 6 - High Prairie Creek Barrier Reach

The reach extending from habitat unit 080 upstream to habitat unit 350 has been termed the barrier reach (Figure 83). Stream channels in this reach are mainly B4 and contain significant volumes of large wood within the bankfull channel. These wood accumulations store variable amounts of sediment and present passage difficulties to migrating salmonids. This is the first reach of High Prairie Creek where surface flows persist year-round and therefore, restoring fish access through this reach while maintaining the benefits of the large wood is considered a high priority.

Modification of wood accumulations in this reach will require careful planning to ensure channel stability, wood retention, and to prevent significant increases in sediment delivery to downstream habitats. A longitudinal profile through this reach and more cross sectional surveys should be conducted prior to any major barrier modification efforts, particularly modification of barrier HP4b. This summer, YTFP plans to modify barrier HP4a by removing the boulder located in the thalweg and manipulating structural elements to increase the jump pool depth.

Reach 7 - Upper High Prairie Creek

The upper High Prairie restoration reach extends from habitat unit 351 to the upper reaches of High Prairie Creek (Figure 83). Except for lands contained in the natural area of the Yurok Redwood Experimental Forest, High Prairie Creek has been subjected to intensive timber harvest and related road construction. Habitat data suggests these activities have resulted in increased streambed sedimentation and reduced channel stability. Future wood recruitment sources for the stream are also severely limited in this reach. Therefore, restoration efforts should focus on rehabilitating riparian habitats by reestablishing conifers to increase canopy cover and maintain future wood recruitment sources to ensure long-term channel stability and increase fish habitat complexity. Road networks should be assessed to determine upslope treatment options for this portion of the watershed.

Reach 8 - Upper Salt Creek

This reach extends through the marsh habitats located upstream of Salt Creek's confluence with High Prairie Creek (Figure 83). The high quality over-wintering habitat existing in this reach is likely vital to both fish emigrating from High Prairie Creek and to those populations using upper Salt Creek to spawn and rear. This area will also be considered in future geomorphic assessment and restoration planning activities. More detailed assessment of fish use of this marsh and habitats upstream should be conducted.

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Appendix 1. Summary of salmonids captured during an electrofishing survey conducted on 16 September 1997 within ~500 feet of upper Salt Creek, lower Klamath River, California.

Creek	Salt Creek	**Reach #**	Upstream of High Prairie Creek		
Date	16-Sep-97	**Water Temp**		**at Time**	
Crew	DG, BJ. ED	**Air Temp**	47 ºF	**at Time**	14:00
Weather	Partly cloudy	**Water Visibility (ft)**	0.5		
Est. Discharge (cfs)		**S-Time (sec)**	477		
Dist. Surveyed (ft)	150				

Species Code	**Count**	**Fork Length mm**	**Condition Code**
OC		121	2
OC		109	2
OC		87	1
OC		82	1
OC		74	1
OC		60	1
TF		54	--
Cottus	Y	--	--
GA	Y	--	--
RO	Y	--	--

Comments: From HP confluence u/s 1000 ft - only surveyed 150 ft due to depth and difficult habitat

Appendix 2. Summary of salmonids captured during electrofishing surveys conducted in May 2002 in four reaches located in Salt Creek, lower Klamath River, California.

Creek	Salt Creek	**Reach #**	1, 2, 3		
Date	7-May-02	**Water Temp**			**at Time**
Crew	MH, SG, DJ	**Air Temp**			**at Time**
Weather	Sunny, windy	**Water Visibility (ft)**			
Est. Discharge (cfs)		**S-Time (sec)**			
Dist. Surveyed (ft)					

Reach #	Species Code	Count	Fork Length mm	Condition Code
1	OM	1	95	2
2	OC	1	144	2
2	OC	1	144	2
2	OC	1	131	2
2	OC	1	131	2
2	OC	1	112	2
2	OK	1	95	2
2	OK	1	51	2
2	OM	1	79	1
3	OC	1	152	2
3	OC	1	148	2
3	OC	1	147	3
3	OC	1	145	2
3	OC	1	114	2
3	OC	1	110	2
3	OC	1	102	2
3	OC	1	93	2
3	OC	1	88	2
3	OK	1	117	3
3	OK	1	70	2
3	OK	1	67	2
3	OK	1	63	2
3	OK	1	62	3
3	OK	1	59	2
3	OK	1	47	3
3	OM	1	132	2
3	OM	1	117	2
3	OM	1	96	2
3	TF	1	54	MORT
3	TF	1	52	3
3	TF	1	46	2
3	TF	1	46	3
3	TF	1	40	MORT
	Cottus	Y	--	--
	GA	Y	--	--
	Lampetra	Y	--	--

Comments: Made left caudal fin clip on all salmonids within reaches 1 and 2 in case we catch in fyke net Electrofished on outgoing tide - habitat mainly small riffles and complex pools with lots of LWD.

Appendix 2 Continued.

Creek	Salt Creek	**Reach #**	Upper Salt		
Date	13-May-02	**Water Temp**		**at Time**	16:00
Crew	DJ, SG, JJ	**Air Temp**		**at Time**	
Weather	Sunny	**Water Visibility (ft)**			
Est. Discharge (cfs)		**S-Time (sec)**			
Dist. Surveyed (ft)					

Reach #	Species Code	Quantity	Fork Length mm	Condition Code
Upper	OC	1	84	--
Upper	OC	1	84	--
Upper	OC	1	97	--
Upper	OC	1	97	--
Upper	OC	1	94	--
Upper	TF	1	43	--
Upper	TF	1	45	--
Upper	OC	1	172	--
Upper	OC	1	114	--
Upper	OC	1	94	--
Upper	OC	1	114	--
Upper	TF	1	33	--
Upper	GA	Y	--	--
Upper	Lampetra	Y	--	--

Comments: Upper Salt Creek reach consisted of 2 pools and a riffle.

Appendix 3. Summary of salmonids captured during hook-and-line sampling on 27 March 2003 within a beaver pond (BVR 2) of Salt Creek, lower Klamath River, California.

Creek	Salt Creek	**Reach #**	BVR 2		
Date	27-Mar-03	**Water Temp**		**at Time**	12:35
Crew	SG, BR	**Air Temp**		**at Time**	
Weather	Sunny, clear	**Water Visibility (ft)**			
Est. Discharge (cfs)					

Location	Species Code	Fork Length mm	Condition Code
BVR2	OC	210	3
BVR2	OC	185	3
BVR2	OC	162	3
BVR2	OC	150	2
BVR2	OK	127	3
BVR2	OK	125	3
BVR2	OK	120	3
BVR2	OK	110	3
BVR2	OK	109	3
BVR2	OK	109	3
BVR2	OK	97	3

