

**FISHERY AND RIPARIAN RESOURCES  
OF  
DEVILS POSTPILE NATIONAL MONUMENT  
AND SURROUNDING WATERS**

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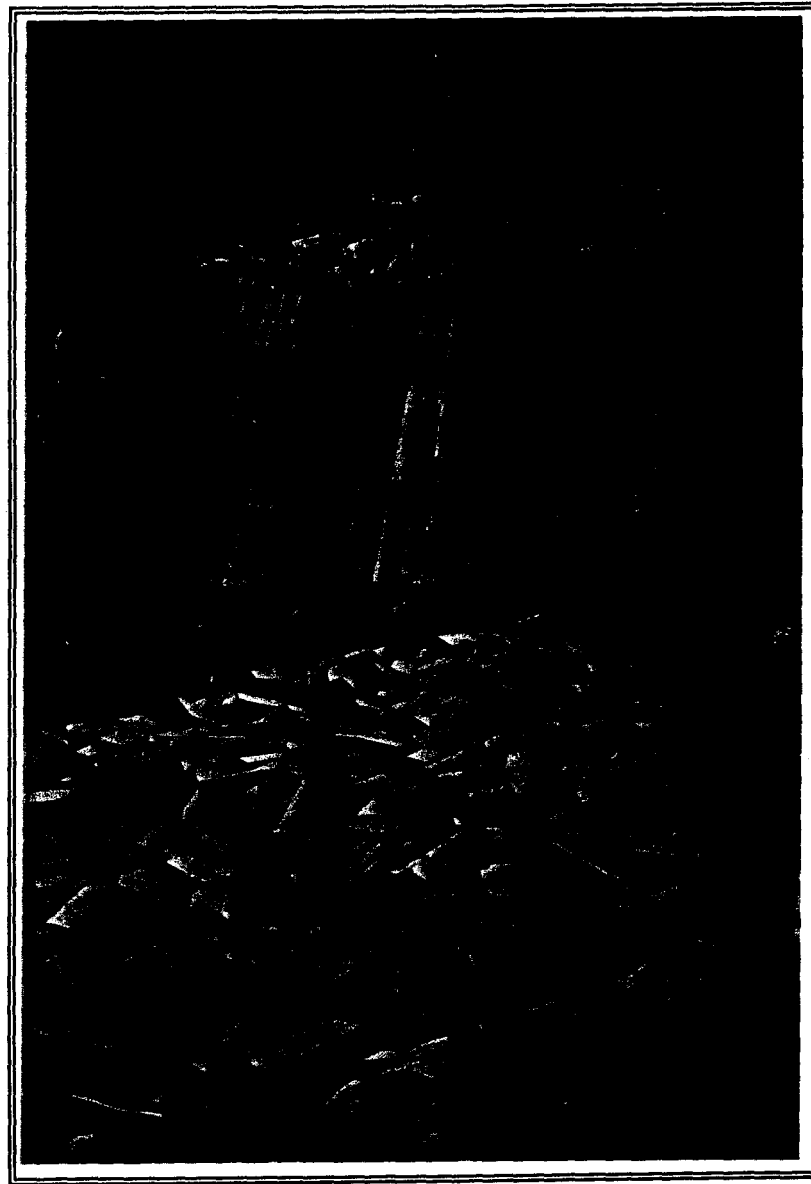
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## **ABSTRACT**

This paper systematically combines and augments fishery and riparian information developed over the past decade in Devils Postpile National Monument and vicinity, Madera County, California. The 1992 Rainbow Fire affected water chemistry, upland and riparian vegetation, and extirpated the brown trout of Boundary Creek. Riparian vegetation is rapidly recovering and no evidence indicates fire impact on aquatic biota or habitat condition in the study area. Hydrologic and water chemistry data were gathered for all streams and ponds in the study area. Frequency and distribution of habitat types were inventoried for all streams. A stream gauge was installed in the Middle Fork San Joaquin River near the Devils Postpile formation to provide the means for monitoring river discharge. Aquatic macroinvertebrate communities in the Middle Fork are uniform and show no evidence of pollution or environmental stress. Pacific tree frog is widespread in the study area; other anurans present in similar Sierra Nevada habitats were not found. The endangered Owens tui chub occurs in Sotcher Lake and Reds Meadow Creek, but appears not to have spread to the Middle Fork. Four species of trout were found in the river, and are isolated in tributary streams in a variety of assemblages. Catchable trout stocked upstream of the Monument disperse downstream and are found in many accessible habitats. Angler self-survey, hook-and-line sampling, and past roving clerk and electrofishing surveys support earlier conclusions that the recreational fishery ranks among the highest in California in stream-born trout density, biomass, catch rate, and angler effort. These fishery attributes and the findings of this resource assessment led to the designation of the Middle Fork San Joaquin River within Devils Postpile National Monument as Wild Trout Water by the California Fish and Game Commission in June, 1995.

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Frontispiece. Devils Postpile formation.

... the natural formations known as Devil Postpile and Rainbow Falls<sup>1</sup>, ... are of scientific interest, and it appears that the public interests will be promoted by reserving said formations as a National Monument ... Wm. H. Taft

From the Establishment Proclamation  
(No. 1166) of July 6, 1911

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<sup>1</sup>See Figure 11

## INTRODUCTION

Few California trout streams provide anglers the opportunity to catch four species of trout, the "Grand Slam" of trout angling. Rainbow, brown, brook, and golden trout all inhabit the Middle Fork San Joaquin River. Knowing that "natural processes must be allowed to progress without human intervention," the National Park Service requested that stocking of trout in Devils Postpile National Monument waters cease in 1971 (Eckhardt 1994). This would allow anglers to catch a diversity of stream-born trout, including California's state fish, the golden trout, amid the geologic wonders and natural beauty of Devils Postpile National Monument.

Recreational fishing has been part of the National Park System since its creation. The primary goal has been to provide the recreational angler with a quality fishery experience while preserving wild or native species and their habitats in a natural condition (Eckhardt 1994). The diversity and abundance of introduced trouts make this segment of the Middle Fork unique.

With the successful responses seen in fisheries under wild trout management in several western states, including California (Snider 1981), it was the desire of the National Park Service and California Department of Fish and Game to have the Devils Postpile National Monument segment of the Middle Fork designated "Wild Trout Water" and to manage the river and its fishery as such.

There was a need for baseline information on the status of nongame aquatic animals in the monument to fulfill the National Park Service and Department of Fish and Game's trustee duties for conservation of biodiversity. Surveys were performed to quantify aquatic invertebrate populations and amphibian species occurrence.

Aquatic and riparian resource data collected over the past decade was complimented by a comprehensive evaluation and current status report. This joined past fragmented works into a coherent whole, and set the framework for long term environmental monitoring. This survey of the historical and existing conditions of the Middle Fork fishery, in-stream and riparian resources, and sensitive species led to the

designation of the Middle Fork San Joaquin River within Devils Postpile National Monument as "Wild Trout Water" by the California Fish and Game Commission in June 1995. Now with a more organized and thorough understanding of the aquatic resources of the Monument, the staff is better prepared to adapt to changing conditions.

## STUDY AREA

The Middle Fork San Joaquin River originates from 128 hectare (320 acres) Thousand Island Lake within the Ansel Adams Wilderness Area, Madera County, California, at an elevation of 2,998 m (9,834 ft) (Figure 1). It flows 14.1 km (8.75 mi), through National Forest system lands in a southerly direction in a moderately steep glacial valley to enter 320 hectare (800 acres) Devils Postpile National Monument at 2,317 m (7,600 ft) (Figure 2). The river continues to flow south (mean gradient = 1.5%) past the Devils Postpile formation (Figure 3). After 6.0 km (3.7 mi) the river exits the Monument at 2,195 m (7,200 ft). At that point the Middle Fork, a fourth order stream, is draining 13,200 ha (32,495 acres). From there, the river continues through California's Central Valley to its terminus in the Sacramento-San Joaquin River delta. Because natural processes and biota span administrative boundaries, the study area was extended 0.8 km (0.5 mi) outward from the Monument boundaries (Figure 4) to include areas which may closely influence Monument resources. The additional area totals 1,040 ha (2,554 acres) of National Forest land enlarging the area studied to near 1,370 ha (3,352 acres). All lands in the study area west of the San Joaquin River and south of Boundary Creek are designated Wilderness.

The Middle Fork changes character frequently as it flows south through the lightning ignited, August 1992 Rainbow Fire burn area (Manley 1992). The fire burned in 85% of the National Monument lands (Figure 5). The river in the northern section of the study area is comprised of large and small woody debris, boulders, cobbles, gravel, and small amounts of fine sediment in a wide, shallow, and somewhat braided, meandering channel (Figure 6). To the south, the river commonly has a steep, straight, narrow, and

confined channel (Figure 7). Abundant riffle and run habitats make productive aquatic macroinvertebrate habitat, feeding and spawning sites for trout. Trout use the Middle Fork's many pools of irregular size and type as refuge from predators and strong currents (Figures 8, 9, and 10). The river displays the most dramatic change at Rainbow Falls near the southern boundary of the Monument. Here the Middle Fork plunges 30.8 m (101 ft) over a volcanic cliff to a shallow bedrock lined pool below (Figure 11). Downstream from Rainbow Falls there are 0.65 km (0.4 mi) of riffle and flatwater habitats before the Middle Fork exits the Monument.

For the past 46 years, annual precipitation in the Monument is estimated at 72.1 cm (28.4 in) (LADWP 1994). The majority of summer flow entering the study area does not originate as runoff from Monument tributaries and hill slopes, but from snowmelt higher in the watershed on National Forest system lands. Over 135 lakes drain into the Middle Fork upstream of the Monument. Intermittent and perennial tributaries are underlain by basaltic or granitic rocks. Little sheet run-off from rain enters the Middle Fork in the study area due to highly permeable volcanic soils. Prior to 1994, stream discharge data was not systematically collected in the Monument (Eckhardt 1994).

Common Monument riparian vegetation include Lemmon's willow (*Salix lemmonii*), mountain (creek) alder (*Alnus tenuifolia*), quaking aspen (*Populus tremuloides*), black cottonwood (*Populus trichocarpa*), western dogwood (*Cornus occidentalis*), and creek dogwood (*Cornus stolonifera*). A list of common riparian plant species appears in Table 1.

Watershed slopes are characterized by lodgepole pine-red fir forest (*Pinus contorta* var. *murrayana* and *Abies magnifica*) typical of mid-elevations on the west slope Sierra Nevada. Jeffrey pine (*Pinus jeffreyi*) grow on south facing slopes, and Western white pine (*Pinus monticola*) is found on north facing rock benches. Other species include white fir (*Abies concolor*), Western hemlock (*Tsuga mertensiana*), and Western juniper (*Juniperus occidentalis*). No known threatened, endangered, or sensitive plant species are found in the Monument (Ogden 1994).

Beaver (*Castor canadensis*) were reportedly introduced to Reds Meadow Creek

below Sotcher Lake in the 1950's, but it is uncertain by whom (Sollima 1994). Today, occupied and remnant beaver dams and their effects are noticeable (Figures 12 and 13). Other mammals known to frequent riparian areas in the Monument include pine marten (*Martes americana*), raccoon (*Procyon lotor*), black bear (*Ursus americanus*), mule deer (*Odocoileus hemionus*), water shrew (*Sorex palustris*), and coyote (*Canis latrans*).

Common riparian birds of the Monument (Table 2) include the American dipper (water ouzel) (*Cinclus mexicanus*), belted kingfisher (*Ceryle alcyon*), great blue heron (*Ardea herodias*), spotted sandpiper (*Actitis macularia*), and California gull (*Larus californicus*). Double-crested cormorants (*Phalacrocorax auritus*) have been seen at Starkweather Lake (Ogden 1994). The endangered willow flycatcher (*Empidonax trailii*) was sighted in Monument meadows (Brubaker 1994).

The herpetofauna in the study area is less diverse. Reptiles include the mountain western terrestrial garter snake (*Thamnophis elegans elegans*), striped racer (*Masticophis lateralis*), and Northern alligator lizard (*Gerrhonoyus coeruleus*). Amphibians include only the Pacific tree frog (*Hyla regilla*) (Basey 1991).

Four species of trout (Salmonidae) sustain the study area fisheries. These are rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and golden trout (*Oncorhynchus mykiss aguabonita*). Rainbow trout x golden trout hybrids also occur in and adjacent to Monument waters. The only nongame fish found in the study area is the introduced Owens tui chub (*Gila bicolor snyderi*: Cyprinidae). This chub subspecies is listed as endangered under both federal and state Endangered Species Acts.

Approximately 150,000 visitors come to Devils Postpile National Monument during the summer season which usually lasts from mid-June through October (Huber and Eckhardt 1985). Camping, fishing, hiking, and pack-stock trips are popular along the Pacific Crest National Scenic Trail and the John Muir Trail. Cattle grazing, mining, and commercial timber harvest do not occur in the study area or watershed (Eckhardt 1994). Road development within Monument boundaries is limited to 0.6 km (0.4 mi) paved and 0.9 km (0.6 mi) unpaved. Outside the Monument boundary, but within

the study area, an additional 4.9 km (3.0 mi) of paved and unpaved roadways exist.

## METHODS

### *Hydrology*

Annual precipitation data for the period 1946-1994 were obtained from the City of Los Angeles Department of Water and Power Division of Hydrography. Subsequent weather data are being collected near the ranger station by a Remote Automated Weather Station (RAWS) which was brought on-line in June 1994, but the data were not used in this study. The RAWS station measures rainfall, wind direction, wind speed, air and fuel temperatures, relative humidity, peak wind gust direction and velocity, fuel moisture, air temperature range, and relative humidity range. Data are transmitted via satellite to the National Interagency Fire Center in Boise, Idaho where they can be accessed.