Appendix 4. Summary of fish captured in a downstream migrant trap on 26 capture dates in April and May 2003 in lower Salt Creek, lower Klamath River, California.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
3-Apr-03	SG, BR	49	11:30	44	11:30	Catostomus		1	0		
3-Apr-03	SG, BR	49	11:30	44	11:30	Cottus		30	0		
3-Apr-03	SG, BR	49	11:30	44	11:30	Frog Larvae		1	0		
3-Apr-03	SG, BR	49	11:30	44	11:30	GA		1	0		
3-Apr-03	SG, BR	49	11:30	44	11:30	OM	P/S	1	0	82	1
3-Apr-03	SG, BR	49	11:30	44	11:30	OM	P/S	1	0	83	1
3-Apr-03	SG, BR	49	11:30	44	11:30	OM	P/S	1	0	94	2
3-Apr-03	SG, BR	49	11:30	44	11:30	RO		4	0		
4-Apr-03	SB, RF	45	10:30	48	10:38	Cottus		28	0		
4-Apr-03	SB, RF	45	10:30	48	10:38	GA		3	2		
4-Apr-03	SB, RF	45	10:30	48	10:38	OM	P/S	1	0	83	1
4-Apr-03	SB, RF	45	10:30	48	10:38	OM	P/S	1	0	100	1
4-Apr-03	SB, RF	45	10:30	48	10:38	OM	P/S	1	0	110	2
5-Apr-03	SG, BR	44	9:45	45	9:45	Catostomus		5	0		
5-Apr-03	SG, BR	44	9:45	45	9:45	Cottus		60	0		
5-Apr-03	SG, BR	44	9:45	45	9:45	GA		7	5		
5-Apr-03	SG, BR	44	9:45	45	9:45	LP		1	0		
5-Apr-03	SG, BR	44	9:45	45	9:45	OC	P/S	1	0	115	2
5-Apr-03	SG, BR	44	9:45	45	9:45	OC	P/S	1	0	116	2
5-Apr-03	SG, BR	44	9:45	45	9:45	OC	P/S	1	0	152	2.5
5-Apr-03	SG, BR	44	9:45	45	9:45	OM	P/S	1	0	83	1
5-Apr-03	SG, BR	44	9:45	45	9:45	OM	P/S	1	0	83	1
5-Apr-03	SG, BR	44	9:45	45	9:45	OM	P/S	1	0	94	1
5-Apr-03	SG, BR	44	9:45	45	9:45	RO		5	0		
6-Apr-03	SG, BR	48	9:00	44	9:00	Cottus		36	0		
6-Apr-03	SG, BR	48	9:00	44	9:00	GA		2	0		
6-Apr-03	SG, BR	48	9:00	44	9:00	OC	P/S	1	0	89	1
6-Apr-03	SG, BR	48	9:00	44	9:00	OC	P/S	1	0	163	3
6-Apr-03	SG, BR	48	9:00	44	9:00	OC	P/S	1	0	172	3
6-Apr-03	SG, BR	48	9:00	44	9:00	OM	P/S	1	0	81	1
6-Apr-03	SG, BR	48	9:00	44	9:00	RO		3	0		
7-Apr-03	SB, SG	48	10:30	50	10:30	Cottus		28	0		
7-Apr-03	SB, SG	48	10:30	50	10:30	GA		1	1		
7-Apr-03	SB, SG	48	10:30	50	10:30	OK	P/S	1	0	126	3
8-Apr-03	SB	45	9:30	50	10:00	Cottus		14	0		
8-Apr-03	SB	45	9:30	50	10:00	OC	P/S	1	0	128	2
8-Apr-03	SB	45	9:30	50	10:00	OM	P/S	1	0	130	2
9-Apr-03	SB, BL	52	9:30	57	10:00	Catostomus		33	0		
9-Apr-03	SB, BL	52	9:30	57	10:00	Cottus		106	0		
9-Apr-03	SB, BL	52	9:30	57	10:00	GA		19	10		
9-Apr-03	SB, BL	52	9:30	57	10:00	LP		9	0		
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	102	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	118	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	119	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	120	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	137	1

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	145	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	145	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	150	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	155	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	0	170	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OC	P/S	1	1	190	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	115	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	115	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	119	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	125	3
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	126	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	127	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	129	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	130	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	135	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	135	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	0	135	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OK	P/S	1	1	145	3
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	79	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	81	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	83	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	92	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	107	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	108	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	109	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	111	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	112	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	113	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	115	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	115	2.5
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	120	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	125	1
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	127	2
9-Apr-03	SB, BL	52	9:30	57	10:00	OM	P/S	1	0	138	1
9-Apr-03	SB, BL	52	9:30	57	10:00	RO		9			
9-Apr-03	SB, BL	52	9:30	57	10:00	NC		1	0		
9-Apr-03	SB, BL	52	9:30	57	10:00	ST	P/S	1	0	130	1
16-Apr-03	SG, BR	49	9:15	49	9:15	Catostomus		12	0		
16-Apr-03	SG, BR	49	9:15	49	9:15	Cottus		64	0		
16-Apr-03	SG, BR	49	9:15	49	9:15	GA		7	0		
16-Apr-03	SG, BR	49	9:15	49	9:15	LP		6	0		
16-Apr-03	SG, BR	49	9:15	49	9:15	OM	P/S	1	0	95	2
16-Apr-03	SG, BR	49	9:15	49	9:15	OM	P/S	1	0	95	2
16-Apr-03	SG, BR	49	9:15	49	9:15	OM	P/S	1	0	98	2
16-Apr-03	SG, BR	49	9:15	49	9:15	RO		8	0		
17-Apr-03	BR, BJ	50	10:45	54	10:50	Catostomus		15	0		
17-Apr-03	BR, BJ	50	10:45	54	10:50	Cottus		122	0		
17-Apr-03	BR, BJ	50	10:45	54	10:50	GA		21	0		

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
17-Apr-03	BR, BJ	50	10:45	54	10:50	LP		8	0		
17-Apr-03	BR, BJ	50	10:45	54	10:50	OC	P/S	1	0	104	2
17-Apr-03	BR, BJ	50	10:45	54	10:50	OM	P/S	1	0	84	2
17-Apr-03	BR, BJ	50	10:45	54	10:50	OM	P/S	1	0	90	2
17-Apr-03	BR, BJ	50	10:45	54	10:50	OM	P/S	1	0	93	2
17-Apr-03	BR, BJ	50	10:45	54	10:50	OM	P/S	1	0	94	2
17-Apr-03	BR, BJ	50	10:45	54	10:50	OM	P/S	1	0	96	2
17-Apr-03	BR, BJ	50	10:45	54	10:50	OM	P/S	1	0	107	2
17-Apr-03	BR, BJ	50	10:45	54	10:50	OM	P/S	1	0	109	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	Catostomus		30	0		
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	Cottus		251	1		
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	GA		71	14		
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	LP		13	0		
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	83	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	94	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	95	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	99	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	102	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	105	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	105	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	112	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	115	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	115	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	116	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OC	P/S	1	0	120	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	103	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	111	3
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	112	2.5
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	112	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	115	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	118	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	118	2.5
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	118	2.5
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	118	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	119	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	119	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	119	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	120	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	125	2.5
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	125	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	128	2
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OK	P/S	1	0	129	2.5
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	83	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	85	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	86	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	89	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	89	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	90	1

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	90	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	97	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	98	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	99	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	100	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	100	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	100	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	103	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	104	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	110	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	113	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	116	1.5
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	OM	P/S	1	0	120	1
18-Apr-03	SB, SG, RF	49	9:20	50	9:15	RO		62	0		
22-Apr-03	SG, BR	50	10:15	51	10:25	Catostomus		26	0		
22-Apr-03	SG, BR	50	10:15	51	10:25	Cottus		88	0		
22-Apr-03	SG, BR	50	10:15	51	10:25	GA		80	12		
22-Apr-03	SG, BR	50	10:15	51	10:25	LP		12	0		
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	75	1
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	82	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	84	1
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	85	1
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	92	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	92	1
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	93	1
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	93	1
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	94	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OC	P/S	1	0	108	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	103	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	108	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	109	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	114	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	115	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	115	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	116	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	116	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	116	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	116	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	117	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	118	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	121	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	123	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	123	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	125	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	128	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	129	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	131	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OK	P/S	1	0	134	3