No quantitative records of river flow in the Monument existed prior to 1994. A 0.9 m (3.0 ft) permanent staff gauge was installed on bedrock along a uniform segment of the Middle Fork near the Devils Postpile formation. The staff gauge was assigned a true elevation by Nevada Air National Guard surveyors using a "total station." A stage-discharge relationship was developed using multiple measurements of discharge from a suitable site near the pumphouse, a distance of 1.2 km (0.75 mi) upstream from the staff gauge. Discharge measurements were made by wading the cross section with a pygmy current meter. Techniques followed the midsection method of Buchanan and Somers (1969). Flow volumes are monitored by National Park rangers during routine patrol activities. The record of streamflow characteristics will provide a basis with which to interpret long term ecological and climatic data.

Stream gradient and length were obtained using the Devils Postpile quadrangle 15 minute topographic map, clinometer, and hip-chain. Area and distance calculations were made using a dot grid and cartometer.

### ***Water Chemistry***

A Ryan TempMentor thermograph was secured in the Middle Fork in June 1994 to measure hourly water temperature. A bulb thermometer was used to measure water temperature for all amphibian and tributary stream sites. An Oakton "Testr 1" pocket pH meter ( $\pm 0.2$ ) was used for field measurement of pH. pH data were analyzed for sampled ponds by analysis of variance (ANOVA) (Dowdy and Weardon 1991) using SYSTAT (1992). Observations of sedimentation and substrate quality were made during habitat typing inventory.

### ***Habitat Typing Inventory***

Inventories of aquatic and riparian habitats were conducted along the Middle Fork and its tributaries from Lower Falls upstream to Reds Creek using the methods of Flosi and Reynolds (1991). This method divides and classifies streams into physical units with homogeneous habitat characteristics. Each unit is assigned to one of 24 habitat types, each of which is a subset of the general classifications "pool" or "riffle". Habitat types are determined by their physical characteristics as well as by the hydrologic forces which create them. A detailed description habitat types with the associated letter code abbreviations is presented in Appendix A. Instream shelter complexity was rated on a scale of zero to three (0 = no shelter), and "shelter rating" was derived by multiplying the complexity rating by percent cover. Percent cover is an area measure occupied by instream shelter divided by total area of each habitat unit.

Eight stream bank composition classes were used in defining mean percentage of dominant vegetation. They include bedrock, boulder, cobble/gravel, bare soil, grass, brush, deciduous trees, and coniferous tree bank composition types. Substrate embeddedness (%), the amount of the bottom substrate of the habitat unit that is buried in the channel bed or surrounded by other substrates was visually estimated in pool tails and low gradient riffles (Flosi and Reynolds 1991). Stream channels were classified according to Rosgen (1994).

Riverine habitat data were summarized using California Department of Fish and

Game's HABITAT 3.0 software. Sequential numbers were assigned to all aquatic habitat units surveyed to assist in stratification of further samples. The National Park Service provided aerial photos of the study area for field reference.

### ***Biotic Inventory***

**Aquatic Macroinvertebrates** Aquatic macroinvertebrate taxon composition and diversity were measured to describe the benthic community, and to quantify potential impacts from human disturbance (Schroeter and Harrington 1995). Samples were collected on June 23 and 24, 1994 after the river flow declined to a suitable level.

Six comparable riffles were selected along chosen areas of the Middle Fork (Figure 14). Three transects were randomly placed across each riffle. Along each transect, three areas of 0.18 m<sup>2</sup> (2 ft<sup>2</sup>) were subsampled by disturbing the substrate to a depth of 10.2 cm (4 in) and collecting the invertebrates in a net. The collections were combined, after which three hundred invertebrates were subsampled and identified to the lowest possible taxonomic level (Harrington, undated).

Each taxon was designated a functional feeding group based on Merritt and Cummins (1984). Bioassessment metrics described in Plafkin et al. (1989) were used to describe the macroinvertebrate community at each station. The diversity index based on Shannon and Weaver (1963) was calculated for each sample. Other macroinvertebrate methods used followed the U.S. Environmental Protection Agency Rapid Bioassessment Protocol as modified by Harrington (undated). Samples were sorted and processed at California Department of Fish and Game's Aquatic Bioassessment Laboratory in Rancho Cordova, CA. Voucher specimen sets and residual samples were returned to the Monument for curation, research, and interpretive uses.

Macroinvertebrates in ponds were sampled by dip-net using standard sweeps from all accessible habitats. Animals were identified to lowest possible taxonomic level, and the composition and diversity (taxon richness) of the samples were determined using standard methods and keys (Usinger 1963; Wiggins 1977; Pennak 1978; Merritt and Cummins 1984; Magurran 1988; Eng et al. 1990). Macroinvertebrate taxa and surface area

relationships were analyzed using linear regression and ANOVA techniques (Dowdy and Weardon 1991; SYSTAT 1992). Due to small sample sizes, taxon richness data were square-root transformed (Dowdy and Weardon 1991) to normalize data prior to analysis.

Fishes. Trout populations have been periodically assessed beginning in 1987 using electrofishing equipment at permanent stations established by the California Department of Fish and Game (Eckhardt 1994). Population density and size structure estimates were derived according to the methods of Van Deventer and Platts (1983).

The distribution and relative abundance of Owens tui chub in Reds Meadow Creek was estimated by electrofishing.

Fish species composition and size distributions for tributary streams in the study area were determined by hook-and-line and electrofishing methods. Fish condition factor ( $K$ ), a measure of body proportion or "plumpness", was calculated for individual fish using the formula of Rounsefell and Everhardt (1953):

$$K = \frac{100,000W}{L^3}$$

where:  $W$  = weight of fish (g)  
 $L$  = fork length of fish (mm)

Amphibians. Amphibian presence was visually assessed at standing waters and by using dip nets and hand capture techniques. The aquatic survey protocol of Fellers (1995) was used to record data.

### ***Survey of the Recreational Fishery***

Studies of trout fishery trends in the Middle Fork began with roving-clerk creel surveys conducted by California Department of Fish and Game personnel from June through October 1988 (Deinstadt et al. 1995).

An angler self-survey box was placed 50 m (165 ft) south of the ranger station along the Devils Postpile Trail on June 10, 1994. Information requested from anglers included date, total hours spent fishing, terminal gear used (bait, lure, fly), species,

number, estimated lengths of trout kept or released, and personal satisfaction (-2 to 2) with their angling experience. The self survey enabled time-trend monitoring of the fishery and comparison with approximately 50 other trout fisheries similarly surveyed (Tables 3 and 4). An angler survey box installed upstream of Soda Springs Campground in 1990 provided comparable data on the upper trailside reach of the Middle Fork (Deinstadt et al. 1993).