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	76	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	79	1
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	94	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	98	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	100	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	100	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	107	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	111	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	113	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	116	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	116	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	117	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	118	3
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	118	2
22-Apr-03	SG, BR	50	10:15	51	10:25	OM	P/S	1	0	122	2
22-Apr-03	SG, BR	50	10:15	51	10:25	RO		61	0		
23-Apr-03	SB	49	10:05	47	10:00	Catostomus		2	2		
23-Apr-03	SB	49	10:05	47	10:00	Cottus		152	1		
23-Apr-03	SB	49	10:05	47	10:00	GA		59	12		
23-Apr-03	SB	49	10:05	47	10:00	LP		7	0		
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	78	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	78	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	78	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	80	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	81	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	83	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	87	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	90	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	90	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	92	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	93	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	94	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	96	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	98	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	98	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	104	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	111	1.5
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	111	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	112	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	113	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	115	1
23-Apr-03	SB	49	10:05	47	10:00	OC	P/S	1	0	119	1
23-Apr-03	SB	49	10:05	47	10:00	OK	P/S	1	0	108	2
23-Apr-03	SB	49	10:05	47	10:00	OK	P/S	1	0	118	3
23-Apr-03	SB	49	10:05	47	10:00	OK	P/S	1	0	119	3
23-Apr-03	SB	49	10:05	47	10:00	OK	P/S	1	0	125	3
23-Apr-03	SB	49	10:05	47	10:00	OK	P/S	1	0	128	3
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	70	1

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	78	1
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	83	1
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	88	1
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	89	1
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	98	1
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	107	1
23-Apr-03	SB	49	10:05	47	10:00	OM	P/S	1	0	118	1
23-Apr-03	SB	49	10:05	47	10:00	RO		98	0		
6-May-03	SG, BR	50	13:00	51	13:50	Cottus		19	0		
6-May-03	SG, BR	50	13:00	51	13:50	RO		46	0		
6-May-03	SG, BR	50	13:00	51	13:50	GA		26	0		
6-May-03	SG, BR	50	13:00	51	13:50	Catostomus		13	0		
6-May-03	SG, BR	50	13:00	51	13:50	LT		2	0		
6-May-03	SG, BR	50	13:00	51	13:50	LP		6	0		
6-May-03	SG, BR	50	13:00	51	13:50	OC	P/S	1	0	144	2
6-May-03	SG, BR	50	13:00	51	13:50	OC	P/S	1	0	122	2
6-May-03	SG, BR	50	13:00	51	13:50	OC	P/S	1	0	130	2
6-May-03	SG, BR	50	13:00	51	13:50	OC	P/S	1	0	119	2
6-May-03	SG, BR	50	13:00	51	13:50	OC	P/S	1	0	110	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	127	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	117	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	114	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	107	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	98	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	111	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	110	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	115	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	87	1
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	88	1
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	114	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	114	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	107	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	100	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	123	2
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	98	1
6-May-03	SG, BR	50	13:00	51	13:50	OM	P/S	1	0	120	2
6-May-03	SG, BR	50	13:00	51	13:50	OK	0+	1	0	63	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	0+	1	0	38	1
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	106	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	120	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	118	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	108	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	119	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	124	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	130	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	107	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	115	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	115	3

Appendix 4 Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	130	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	115	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	130	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	115	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	112	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	119	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	122	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	136	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	112	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	115	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	122	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	113	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	104	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	128	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	110	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	108	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	116	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	118	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	119	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	111	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	122	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	130	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	130	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	125	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	119	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	104	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	126	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	127	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	109	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	123	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	120	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	121	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	126	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	111	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	123	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	115	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	118	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	116	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	120	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	132	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	126	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	123	3

Appendix 4 Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	116	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	116	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	112	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	122	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	123	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	118	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	116	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	125	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	119	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	122	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	118	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	110	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	128	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	126	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	105	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	119	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	124	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	127	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	117	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	123	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	124	3
6-May-03	SG, BR	50	13:00	51	13:50	OK	P/S	1	0	120	3
7-May-03	SG, BR	49	10:05	49	10:00	Cottus		30	0		
7-May-03	SG, BR	49	10:05	49	10:00	RO		55	0		
7-May-03	SG, BR	49	10:05	49	10:00	GA		22	6		
7-May-03	SG, BR	49	10:05	49	10:00	Catostomus		22	0		
7-May-03	SG, BR	49	10:05	49	10:00	LT		2	0		
7-May-03	SG, BR	49	10:05	49	10:00	LP		14	0		
7-May-03	SG, BR	49	10:05	49	10:00	NC		1	0		
7-May-03	SG, BR	49	10:05	49	10:00	OC	P/S	1	0	121	2
7-May-03	SG, BR	49	10:05	49	10:00	OC	P/S	1	0	96	2
7-May-03	SG, BR	49	10:05	49	10:00	OC	P/S	1	0	117	2
7-May-03	SG, BR	49	10:05	49	10:00	OC	P/S	1	0	96	2
7-May-03	SG, BR	49	10:05	49	10:00	OC	P/S	1	0	119	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	95	1
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	94	1
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	106	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	96	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	84	1
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	107	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	99	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	92	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	96	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	119	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	92	2
7-May-03	SG, BR	49	10:05	49	10:00	OM	P/S	1	0	86	1

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	126	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	109	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	107	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	119	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	116	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	114	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	119	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	112	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	127	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	116	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	126	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	122	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	122	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	120	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	116	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	126	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	116	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	122	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	117	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	118	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	129	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	132	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	122	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	130	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	120	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	136	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	122	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	110	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	116	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	122	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	123	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	133	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	122	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	124	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	112	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	131	3
7-May-03	SG, BR	49	10:05	49	10:00	OK	P/S	1	0	123	3
8-May-03	SG, BR	50	10:35	49	10:30	Cottus		12	0		
8-May-03	SG, BR	50	10:35	49	10:30	RO		8	0		
8-May-03	SG, BR	50	10:35	49	10:30	GA		3	0		
8-May-03	SG, BR	50	10:35	49	10:30	LP		6	0		
8-May-03	SG, BR	50	10:35	49	10:30	OC	P/S	1	0	123	
8-May-03	SG, BR	50	10:35	49	10:30	OC	P/S	1	0	124	
8-May-03	SG, BR	50	10:35	49	10:30	OC	P/S	1	0	150	
8-May-03	SG, BR	50	10:35	49	10:30	OC	P/S	1	0	145	
8-May-03	SG, BR	50	10:35	49	10:30	OM	P/S	1	0	95	
8-May-03	SG, BR	50	10:35	49	10:30	OK	0+	1	0	39	
8-May-03	SG, BR	50	10:35	49	10:30	OK	P/S	1	0	120	

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
8-May-03	SG, BR	50	10:35	49	10:30	OK	P/S	1	0	117	
8-May-03	SG, BR	50	10:35	49	10:30	OK	P/S	1	0	124	
13-May-03	SG, BR	--	--	--	--	Cottus		236	0		
13-May-03	SG, BR	--	--	--	--	RO		664	0		
13-May-03	SG, BR	--	--	--	--	GA		245	20		
13-May-03	SG, BR	--	--	--	--	LP		29	0		
13-May-03	SG, BR	--	--	--	--	LT		2	0		
13-May-03	SG, BR	--	--	--	--	LC		1	1		
13-May-03	SG, BR	--	--	--	--	OC	P/S	1	0	90	2
13-May-03	SG, BR	--	--	--	--	OC	P/S	1	0	75	1
13-May-03	SG, BR	--	--	--	--	OC	P/S	1	0	124	2
13-May-03	SG, BR	--	--	--	--	OC	P/S	1	0	129	3
13-May-03	SG, BR	--	--	--	--	OM	P/S	1	0	96	2
13-May-03	SG, BR	--	--	--	--	OM	P/S	1	0	92	2
13-May-03	SG, BR	--	--	--	--	OM	P/S	1	0	121	2
13-May-03	SG, BR	--	--	--	--	OK	P/S	1	0	123	3
13-May-03	SG, BR	--	--	--	--	OK	P/S	1	0	125	3
13-May-03	SG, BR	--	--	--	--	OK	P/S	1	0	123	3
13-May-03	SG, BR	--	--	--	--	OK	P/S	1	0	116	3
13-May-03	SG, BR	--	--	--	--	LC		1	1		
13-May-03	SG, BR	--	--	--	--	RSN		1	0		
14-May-03	SB, SG	54	9:45	56	9:30	Cottus		231	0		
14-May-03	SB, SG	54	9:45	56	9:30	RO		649	0		
14-May-03	SB, SG	54	9:45	56	9:30	GA		131	35		
14-May-03	SB, SG	54	9:45	56	9:30	Catostomus		73	2		
14-May-03	SB, SG	54	9:45	56	9:30	LP		13	0		
14-May-03	SB, SG	54	9:45	56	9:30	ST	P/S	0	1	117	2
14-May-03	SB, SG	54	9:45	56	9:30	RSN		1	0		
14-May-03	SB, SG	54	9:45	56	9:30	NC		4	2		
14-May-03	SB, SG	54	9:45	56	9:30	Frog larvae		1	0		
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	176	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	115	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	96	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	120	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	130	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	148	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	148	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	128	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	94	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	115	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	110	1
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	114	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	134	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	121	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	131	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	119	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	104	2
14-May-03	SB, SG	54	9:45	56	9:30	OC	P/S	1	0	130	2

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	139	2.5
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	126	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	125	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	99	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	89	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	106	1
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	114	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	120	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	122	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	85	1
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	80	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	118	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	115	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	116	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	129	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	89	2
14-May-03	SB, SG	54	9:45	56	9:30	OM	P/S	1	0	95	1
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	123	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	116	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	121	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	138	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	115	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	116	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	111	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	121	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	127	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	126	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	111	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	118	2
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	125	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	115	2
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	130	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	125	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	125	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	110	2
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	2
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	108	2
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	121	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	122	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	122	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	115	2
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	122	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	121	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	118	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	127	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	127	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	115	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	119	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	128	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	126	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	120	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	122	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	119	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	123	3
14-May-03	SB, SG	54	9:45	56	9:30	OK	P/S	1	0	115	3
14-May-03	SB, SG	54	9:45	56	9:30	OM	0+	1	0	51	
15-May-03	SG, BR	56	11:50	53	11:57	Cottus		245	0		
15-May-03	SG, BR	56	11:50	53	11:57	RO		522	0		
15-May-03	SG, BR	56	11:50	53	11:57	GA		131	35		
15-May-03	SG, BR	56	11:50	53	11:57	LP		11	0		
15-May-03	SG, BR	56	11:50	53	11:57	LT		1	0		
15-May-03	SG, BR	56	11:50	53	11:57	NC		3	0		
15-May-03	SG, BR	56	11:50	53	11:57	RSN		1	0		
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	122	2
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	173	3
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	118	2
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	153	2
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	140	2
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	129	3
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	130	2
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	102	2
15-May-03	SG, BR	56	11:50	53	11:57	OC	P/S	1	0	127	2
15-May-03	SG, BR	56	11:50	53	11:57	OM	P/S	1	0	71	1
15-May-03	SG, BR	56	11:50	53	11:57	OM	P/S	1	0	88	1
15-May-03	SG, BR	56	11:50	53	11:57	OM	P/S	1	0	90	2
15-May-03	SG, BR	56	11:50	53	11:57	OM	P/S	1	0	105	2
15-May-03	SG, BR	56	11:50	53	11:57	OM	P/S	1	0	95	1
15-May-03	SG, BR	56	11:50	53	11:57	OM	P/S	1	0	112	2
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	118	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	107	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	114	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	128	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	121	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	118	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	126	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	110	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	128	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	121	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	122	3

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	123	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	128	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	126	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	115	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	119	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	117	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	111	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	123	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	124	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	113	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	123	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	127	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	114	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	125	3
15-May-03	SG, BR	56	11:50	53	11:57	OK	P/S	1	0	109	3
15-May-03	SG, BR	56	11:50	53	11:57	OT	P/S	1	0	63	3
16-May-03	SG, BR	55	10:30	54	10:38	Cottus		159	0		
16-May-03	SG, BR	55	10:30	54	10:38	RO		219	0		
16-May-03	SG, BR	55	10:30	54	10:38	GA		112	8		
16-May-03	SG, BR	55	10:30	54	10:38	Catostomus		66	4		
16-May-03	SG, BR	55	10:30	54	10:38	LP		13	0		
16-May-03	SG, BR	55	10:30	54	10:38	OC	P/S	1	0	66	2
16-May-03	SG, BR	55	10:30	54	10:38	OM	P/S	1	0	111	2
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	104	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	119	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	107	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	107	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	110	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	120	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	114	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	126	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	120	3
16-May-03	SG, BR	55	10:30	54	10:38	OK	P/S	1	0	111	3
20-May-03	BR, DJ	56	14:30	58	15:00	Frog larvae		2	0		
20-May-03	BR, DJ	56	14:30	58	15:00	Cottus		34	0		
20-May-03	BR, DJ	56	14:30	58	15:00	RO		36	0		
20-May-03	BR, DJ	56	14:30	58	15:00	GA		50	18		
20-May-03	BR, DJ	56	14:30	58	15:00	Catostomus		42	0		
20-May-03	BR, DJ	56	14:30	58	15:00	LP		9	1		
20-May-03	BR, DJ	56	14:30	58	15:00	OC	P/S	1	0	93	2
20-May-03	BR, DJ	56	14:30	58	15:00	OC	P/S	1	0	102	2
20-May-03	BR, DJ	56	14:30	58	15:00	OK	P/S	1	0	122	3
20-May-03	BR, DJ	56	14:30	58	15:00	OK	P/S	1	0	112	3
20-May-03	BR, DJ	56	14:30	58	15:00	OK	P/S	1	0	121	3
20-May-03	BR, DJ	56	14:30	58	15:00	OK	P/S	1	0	124	3
20-May-03	BR, DJ	56	14:30	58	15:00	OK	P/S	1	0	124	3
20-May-03	BR, DJ	56	14:30	58	15:00	OK	P/S	1	0	113	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	Frog larvae		2	0		