### ***Photographic Documentation***

Color slides were made for educational, research and interpretive uses as indicated below. The images are incorporated into the 35 mm slide collection at Devils Postpile National Monument.

Aquatic and Riparian Habitats. Representative slides were made in the study area of each macrohabitat type during fish and amphibian habitat surveys.

Fishes. Representative slides of each fish species collected in the study area were made. Specimens were photographed in hand, instream, on a scaled fish board, and in an experimental plexiglass aquarium fabricated for photographing aquatic animals (Figure 15). Subjects were collected by electrofishing and hook-and-line methods.

Amphibians. Representative slides were made of each larval and adult amphibian species encountered. Specimens were photographed in hand, on a scaled fish board, and in the plexiglass aquarium.

## **RESULTS AND DISCUSSION**

Source information, original data, and summary analyses can be found in the Research and Management Recommendations and Appendix sections of this document.

### ***Hydrology***

Tributary streams in the study area drain about 36% of the Middle Fork watershed and contributed 1.26 cms (45 cfs) during spring thaw. Measured flows near the

pumphouse declined from 1.49 to 0.24 cms (49.5 to 8.2 cfs) between July and October 1994 (Figure 16). During 1987-1991, Deinstadt et al. (1995) measured flows of 0.15 - 0.23 cms (5.4 - 8.0 cfs) in September. A subsequent flow reported in the same study measured after a September 1988 storm yielded flows of about 1.32 cms (46.5 cfs). This rapid increase is common in unregulated streams.

### *Water Chemistry*

Few data exist on annual and daily water temperature cycles in the Middle Fork. Deinstadt et al. (1995) state the high temperature of 20 °C (69 °F) occurs in July, while lower temperatures, near 6.7 °C (44 °F), occur in October. Anchor ice occurs in winter. Water temperature summaries were calculated from data automatically recorded by the thermograph (Figure 17). For the period June 8, 1994 through October 15, 1994, the maximum water temperature recorded was 21.8 °C (71 °F) on August 14th. The minimum temperature recorded was a supercooled -0.3 °C (31 °F) on October 5th (Figure 17).

Water temperatures from surveyed ponds varied daily with air temperatures. A high of 25.6 °C (78 °F) was noted at site DPNM-EIN. Sample site JMT-S1Str is fed by a 48 °F spring and the temperature did not vary seasonally (Figure 4). Several lentic sites within the Rainbow Fire burn area have a significantly reduced tree canopy, thus exposing the sites to more sunlight and direct heating than in previous years.

Accelerated erosion and sedimentation of the river from recreational uses does not appear significant, although some soil compaction is evident along stream banks near the ranger station. Flood events, however, are not uncommon to the Devils Postpile area (Figures 18 and 19). Streamflows, geology, watershed and channel characteristics in the study area do not favor deposition of fine materials. Werner (1993) states, "I do not anticipate any serious stream depositional problems caused by the fire. You may get some sand deposition caused by large summer storms, but that will probably be removed by next winter's snowmelt." Manley (1992) noted that on September 1, 1992 the Middle Fork remained clear with no visible sediment as a result of the Rainbow Fire despite the fact that 1.9 cm (0.75 in) of rainfall occurred near the ranger station the previous evening.

Post Rainbow Fire erosion effects on surveyed pond aquatic macroinvertebrate taxon richness also appeared insignificant (ANOVA;  $DF = 1,6$ ;  $P = 0.57$ ) when compared to sites outside the burn area. This is not uncommon under these conditions as nearly all taxa sampled are univoltine flying forms or hitch rides on bird feet and, therefore, excellent dispersers (Thorp and Covich 1991).

The 1992 Rainbow Fire and its effects on canopy may have increased pH values in the study area by allowing more sunlight penetration and increasing primary production. Recorded pH values from the Middle Fork in 1986-1991 averaged 7.7 in the Monument. The 1994 mean pH in the same area was 8.0. This apparent increase seems large since much of the river's shade derives from topography and unburned vegetation. The apparent difference may result from time of day and season when measured. River pH values may be influenced by the abundance of carbonates from soda springs ( $pH = 6.0$ ) located in the Monument. The oligotrophic lakes lying in igneous rock catchments common to the Middle Fork headwaters typically have low buffering capacity and neutral to slightly alkaline pH suggesting that increases in pH may occur downstream or in the river as nutrient levels and photosynthetic rates increase. Ponds sampled in burned areas did not significantly vary in pH (ANOVA;  $DF = 1,9$ ;  $P = 0.38$ ) when compared to unburned sites.

Boundary Creek, Creek Creek, King Creek and its tributary Alligator Creek, three severely burned watersheds, yielded pH values of 8.6, 8.4, 7.9, and 7.7, respectively. No pH data were available for these streams prior to the burn. Some streams in the burn area showed neutral to slightly acidic pH readings (Table 5). These sites lacked aquatic vegetation and are located in canyons that provide shade throughout the day. Historical measures of alkalinity and conductivity in 1986-1991 averaged 37.1 mg/L and 52.8  $\mu S$  (Deinstadt et al. 1995).

### ***Trout Habitat Inventory***

Middle Fork San Joaquin River. Instream trout habitat is adequate for successful spawning, rearing, and wintering for the four resident species. Flatwater and riffle habitats (85%) were most common in the study reach with various pool types making up the

remaining 15% (Figures 20, 21; Tables 6 through 11). Average Middle Fork pool depth was 1.53 m (2.2 ft), width 7.7 m (25.3 ft), and maximum pool depth was 5.0 m (16.3 ft). Mean pool shelter rated 59%, a mid-range value. Shelter was contributed largely by the high stream gradient and canyon geomorphology. Shelter was greater in split channels and low gradient stream segments. Riffles averaged 0.2 m (0.7 ft) deep, 11.7 m (38.4 ft) wide, and had a shelter rating of 36.5%. Flatwater habitat averaged 0.4 m (1.4 ft) deep, 9.8 m (32.2 ft) wide, and had a shelter rating of 43.4%.

Instream cover was high in the B1-1, B-2, and C-3 Rosgen channel types, with bedrock ledges (10%) and boulder cover (14%) dominant. Undercut banks, large and small woody debris, and aquatic vegetation contributed less than 5% of cover each. The highly stable, volcanic formed B1-1 and B-2 channels limit scouring, inhibiting formation of undercut banks and pools. The river canopy (17.4%) comes from 12.2% deciduous and 5.1% coniferous trees. Most shading is provided by canyon walls and deciduous vegetation. Dominant stream bank cover consisted of deciduous trees (59%), grass (16%), and bedrock (11%) (Table 12). Most coniferous trees, some burned, are located on the canyon rims and steep slopes above.

Substrate composition in the Middle Fork varied with habitat. Cascade habitat was bedrock and boulder dominated, riffle habitats were gravel and large cobble dominated, flatwater habitats were gravel and small cobble dominated, while pool habitat substrates had bedrock and gravel dominant with some sands along the margins. Silt and clay deposits were rare in the study reach. About 84.6% of all substrates were less than 25% embedded, suggesting the substrate was mobile during high water. Substrate composition and characteristics typify high quality habitat for invertebrates and trout.

Pack-stock trips, camping, and hiking are common along the river and on the Pacific Crest National Scenic Trail and John Muir Trail, but do not damage river habitat. Most pack-stock trips originate from Reds Meadow Resort during the summer. Several pack-stock crossings exist on the Middle Fork and tributaries. The majority of these sites are in close proximity to log footbridges. Cattle grazing and mining do not occur in the study area.

Evidence of the Rainbow Fire along the Middle Fork was apparent in the lower reaches. However, little fire associated woody debris and sediment input was found in the river. Most of the naturally downed timber was incinerated by the Rainbow Fire.

Trinutary Streams. Physical habitat characteristics for Middle Fork tributaries are summarized in Figure 22 and Table 13.

Alligator Creek is a  $< 0.06$  cms ( $< 2$  cfs), relatively undisturbed, sand, gravel, and silt dominated tributary of King Creek. Main channel pool, scour pool, and meadow habitat types were dominant (Figure 23). Stream bank vegetation was high ( $> 95\%$ ) along the perennial middle and upper reaches. Alligator Creek waters spread unconfined through a saturated meadow thick with Lemmon's willows. Shallow water and thick vegetation inhibit fish movement through this area. Near the confluence with King Creek, most vegetation was burned by the Rainbow Fire. Lemmon's willows were vigorously stump sprouting. Only a few small isolated pools containing brook trout were found in the meadow. Spawning and winter habitat appears poor for brown, rainbow, and golden trout, but adequate for brook trout. Rearing habitat was good for all trout species in the lower reaches near King Creek. No recent signs of livestock use were apparent.

Boundary Creek was similar in size to Alligator Creek. This sand, gravel, and small cobble bottomed stream flows to the Middle Fork through the most intensely burned part of the Rainbow Fire (Figure 24). Boundary Creek has numerous cascade, riffle, and flatwater habitat types (Figure 25). The whole drainage was seared, and trout are believed to have been temporarily extirpated. Unburned coniferous canopy was nonexistent and most deciduous riparian vegetation had been terminated by superheated winds from the fire. Aspen and alder regeneration appeared rapid and selected vegetation plots are being photo-documented by National Park Service personnel. Instream cover has been noticeably increased from downed and drifting burn vegetation, in some areas creating partial upstream barriers to recolonizing brown trout from the Middle Fork. Spawning gravel was clear and rearing habitat plentiful. Winter habitat may be limiting due to shallow pools that likely fill with ice. Road, trail, and pack-stock uses were high in the lower and middle reaches, decreasing habitat and cover values and creating impediments

to fish movement (Figures 26 and 27).

Creek Creek is one of the larger, lower gradient, tributaries to the Middle Fork San Joaquin River flowing near 0.2 cms (7 cfs) in summer 1994. The stream was 78% flatwater and 18% riffle (Figure 28). Creek Creek seems an excellent brown trout stream containing unconsolidated sand and gravel substrates that remain immobile due to low flows, low gradient, and high channel stability. Rainbow trout and brook trout reproduce in Sotcher Lake and its connecting streams, but apparently were not established in this stream. Habitat for all life stages of brown trout appeared superb in Creek Creek. The Rainbow Fire had only scattered effect on canopy and streamside vegetation. Terrestrial and aquatic vegetative shelter was excellent creating highly stable stream banks. Migrational barriers exist on this stream as well and Creek Creek is isolated from the Middle Fork by a high waterfall at the confluence (Figure 29). Human and livestock use is similar to that at Boundary Creek, but with additional traffic in Reds Meadow Campground (Figure 30). Drainage culverts exist in the campground area, but are clear of debris and negotiable by fish. Cover in the immediate area of these structures was minimal. Above the Reds Meadow Creek confluence trout were not found, and habitat complexity is decreased. This reach was dominated by cascade and high gradient riffle, providing little cover. The headwater flows past a 48.9 °C (120 °F) hot spring. Stream temperatures appeared unaffected by the spring, but the mineral content may cause fish to avoid this part of Creek Creek.

Reds Meadow Creek originates at the outlet of Sotcher Lake and flows approximately 0.7 km (0.4 mi) over a low gradient, sand and gravel bed to its confluence with Creek Creek. Riffle, flatwater, and backwater pool habitats, along with a few bedrock and boulder formed habitats, define the creek bed (Figure 31). This excellent trout stream is very similar to that of Creek Creek. The Rainbow Fire did not affect this stream. In its lower reach, human use (mainly in campgrounds) appeared moderate. Drainage structures exist and are passable by trout. There is a trail from Sotcher Lake downstream to the Reds Meadow Campground that crosses the stream by footbridge, but does not directly affect stream habitat. At the uppermost reach below Sotcher Lake,

dense aquatic vegetation and increased stream depth were characteristic. Two beaver dams created fish migration barriers during the mid and low flow months. Additional flow from springs on west-facing slopes provide clear, 48°F water all year. On February 18, 1986, an avalanche into Sotcher Lake created an estimated 2.7 m (9 ft) wave of ice and water that traveled down Reds Meadow Creek and Creek Creek to the Middle Fork San Joaquin River. This occurred during a record storm from February 12-20 that is believed unequaled for 138 years. The dams immediately below Sotcher Lake in Reds Meadow Creek were washed out and have since been re-constructed by the beavers (Sollima 1994).

Minaret Creek is the largest of the Middle Fork tributaries in the study area. In June 1994 it flowed approximately 0.06 cms (20 cfs). Stream habitat above Minaret Falls (an upstream fish barrier) to Johnston Lake is 76% bedrock scour pool, and Rosgen stream types A and B (Figure 32). Cobble, boulder, and bedrock substrates are common (Figure 33). The stream banks were in nearly pristine condition. Pack-stock and backpackers use the nearby John Muir Trail. Instream and terrestrial cover, bank stability, and habitat characteristics for all life stages of trout appeared excellent. This drainage was not affected by the Rainbow Fire.

Reds Creek is a very small intermittent tributary which apparently does not support fish. From the origin at Reds Lake, the creek flows through a 12% gradient Rosgen A stream channel type. It continues under the Minaret Road through a culvert, and into a large meadow where streamflow becomes subsurface. At the end of the meadow, Reds Creek resurfaces to flow through a passable culvert to confluence with the Middle Fork. Main channel pool and flatwater habitats were common in this sand and gravel bottomed stream (Figure 34). Canopy was sparse, but stream banks were completely vegetated. This stream had numerous barriers including discontinuous surface flows through the meadow. This stream reach was accessible to fish, but dried up in late June of 1994. No fish were seen in the drainage.