Appendix 4. Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
21-May-03	DJ, BR, SG	55	14:00	58	14:17	Cottus		43	1		
21-May-03	DJ, BR, SG	55	14:00	58	14:17	RO		40	0		
21-May-03	DJ, BR, SG	55	14:00	58	14:17	GA		76	35		
21-May-03	DJ, BR, SG	55	14:00	58	14:17	Catostomus		91	0		
21-May-03	DJ, BR, SG	55	14:00	58	14:17	LP		5	0		
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	124	2
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	156	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	92	1
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	115	2
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	85	1
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	115	2
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	125	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	119	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	129	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OC	P/S	1	0	95	2
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	117	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	117	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	124	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	117	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	117	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	116	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	115	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	119	3
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	100	2
21-May-03	DJ, BR, SG	55	14:00	58	14:17	OK	P/S	1	0	115	2
22-May-03	DJ, BR, SG					Frog larvae		1	0		
22-May-03	DJ, BR, SG					Cottus		90	0		
22-May-03	DJ, BR, SG					RO		230	0		
22-May-03	DJ, BR, SG					GA		103	20		
22-May-03	DJ, BR, SG					Catostomus		150	0		
22-May-03	DJ, BR, SG					LP		1	0		
22-May-03	DJ, BR, SG					OK	P/S	1	1	116	3
23-May-03	DJ, SG					Cottus		56	0		
23-May-03	DJ, SG					RO		226	0		
23-May-03	DJ, SG					GA		109	15		
23-May-03	DJ, SG					Catostomus		120	1		
23-May-03	DJ, SG					Leach		1	0		
23-May-03	DJ, SG					Frog larvae		1	0		
23-May-03	DJ, SG					OK	P/S	1	0	122	3
23-May-03	DJ, SG					OK	P/S	1	0	116	3
28-May-03	AM, SG	56	9:30	59	9:45	Cottus		1	1		
28-May-03	AM, SG	56	9:30	59	9:45	RO		32	0		
28-May-03	AM, SG	56	9:30	59	9:45	GA		26	2		
28-May-03	AM, SG	56	9:30	59	9:45	Catostomus		4	0		
28-May-03	AM, SG	56	9:30	59	9:45	LP		2	0		
28-May-03	AM, SG	56	9:30	59	9:45	Frog larvae		1	0		
28-May-03	AM, SG	56	9:30	59	9:45	OK	P/S	1	0	110	3
29-May-03	SG, BR, ED, JJ	57	12:10			Cottus		20	0		

Appendix 4 Continued.

Date	Crew	Water Temp ºF	Time	Air Temp ºF	Time	Species Code	Age	Count	Mortality	Fork Length mm	Condition Code
29-May-03	SG, BR, ED, JJ	57	12:10			RO		39	0		
29-May-03	SG, BR, ED, JJ	57	12:10			GA		25	0		
29-May-03	SG, BR, ED, JJ	57	12:10			Catostomus		7	0		
29-May-03	SG, BR, ED, JJ	57	12:10			LT		1	1		
30-May-03	DJ, SG	13.3 ºC				Cottus		36	0		
30-May-03	DJ, SG	13.3 ºC				GA		57	0		
30-May-03	DJ, SG	13.3 ºC				LT		1	0		
30-May-03	DJ, SG	13.3 ºC				RO		126	0		
30-May-03	DJ, SG	13.3 ºC				Catostomus		41	0		
30-May-03	DJ, SG	13.3 ºC				OC	0+	1	0	64	1
30-May-03	DJ, SG	13.3 ºC				OC	0+	1	0	63	1
30-May-03	DJ, SG	13.3 ºC				OC	0+	1	0	68	2
30-May-03	DJ, SG	13.3 ºC				OK	P/S	1	0	108	3
30-May-03	DJ, SG	13.3 ºC				OK	P/S	1	0	120	3

Appendix 5. Summary of salmonids captured during electrofishing surveys conducted in two reaches on 16 September 1997 in lower High Prairie Creek, lower Klamath River, California.

Creek	High Prairie Creek	**Reach #**	1				
Date	16-Sep-97	**Water Temp**	60	ºF	**at Time**	14:00	
Crew	DG, BJ, ED	**Air Temp**	64	ºF	**at Time**	14:00	
Weather	Sunny	**Water Visibility (ft)**	1.0				
Est. Discharge (cfs)	0.25	**S-Time (sec)**	652				
Dist. Surveyed (ft)	785						

Reach #	Species Code	Count	Fork Length mm	Condition Code
1	OC	1	152	2.0
1	OC	1	114	2.0
1	OC	1	111	2.0
1	OC	1	104	2.0
1	OC	1	87	1.0
1	OC	1	84	1.5
1	OC	1	84	1.0
1	OC	1	82	2.0
1	OC	1	81	2.0
1	OC	1	79	1.5
1	OC	1	79	1.5
1	OC	1	79	1.0
1	OC	1	79	1.0
1	OC	1	77	1.0
1	OC	1	77	1.5
1	OC	1	77	1.5
1	OC	1	72	1.0
1	OC	1	71	1.0
1	Cottus	Y	--	--
1	GA	Y	--	--
1	Lampetra	Y	--	--
1	Yellow-leg frog	Y	--	--

Comments: Reach 1 from High Prairie mouth to 785 u/s past HWY 101 bridge

Appendix 5. Continued.

Creek	High Prairie Creek	**Reach #**	2		
Date	16-Sep-97	**Water Temp**	58 ºF	**at Time**	17:50
Crew	DG, BJ, ED	**Air Temp**	61 ºF	**at Time**	17:50
Weather	Sunny	**Water Visibility (ft)**	2.5		
Est. Discharge (cfs)	6.5	**S-Time (sec)**	1071		
Dist. Surveyed (ft)	715				

Reach #	Species Code	Count	Fork Length mm	Condition Code
2	OC	1	54	1
2	OC	1	56	1
2	OC	1	56	1
2	OC	1	56	1
2	OC	1	57	1
2	OC	1	59	1
2	OC	1	59	1
2	OC	1	60	1
2	OC	1	61	1
2	OC	1	62	1
2	OC	1	64	1
2	OC	1	64	1
2	OC	1	65	1
2	OC	1	66	1
2	OC	1	68	1
2	OC	1	70	2
2	OC	1	70	2
2	OC	1	72	1
2	OC	1	73	2
2	OC	1	74	1
2	OC	1	74	2
2	OC	1	76	2
2	OC	1	77	1
2	OC	1	78	2
2	OC	1	79	1
2	OC	1	79	2
2	OC	1	79	2
2	OC	1	80	2
2	OC	1	82	2
2	OC	1	83	2
2	OC	1	88	2
2	OC	1	91	2
2	OC	1	93	2
2	OC	1	94	2
2	OC	1	97	2
2	OC	1	99	2
2	OC	1	100	2
2	OC	1	100	2
2	OC	1	101	2

Appendix 5. Continued.