### ***Amphibian Habitat Inventory***

Over 12.6 ha (31.1 acres) of potential amphibian habitat were physically searched in the study area (Table 5). With the exception of Sotcher Lake and site JMT-S1Str, all sites were natural ponds with no inlet or outlet streams. Substrates mainly consisted of silt and sand. Average and maximum depths were 0.96 m (3.2 ft) and 1.7 m (5.6 ft) respectively. Mean mid-day shade rated 22.5%, mean rooted vegetation 39.6%, and mean floating vegetation 0.8 %. Seventy-five percent of all surveyed sites were altered by the Rainbow fire, accounting for the low mid-day shade percentages. Fallen, burned trees were commonly seen submerged. Unburned ponds to the north and east of the northern Monument boundary were characterized by higher canopy cover and lower aquatic shelter ratings. Hiking trails pass several of the smaller ponds, but many are remotely located and show no signs of visitation. Except for Sotcher Lake, human and pack-stock use appeared minimal. Sotcher Lake is encircled by a self-guided nature trail, has a boat launching area, and usually receives heavy fishing pressure and day use during summer.

### ***Aquatic Macroinvertebrates***

Middle Fork San Joaquin River. Taxon composition and richness, biotic metrics, functional feeding group composition, and total numbers of individuals for 1994 are presented in Schroeter and Harrington (1995).

Plafkin's (1987) modified Hilsenhoff biotic index summarizes family level tolerance values ranging from 0-10, increasing as water quality decreases. Biotic index values for the sites lie between 3.4 and 3.6, signifying uniform and very good water quality. All other metric values were consistent with streams of this order and there were no other considerable differences between sample sites.

Aquatic macroinvertebrate communities in the Middle Fork varied little among sites, and show no evidence of pollution or environmental stress. In the future, fire, volcanism, chemical spill, or climatic change may alter the benthic community. Should one of these occur, a strong baseline now exists with which to quantify natural resource damages and to monitor ecological recovery.

Tributary Streams. Mayflies (Ephemeroptera), the true bugs (Hemiptera), and caddisflies (Trichoptera) were most common in all Middle Fork tributaries surveyed. Flies (Diptera) were common in the smaller, lower gradient streams with fine substrates including Reds and Alligator Creeks. Caddis and mayflies were the two most abundant orders found in flowing waters. Five orders of aquatic macroinvertebrates were observed in Alligator and Minaret Creeks. The other tributaries varied from three to four orders observed (Table 14). Taxonomic richness was likely underestimated due to the sampling method used.

Ponds and Lakes. Aquatic macroinvertebrates from ten orders were found in eight lentic waters surveyed in the study area and included insects, crustaceans, and mollusks (Figure 35 and Table 15). Sites in close proximity or at similar elevations varied little in taxonomic composition and richness, primarily due to the reproductive and dispersal power of the taxa encountered. Taxon richness ranged from 8 to 11 across all sampled sites and decreased insignificantly with increased water surface area ( $R^2 = 0.11$ ,  $P < 0.05$ ). This relation was not positively and linearly related to increased surface area ( $R^2 = 0.00$ ,  $P = 0.96$ ) except for sites less than 2,100 m<sup>2</sup> ( $R^2 = 0.85$ ,  $P = 0.05$ ) (Figure 36). Aquatic beetles (Coleoptera), true bugs (Hemiptera: Gerridae), dragonflies (Anisoptera), and damselflies (Zygoptera) were most common. These orders almost entirely consist of pond species. Gastropods, lake dwelling mayflies (*Callibaetis*), mollusks (*Pisidium*), crustaceans (Amphipoda and Anostraca), and caddisflies were less abundant, or limited to one to five sites. The one Anostracan found (*Streptocephalus seali*) is known in California from the coniferous forest belt from north of Lassen Volcanic Park to the Mammoth Lakes area. *S. seali* is North America's most widely distributed fairy shrimp (Eng et al. 1990). The Amphipod *Hyaella azteca* is a common neotropical deposit feeder in mesotrophic and eutrophic lakes. *H. azteca* also inhabit alkaline, brackish, and deep oligotrophic waters (Rowan 1992). The fingernail clam (*Pisidium*) is common in the eastern Sierra (Wong 1994; Rowan 1996).

## ***Amphibians***

Of the sites surveyed for amphibians, only the Pacific tree frog was encountered (Table 15). This species was found in the egg stage at one site, larval form at seven sites, sub-adult at six sites, adult at five sites, and in all life stages at one site (Figure 35). Adult tree frogs were commonly seen in meadows throughout the Monument during all hours of the day. Yosemite toad (*Bufo canorus*) were found southeast of the study area at 9,000 ft on Crater Creek near Red Cones, and mountain yellow-legged frog (*Rana muscosa*) have been reported higher in the watershed (Cunningham 1994). No records for either species are known from the study area. Standing waters in the study area are mostly ephemeral, rendering them unsuitable for the mountain yellow-legged frog. Apparent absence of Yosemite toad from the study area remains unexplained.

## ***Fishes***

Owens Tui Chub. Owens tui chub are an endemic Great Basin minnow that is both a federal and state listed Endangered subspecies. The proximal cause of endangerment is believed to be introgressive hybridization with chub introduced from the Lahontan hydrographic basin (Miller 1973). Particular predation by brown trout has probably reduced Owens tui chub numbers as well (Williams 1985). Today, Owens tui chub is found in five locations within its historical range.

Owens tui chub were obtained by electrofishing from Reds Meadow Creek downstream from Sotcher Lake. Five individuals were measured from a small, densely vegetated pool. Mean fork length was 67.4 mm (2.7 in). Owens tui chub, an omnivore, associate with streams having slow current, silty bottoms and abundant submerged aquatic vegetation. Preferred habitat characteristics include high quality, cool water with adequate cover in the form of rocks, undercut banks, aquatic vegetation and a sufficient insect food base (Williams 1985). A 22.9 m (75 ft) segment of Reds Meadow Creek immediately below Sotcher Lake provides preferred habitat characteristics, and in fact contains Owens tui chub. Downstream of this short section, Reds Meadow Creek is occupied by a large, healthy population of brown trout which appear to exclude tui chub.

Very little information exists about the population biology of Owens tui chub and their origins in Sotcher Lake, although it seems likely they accompanied rainbow trout stocked from Hot Creek Hatchery, where they persist in the source springs. Field survey records on file at the California Department of Fish and Game Bishop office indicate only trout were present in Sotcher Lake in 1951, and chub became "abundant" by 1959. While Owens tui chub remained abundant in Sotcher Lake in 1994, there is no evidence that chub has established in the Middle Fork San Joaquin River to date.