Creek	High Prairie Creek	**Reach #**	2		
Date		**Water Temp**	58 ºF	**at Time**	17:50
Crew	DG, BJ, ED	**Air Temp**	61 ºF	**at Time**	17:50
Weather	Sunny	**Water Visibility (ft)**	2.5		
Est. Discharge (cfs)	6.5	**S-Time (sec)**	1071		
Dist. Surveyed (ft)	715				

Reach #	Species Code	Count	Fork Length mm	Condition Code
2	OC	1	102	2
2	OC	1	112	2
2	OC	1	112	2
2	OC	1	112	2
2	OC	1	113	2
2	OC	1	114	2
2	OC	1	114	2
2	OC	1	114	2
2	OC	1	114	2
2	OC	1	117	2
2	OC	1	118	2
2	OC	1	118	2
2	OC	1	119	2
2	OC	1	119	2
2	OC	1	120	2
2	OC	1	121	2
2	OC	1	122	2
2	OC	1	123	2
2	OC	1	124	2
2	OC	1	124	2
2	OC	1	131	2
2	OC	1	134	2
2	OC	1	147	2
2	OC	1	174	2
2	OC	1	190	2
2	OC	1	218	2
2	OC	1	222	2
2	SH	1	133	--
2	TF	1	57	--
2	Cottus	Y	--	--
2	PGS	Y	--	--

Comments: Reach 2 from USFS bridge over High Prairie u/s 715 ft for pass 1 and 448 ft pass 2

Appendix 6. Summary of salmonids captured on 30 April 1999 during electrofishing surveys of two reaches in lower High Prairie Creek, lower Klamath River, California.

Creek	High Prairie Creek	**Reach #**	1	
Date	30-Apr-99	**Water Temp**	54 ºF	**at Time**
Crew	TH, BJ, ED	**Air Temp**	62 ºF	**at Time**
Weather	Sunny	**Water Visibility (ft)**	3.5	
Est. Discharge (cfs)	5.5	**S-Time (sec)**	861	
Dist. Surveyed (ft)	700			

Reach #	**Species Code**	**Count**	**Fork Length mm**	**Condition Code**
1	OC	1	124	2
1	OC	1	115	1
1	OM	1	122	2
1	OM	1	109	2
1	OM	1	109	1
1	OM	1	109	1
1	OM	1	106	1
1	TF	1	35	--
1	Cottus	Y	--	--
1	GA	Y	--	--
1	Lampetra	Y	--	--

Comments: Reach 1 began at confluence with Salt Creek to ~ Quad Trail (700 ft).
Stickleback in spawning colors, 20-30 lamprey (digging redds)

Appendix 6. Continued.

Creek	High Prairie Creek	**Reach #**	1		
Date	30-Apr-99	**Water Temp**	54 ºF	**at Time**	16:00
Crew	TH, BJ, ED	**Air Temp**	58 ºF	**at Time**	
Weather	Sunny	**Water Visibility (ft)**	3.5		
Est. Discharge (cfs)	5.5	**S-Time (sec)**			
Dist. Surveyed (ft)	836				

Reach #	Species Code	Count	Fork Length mm	Condition Code
2	OC	1	189	2
2	OC	1	129	2
2	OC	1	119	1
2	OC	1	118	2
2	OC	1	98	1
2	OC	1	94	1
2	OM	1	120	2
2	OM	1	119	2
2	OM	1	116	2
2	OM	1	105	2
2	OM	1	102	2
2	OM	1	98	2
2	OM	1	97	2
2	OM	1	93	2
2	OM	1	90	2
2	OM	1	83	1
2	OM	1	81	1
2	Cottus	Y	--	--
2	GA	Y	--	--
2	Lampetra	Y	--	--

Comments: Reach 2 began 300 ft d/s of 101 bridge u/s 836 ft

Appendix 7. Summary of salmonids captured on 12 April 2000 during an electrofishing survey in lower High Prairie Creek, lower Klamath River, California.

Creek	High Prairie Creek	**Reach #**	1		
Date	12-Apr-00	**Water Temp**	53 ºF	**at Time**	16:35
Crew	BJ, DW, OG	**Air Temp**	62 ºF	**at Time**	16:35
Weather	Rain	**Water Visibility (ft)**	Clear		
Est. Discharge (cfs)	1.5	**S-Time (sec)**	583		
Dist. Surveyed (ft)	475				

Species Code	Count	Fork Length mm	Condition Code
OC	1	94	1
OC	1	78	1
OC	1	78	1
OM	1	150	2
OM	1	140	2
OM	1	120	2
OM	1	120	1
OM	1	109	1
OM	1	90	1
OM	1	81	1
TF	1	41	1
TF	1	38	1
TF	1	36	1
Catostomus	Y	--	--
GA	Y	--	--
RO	Y	--	--

Comments: From mouth u/s 475 ft to 300 ft d/s of 101 bridge

Appendix 8. Summary of salmonids captured during electrofishing surveys conducted in four reaches in May 2002 in High Prairie Creek, lower Klamath River, California.

Creek	High Prairie Creek	**Reach #**	1		
Date	13-May-02	**Water Temp**		**at Time**	13:45
Crew	SG, DJ, JJ	**Air Temp**		**at Time**	
Weather	Partly sunny	**Water Visibility (ft)**			
Est. Discharge (cfs)		**S-Time (sec)**			
Dist. Surveyed (ft)	70				

Reach #	Species Code	Count	Fork Length mm	Condition Code
1	OK	1	79	--
1	OK	1	73	--
1	OK	1	69	--
1	OK	1	68	--
1	OK	1	67	--
1	OK	1	66	--
1	OK	1	64	--
1	OK	1	60	--
1	OK	1	60	--
1	OK	1	60	--
1	TF	1	59	--
1	TF	1	55	--
1	TF	1	53	--
1	TF	1	47	--
1	TF	1	47	--
1	TF	1	46	--
1	TF	1	44	--
1	TF	1	43	--
1	GA	Y	--	--

Comments: Reach 1 began 500 ft upstream of HWY 101 bridge.
Encountered one female stickleback full of eggs.

Appendix 8. Continued.

Creek	High Prairie Creek	**Reach #**	2		
Date	13-May-02	**Water Temp**		**at Time**	14:30
Crew	SG, DJ, JJ	**Air Temp**		**at Time**	
Weather	Sunny	**Water Visibility (ft)**			
Est. Discharge (cfs)		**S-Time (sec)**			
Dist. Surveyed (ft)	130				

Reach #	**Species Code**	**Count**	**Fork Length mm**	**Condition Code**
2	OC	1	137	--
2	OC	1	125	--
2	OC	1	70	--
2	OC	1	67	--
2	OC	1	59	--
2	OC	1	58	--
2	OC	1	55	--
2	OK	1	77	--
2	OK	1	69	--
2	OK	1	68	--
2	OK	1	67	--
2	OK	1	65	--
2	OK	1	62	--
2	OK	1	61	--
2	OM	1	125	--
2	TF	1	65	--
2	TF	1	65	--
2	TF	1	60	--
2	TF	1	58	MORT
2	TF	1	54	--
2	TF	1	50	--
2	TF	1	47	--
2	TF	1	38	--

Comments: Reach 2 began just upstream of Reach 1.

Appendix 8. Continued.