Trout. King Creek, Alligator Creek, Creek Creek, and Minaret Creek were qualitatively assessed for trout. Reds Meadow Creek was electrofished for Owens tui chub, Boundary Creek was visually assessed and Reds Creek is fishless (Table 13).

King Creek contains brown, brook, golden, rainbow trout, and rainbow x golden hybrids (Figure 37, lower). Rainbow trout were the most abundant (37%) with brook, brown, and golden trout comprising 27%, 22% and 7% respectively. Brown trout inhabit only the first 0.4 km (0.25 mi) of stream, upstream from its confluence with the Middle Fork. A bedrock cascade at this location prohibits further upstream movement. In this lower reach, all other trout species and hybrids exist, including hatchery-reared rainbow trout. During one day in June and six days in July of 1994, a total of 59 trout were caught in King Creek by hook-and-line, identified to species, and measured for fork length. Mean fork length was 186.5 mm (7.3 in) (Figure 37, upper). Two hatchery rainbow trout were of very low condition ( $K < 1.0$ ). Above the cascade, golden, rainbow, and rainbow x golden trout are most common. Occasionally brook trout were found. Trout above the cascade are believed to have derived from introductions to headwater lakes. Below the barrier, brown trout have colonized upstream from the Middle Fork, while the other species may have dispersed from up or downstream.

Alligator Creek was sampled with hook-and-line and yielded only four brook trout from isolated pools. The trout measured 219 to 295 mm fork length (8.6 to 11.6 in). No other species were encountered, probably due to unsuitable habitat.

Creek Creek was electrofished from the barrier falls at the Middle Fork confluence upstream to Reds Meadow Road. Fork lengths were measured on a sample of 100 brown

trout (Figure 38). Brown trout were very abundant, in good condition, and observed feeding. No other fish species were found.

Minaret Creek, above Minaret Falls, was sampled one day by hook-and-line and produced four brook trout and two apparently pure golden trout. Fork lengths for brook trout averaged 175 mm (6.9 in) while golden trout averaged 216 mm (8.5 in). Brook trout appeared more abundant and were observed schooling near Johnston Lake. The golden trout population may emanate from past stocking(s), or derive from downstream migrants from Minaret, Deadhorse, or lower Trinity Lakes. Minaret Creek no longer confluences with Johnston Lake as shown on topographic and Inyo National Forest maps. Johnston Lake is in a late successional stage, filling with organic and inorganic materials and becoming a meadow.

Electrofishing efforts in Reds Meadow Creek produced Owens tui chub, brown, rainbow, and rainbow x golden trout hybrids. One brown trout measured 450 mm fork length (18.0 in) and weighed approximately 1,362 g (3 lbs.,  $K = 1.49$ ). The large size of this trout is anomalous in Reds Meadow Creek. One hatchery rainbow and one rainbow x golden trout hybrid were measured at 265 mm (10.4 in) and 145 mm (5.7 in) respectively. Apparently water conditions provide sporadic downstream passage over the beaver dams at Sotcher Lake's outlet.

Boundary Creek fish were visually seen and identified as brown trout during habitat typing and routine studies in the area. Boundary Creek fish were killed as the Rainbow Fire heated the stream east of the Monument. No direct fish mortality was reported from the fire elsewhere in the Devils Postpile area. Habitat and fish surveys conducted in 1994 showed adult and young-of-the-year brown trout present from the confluence upstream to the road ford. These fish are not likely to have migrated from the river as several barriers exist in this reach of Boundary Creek.

Trout densities were estimated by population surveys in 1986, 1987, 1988, and 1991 (Deinstadt et. al 1995). Densities ranged from 2,508 fish/mi at the arch bridge, to 11,133 fish/mi near the Ranger Station (Figure 39, upper). Between Rainbow Falls and Lower Falls, rainbow trout constituted 69% of the 1987 sample and 63% of the 1988

sample. Instream habitat favored rainbow trout here. Brown trout made up the majority of the samples in the rest of the river, while brook trout were present in low numbers throughout. Mean densities of brown, rainbow, and brook trout populations were 3,442, 1,831, and 182 fish/mi. Mean abundance of trout larger than 15 cm (6 in) for 1986, 1987, 1988, and 1991 was 2,079 fish/mi. Of these, 75% were brown, 23% rainbow, and 2% brook trout. Golden trout were not encountered. Unusually high brown trout densities occur near the Ranger Station in the meandering channels (Figure 6). This abundance may relate to habitat preference. Low water during drought periods may increase brown trout production and decrease rainbow trout production (Deinstadt 1994). Estimated wild trout biomass during four surveys from 1986 to 1991 ranged from 71.3 to 243.8 kg/ha (62.6 to 214.8 lbs./acre). Mean biomass equaled 125.3 kg/ha (110.4 lb./acre). Average standing crops of brown, rainbow, and brook trout were 96.9, 26.0, and 2.38 kg/ha (85.4, 22.9 and 2.1 lbs./acre) (Figure 39, lower). Comparison of the 1987, 1988 and 1991 trout population characteristics with other west slope Sierra trout streams ranks the Middle Fork second in total trout density, third in biomass, and first in the number of six inch and larger trout per mile.

Cultured catchable-sized rainbow trout, stocked weekly at Minaret Falls Campground during the summer months, were not included in the estimates above, but were present during each of the surveys at the upper two sites (Arch bridge to Soda Springs bridge, and Soda Springs bridge to the Monument's North boundary). Estimated densities of hatchery-reared, catchable rainbow trout ranged from 15 fish/mi at the uppermost site in 1991 to 415 fish/mi at the site immediately below. The mean density of catchable rainbow trout for both sites was estimated at 200 fish/mi (Deinstadt et al. 1995). During 1994, hatchery rainbow trout were obtained by hook-and-line throughout the Middle Fork, and in lower King Creek below the bedrock cascade. High water, and a tolerance for winter conditions are believed the reasons for this surprising downstream dispersal.

1994 Middle Fork San Joaquin River Angling Effort and Success. Estimated angling effort in the June-October 1988 roving creel survey totaled 9,222 hours (Deinstadt

et al. 1995). By contrast, 1994 data derive from a total of 670 hours of actual angling effort as reported in the passive "self-survey" angler box. Anglers in 1988 landed 12,902 trout, keeping 25.3% and releasing 74.7%. An estimated 400 of the trout released and 1,040 of the trout kept were stocked, catchable-sized rainbows. Anglers in 1994 landed 1,301 trout, keeping and releasing a similar 26.7% and 73.3% of the total catch (Figure 40, upper). Eighty-three percent of the total catch in 1988 was less than 25 cm (10 in) in length, while 73% in 1994 measured less than 25 cm (10 in). This difference may be the result of increased catch rates for larger fish occurring early in the 1994 season. Anglers in 1988 reported that trout 25 to 30 cm (10 to 12 in), 30 to 36 cm (12 to 14 in), and 36 cm (14 in) and greater comprised 12.6, 3.6 and 0.8% of their catch, while the 1994 reported size of catch for the same size classes were 17.8, 7.3 and 1.4%, a noticeable increase. This increase is believed due to high catch rates influenced directly by catchable-sized hatchery fish stocked upstream from the Monument. Estimates for the number of hatchery-reared rainbow trout caught and released in 1994 were not obtained.