Creek	High Prairie Creek	**Reach #**	3		
Date	22-May-02	**Water Temp**	44 ºF	**at Time**	14:30
Crew	SG, DJ, JJ	**Air Temp**	61 ºF	**at Time**	
Weather	Sunny	**Water Visibility (ft)**			
Est. Discharge (cfs)		**S-Time (sec)**			
Dist. Surveyed (ft)	100				

Reach #	Species Code	Count	Fork Length mm	Condition Code
3	OC	1	125	2
3	OC	1	114	2
3	OC	1	62	2
3	OC	1	56	1
3	OK	1	67	--
3	OK	1	66	--
3	OK	1	61	--
3	OK	1	58	--
3	OK	1	57	--
3	OK	1	55	--
3	OK	1	54	--
3	OK	1	54	--
3	OK	1	54	--
3	OK	1	52	--
3	OK	1	50	--
3	OK	1	48	--
3	OK	1	48	--
3	OK	1	48	--
3	OK	1	48	--
3	OK	1	47	--
3	OK	1	44	--
3	OK	1	44	--
3	OK	1	44	--
3	OK	1	42	--
3	OK	1	37	--
3	OM	1	58	--
3	OM	1	57	--
3	OM	1	55	--
3	OM	1	54	--
3	OM	1	52	--
3	OM	1	52	--
3	OM	1	50	--
3	OM	1	49	--
3	OM	1	49	--
3	OM	1	49	--
3	OM	1	48	--
3	OM	1	48	--
3	OM	1	46	--
3	OM	1	45	--

Appendix 8. Continued.

Creek	High Prairie Creek	**Reach #**	3		
Date	22-May-02	**Water Temp**	44 ºF	**at Time**	14:30
Crew	SG, DJ, JJ	**Air Temp**	61 ºF	**at Time**	
Weather	Sunny	**Water Visibility (ft)**			
Est. Discharge (cfs)		**S-Time (sec)**			
Dist. Surveyed (ft)	100				

Reach #	**Species Code**	**Count**	**Fork Length mm**	**Condition Code**
3	OM	1	45	--
3	OM	1	45	--
3	OM	1	44	--
3	OM	1	44	--
3	OM	1	42	--
3	OM	1	42	--
3	OM	1	41	--
3	OM	1	40	--
3	OM	1	40	--
3	OM	1	40	--
3	OM	1	38	--
3	OM	1	38	--
3	OM	1	38	--
3	OM	1	35	--
3	TF	1	25	--

Comments: Labeled as Reach 2 on data sheet…unsure of location.
Dominant habitat types were shallow pools and riffles; cover types were large and small woody debris.
Dominant substrates were gravel and small cobble; with riparian canopy cover at 90% (alder and maple).

Appendix 8. Continued.

Creek	High Prairie Creek	**Reach #**	4		
Date	22-May-02	**Water Temp**	56 ºF	**at Time**	15:15
Crew	SG, DJ, JJ	**Air Temp**	61 ºF	**at Time**	
Weather	Sunny	**Water Visibility (ft)**			
Est. Discharge (cfs)		**S-Time (sec)**			
Dist. Surveyed (ft)	100				

Reach #	Species Code	Count	Fork Length mm	Condition Code
4	OC		135	2
4	OC		108	2
4	OC		106	2
4	OC		65	2
4	OC		62	2
4	OC		55	2
4	OK		70	--
4	OK		67	--
4	OK		67	--
4	OK		60	MORT
4	OK		53	--
4	OM		66	--
4	OM		65	MORT
4	OM		55	--
4	OM		53	--
4	OM		48	--
4	OM		48	--
4	OM		44	MORT
4	OM		34	--

Comments: Dominant habitat types were scour pools and riffles; cover types were large and small woody debris. Dominant substrate classes were small cobble and sand; riparian canopy cover was 10% (maple).

Appendix 9. Summary of salmonids captured during electrofishing surveys conducted in three reaches in June 2003 in High Prairie Creek, lower Klamath River, California.

Creek	High Prairie Creek	**Reach #**	1	
Date	17-Jun-03	**Water Temp**		**at Time**
Crew	BL, PL, JJ	**Air Temp**		**at Time**
Weather	Overcast	**Water Visibility (ft)**		
Est. Discharge (cfs)	2	**S-Time (sec)**		
Dist. Surveyed (ft)	620			

Reach #	Species Code	Count	Fork Length mm	Weight g	Condition Code
1	OC	1	104	10.7	1
1	OC	1	103	12.9	1
1	OC	1	100	10.2	1
1	OC	1	98	10.1	1
1	OC	1	92	8.9	1
1	OC	1	82	6.3	1
1	OC	1	80	5.3	1
1	OC	1	72	3.8	1
1	OC	1	70	3.6	1
1	OC	1	70	3.6	1
1	OC	1	68	3.1	1
1	OC	1	68	3.1	1
1	OC	1	68	3.3	1
1	OC	1	66	3.5	1
1	OC	1	64	3.2	1
1	OC	1	64	2.9	1
1	OC	1	62	2.5	1
1	OC	1	62	2.9	1
1	OC	1	62	2.4	1
1	OC	1	60	2.4	1
1	OM	1	108	16.8	--
1	TF	1	63	2.5	--
1	TF	1	62	2.3	--
1	TF	1	59	2	--
1	TF	1	58	2	--
1	TF	1	54	1.5	--
1	TF	1	52	1.4	--
1	TF	1	52	1.4	--
1	TF	1	52	1.4	--
1	TF	1	50	1.1	--
1	TF	1	50	1.2	--
1	TF	1	48	1	--
1	TF	1	47	1.2	--
1	TF	1	46	1.1	--
1	TF	1	44	1.8	--
1	TF	1	44	0.8	--
1	TF	1	44	1	--
1	TF	1	42	0.7	--
1	TF	1	42	0.7	--

Appendix 9. Continued.

Creek	High Prairie Creek	**Reach #**	1
Date	17-Jun-03	**Water Temp**	**at Time**
Crew	BL, PL, JJ	**Air Temp**	**at Time**
Weather	Overcast	**Water Visibility (ft)**	
Est. Discharge (cfs)	2	**S-Time (sec)**	
Dist. Surveyed (ft)	620		

Reach #	Species Code	Count	Fork Length mm	Weight mg	Condition Code
1	TF	1	40	0.6	--
1	TF	1	38	0.5	--
1	TF	51	--	--	--
1	Cottus	Y	--	--	--
1	PGS	Y	--	--	--
1	Tail frog larvae	Y	--	--	--

Comments: Reach 1 began at the USFS bridge to 620 ft u/s

Appendix 9. Continued.

Creek	High Prairie Creek	**Reach #**	2
Date	18-Jun-03	**Water Temp**	**at Time**
Crew	DW, OG, JJ	**Air Temp**	**at Time**
Weather	Overcast	**Water Visibility (ft)**	
Est. Discharge (cfs)	5	**S-Time (sec)**	823
Dist. Surveyed (ft)	260		

Reach #	Species Code	Count	Fork Length mm	Condition Code
2	OC	1	138	2
2	OC	1	114	1
2	OC	1	110	2
2	OC	1	109	1
2	OC	1	105	1
2	OC	1	103	1
2	OC	1	102	1
2	OC	1	102	2
2	OC	1	100	2
2	OC	1	97	1
2	OC	1	96	2
2	OC	1	94	1
2	OC	1	94	1
2	OC	1	92	1
2	OC	1	91	1
2	OC	1	85	2
2	OC	1	82	1
2	OC	1	76	1
2	OC	1	76	1
2	OC	1	76	1
2	OC	1	75	1
2	OC	1	74	1
2	OC	1	72	1
2	OC	1	71	1
2	OC	1	70	1
2	OC	1	68	1
2	OC	1	68	1
2	OC	1	68	1
2	OC	1	65	1
2	OC	1	62	1
2	OC	2	--	--
2	OM	1	151	2
2	OM	1	106	2
2	OM	1	100	1
2	OM	1	90	1
2	OM	1	80	2
2	OM	1	76	1
2	OM	1	75	1
2	TF	1	70	--

Appendix 9. Continued.

Creek	High Prairie Creek	**Reach #**	2
Date	18-Jun-03	**Water Temp**	**at Time**
Crew	DW, OG, JJ	**Air Temp**	**at Time**
Weather	Overcast	**Water Visibility (ft)**	
Est. Discharge (cfs)	5	**S-Time (sec)**	823
Dist. Surveyed (ft)	260		

Reach #	Species Code	Count	Fork Length mm	Condition Code
2	TF	1	68	--
2	TF	1	68	--
2	TF	1	66	--
2	TF	1	65	--
2	TF	1	65	--
2	TF	1	65	--
2	TF	1	64	--
2	TF	1	62	--
2	TF	1	62	--
2	TF	1	62	--
2	TF	1	62	--
2	TF	1	60	--
2	TF	1	60	--
2	TF	1	58	--
2	TF	1	58	--
2	TF	1	58	--
2	TF	1	55	--
2	TF	1	55	--
2	TF	1	29	--
2	TF	74	--	--

Appendix 9. Continued.

Creek	High Prairie Creek	**Reach #**	3
Date	18-Jun-03	**Water Temp**	**at Time**
Crew	DW, OG, JJ	**Air Temp**	**at Time**
Weather	Partly cloudy	**Water Visibility (ft)**	
Est. Discharge (cfs)	3	**S-Time (sec)**	458
Dist. Surveyed (ft)	206		

Reach #	Species Code	Count	Fork Length mm	Condition Code
3	OC	1	156	2
3	OC	1	135	1
3	OC	1	129	2
3	OC	1	128	1
3	OC	1	121	2
3	OC	1	118	1
3	OC	1	118	2
3	OC	1	116	1
3	OC	1	111	1
3	OC	1	110	1
3	OC	1	109	1
3	OC	1	108	1
3	OC	1	105	1
3	OC	1	105	1
3	OC	1	104	1
3	OC	1	103	1
3	OC	1	101	1
3	OC	1	100	1
3	OC	1	98	1
3	OC	1	94	2
3	OC	1	88	1
3	OC	1	84	1
3	OC	1	79	1
3	OC	1	79	1
3	OC	1	77	1
3	TF	1	74	--
3	TF	1	68	--
3	TF	1	68	--
3	TF	1	67	--
3	TF	1	66	--
3	TF	1	65	--
3	TF	1	64	--
3	TF	1	64	--
3	TF	1	62	--
3	TF	1	60	--
3	TF	1	59	--
3	TF	1	59	--
3	TF	1	59	--
3	TF	1	58	--

Appendix 9. Continued.

Creek	High Prairie Creek	**Reach #**	3
Date	18-Jun-03	**Water Temp**	**at Time**
Crew	DW, OG, JJ	**Air Temp**	**at Time**
Weather	Partly cloudy	**Water Visibility (ft)**	
Est. Discharge (cfs)	3	**S-Time (sec)**	458
Dist. Surveyed (ft)	206		

Reach #	Species Code	Count	Fork Length mm	Condition Code
3	TF	1	57	--
3	TF	1	54	--
3	TF	1	52	--
3	TF	1	46	--
3	TF	1	43	--
3	TF	1	40	--
3	TF	2	--	--

Appendix 10. Summary of fish rescued from drying habitats during summer 2002 and 2003 in High Prairie Creek, lower Klamath River, California.

Date	Reach	Species Code	Fork Length mm	Weight g	Condition	Crew
21-Jun-02	HP_XS2	OC	68	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	68	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	63	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	63	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	62	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	60	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	60	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	60	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	59	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	59	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	58	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	58	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	57	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	56	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	56	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	55	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	55	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	54	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	53	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	53	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	52	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	51	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	50	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	50	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	50	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	50	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	50	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	50	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	48	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	48	--	2	SG, DJ, TM
21-Jun-02	HP_XS2	OC	45	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	44	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	43	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	43	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	42	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OC	42	--	1	SG, DJ, TM
21-Jun-02	HP_XS2	OK	158	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	78	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	76	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	76	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	75	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	74	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	72	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	72	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	69	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	67	--	--	SG, DJ, TM

Appendix 10. Continued.

Date	Reach	Species Code	Fork Length mm	Weight g	Condition	Crew
21-Jun-02	HP_XS2	OK	66	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	63	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	63	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	61	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	61	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	60	--	Mort	SG, DJ, TM
21-Jun-02	HP_XS2	OK	60	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	60	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	60	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	60	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	59	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	59	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	58	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	57	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	56	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	56	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	56	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	56	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	56	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	56	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	55	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	55	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	55	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	54	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	53	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	53	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	52	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	50	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	OK	49	--	Mort	SG, DJ, TM
21-Jun-02	HP_XS2	OK	36	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	53	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	52	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	51	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	50	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	50	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	48	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	45	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	45	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	45	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	45	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	45	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	42	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	41	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	41	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	40	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	40	--	--	SG, DJ, TM

Appendix 10. Continued

Date	Reach	Species Code	Fork Length mm	Weight g	Condition	Crew
21-Jun-02	HP_XS2	TF	38	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	38	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	33	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	32	--	Mort	SG, DJ, TM
21-Jun-02	HP_XS2	TF	32	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	32	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	32	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	32	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	30	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	30	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	30	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	29	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	28	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	25	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	22	--	--	SG, DJ, TM
21-Jun-02	HP_XS2	TF	22	--	--	SG, DJ, TM
30-May-03	Quad trail	OC	63	3.6	2	SG, DJ
30-May-03	Quad trail	OK	122	19.5	3	SG, DJ
30-May-03	Quad trail	OK	125	21.6	3	SG, DJ
30-May-03	Quad trail	OK	129	29.0	3	SG, DJ
30-May-03	Quad trail	OK	115	18.7	3	SG, DJ
30-May-03	Quad trail	OK	126	23.4	3	SG, DJ
30-May-03	Quad trail	OM	135	31.8	2	SG, DJ
30-May-03	Quad trail	OM	115	19.0	2	SG, DJ
30-May-03	Quad trail	TF	45	1.1	1	SG, DJ
30-May-03	Quad trail	TF	61	3.0	1	SG, DJ
30-May-03	Quad trail	TF	62	3.6	1	SG, DJ
30-May-03	Quad trail	TF	52	1.8	1	SG, DJ
30-May-03	Quad trail	TF	60	2.6	1	SG, DJ
30-May-03	Quad trail	TF	58	2.0	1	SG, DJ
30-May-03	Quad trail	TF	65	2.9	1	SG, DJ
30-May-03	Quad trail	TF	50	1.7	1	SG, DJ
30-May-03	Quad trail	LT	--	--	--	SG, DJ