Wild brown, rainbow, and brook trout landing percentages in 1988 and 1994 were 55%, 33%, 12%, and 40.1%, 43.6% and 15.8% respectively (Figure 40, lower). This change, a 10.6% increase, in the 1994 rainbow trout landing percentage is believed due to the presence of hatchery-reared rainbow. Golden trout reported caught equaled less than 0.5% of the 1994 survey and disappeared from the catch entirely after the month of June. Of the total 1994 catch by species, 85.2% brown trout, 61.0% rainbow trout, 76.1% brook trout, and 85.7% golden trout were released (Figures 41 and 42). Mean 1988 catch rates for wild trout, hatchery trout, and total trout landed were 1.24, 0.16, and 1.40 fish/hr. Average 1994 catch rate for total trout landed was 1.94 fish/hr., a 38.6% increase over that of 1988. Higher catch-rates and the presence of hatchery-reared rainbow trout in June, July, and August probably explain this increase.

Eighty-four percent of the total catch occurred during the summer months on the 1988 survey. This early season fishery was sustained largely by brown trout, accounting for 69% of the total reported brown trout catch during the survey. The lowest average catch rate in 1988, 0.67 trout/hr., was in September. The number of rainbow trout landed

was low in June then increased, peaking in August. The highest catch rates for rainbow trout reported in 1988 occurred in October. The majority of the brook trout reported in 1988 were caught in June and July. About 23% of the trout kept in July and about 60% kept in August and September were hatchery-reared rainbow trout. Stocked rainbow trout entered the 1988 fishery in July, August, and September. Few were caught in June, and none in October. All but six of the reported hatchery rainbow trout caught in 1988 were landed near the ranger station.

Bait angling was the most popular method of fishing in Devils Postpile National Monument in 1988 and 1994, followed by use of flies and lures. Bait angling comprised about 45%, lure angling 25%, and fly angling 30% of the total 1988 catch, and 46.6%, 19.0%, and 34.4% respectively in 1994. Mean 1988 catch rates for fly and lure anglers were 1.75 trout/hr, while bait anglers rated 1.11 trout/hr. Catch rates for summer month bait, lure and fly anglers in 1994 were an impressive 1.89, 2.31, and 1.85 fish/hr. Overall, 1994 bait, lure, and fly anglers kept 42.2, 28.3, and 4.9% of the total trout they landed. This compares to the 40.3, 19.7, and 8.7% respectively kept in 1988. Summer fly anglers in 1994 appear to be releasing ~44% more fish than 1988 fly anglers. The keep rate was a significant part of the total catch for bait anglers, but not for lure and fly anglers in 1988 and 1994. Anglers in 1994 appear to be keeping the rainbow trout larger than 25 cm (> 10 in) and releasing all other species of similar size. The high percentage of brook trout kept measuring less than 20 cm (8 in) (22%) in 1994, although identical to the keep rate of rainbow trout of similar size, was 43% higher than for brown trout. This noticeable change may be due to the 1992 increase in brook trout bag limits allowed in the Sierra Nevada. In 1988, anglers fishing near the Ranger Station caught the most fish, while anglers fishing near the arch bridge had the highest catch rates. Bait, lure and flyfishers in 1994 averaged 6.52, 6.86, and 6.31 trout/angler and, on average, fished 3.45, 2.97, and 3.41 hours/day. Overall, 1994 Middle Fork San Joaquin River anglers had a good angling experience and thought the size and numbers of fish caught rated fair to good.

Compared to nine other designated Catch-and-Release or Wild Trout Streams on

which similar censuses had been conducted in 1988, the Middle Fork San Joaquin River ranked second in catch/hr., third in the number of trout caught per mile per month, and fifth in hours fished per mile per month (Deinstadt et al. 1995).

## RESEARCH AND MANAGEMENT RECOMMENDATIONS

### *General*

Copies of this report, Schroeter and Harrington (1994), and Deinstadt, Kleinfelter and Pert (1995), should be archived together in multiple locations to improve the probability of their baseline data remaining available to future researchers and managers. The documents will not otherwise be disseminated. The archived copies should be bound together with this report and placed at the following locations:

Devils Postpile National Monument files, Mammoth Lakes, CA.

Sequoia and Kings Canyon National Parks library, Three Rivers, CA.

National Park Service, Pacific Great Basin, S.S.O. library, San Francisco, CA.

California Department of Fish and Game files, Bishop, CA.

Calif. Dept. of Fish and Game, Resources Library, Sacramento, CA.

University of California Santa Barbara, Sierra Nevada Aquatic Research Laboratory library, Crowley Lake, CA.

University of California, White Mountain Research Station library, Bishop, CA.

U. S. Forest Service, Inyo National Forest, Bishop, CA.

### *Hydrology*

1. Maintain stream gauges and record stage heights weekly or more frequently during spring, summer, and fall months, and on a monthly basis in wintertime. Annually chart streamflow monitoring results in a file memo.
2. Update and refine stage/discharge curve and discharge measurements.
3. Develop a means to estimate and document peak flood volumes.

### ***Water Chemistry***

1. Continue seasonal measurement of pH, temperature (thermograph), alkalinity and conductivity in the Middle Fork San Joaquin River and surrounding tributary and lentic sites studied in 1994.
2. Collect and analyze water from Creek Creek immediately below the hot springs for constituents that may cause fish avoidance.

### ***Amphibian and Trout Habitat***

1. Maintain current land management practices due to past success.
2. Continue to monitor vegetation plots in the Rainbow Fire burn area to obtain watershed recovery information.
3. Encourage livestock handlers to use bridges and designated fords for crossing the Middle Fork San Joaquin River.
4. Encourage placement of small and large woody debris in Reds Meadow and Creek Creeks immediately below culvert drainage structures occurring on Forest Service land to restore cover for trout.
5. Restore Boundary Creek channel at footbridge crossing on the Rainbow Falls Trail. Construct a footbridge in this area for pack-stock to minimize erosion and sedimentation.
6. Evaluate role of beavers in and near the vicinity of Sotcher Lake because they are an exotic species.
7. Evaluate alternative measures to reduce apparent soil compaction and stream bank instability due to high visitor use along the river near the ranger station. Maintain natural stream channel dynamics and aesthetics, and visitor access, to this excellent location for viewing the river.

### ***Aquatic Macroinvertebrates***

Monitor invertebrate populations on a five year basis, or if a disturbance is suspected.

### ***Amphibians***

Search for Yosemite toad and salamanders in Devils Postpile National Monument using alternate techniques such as pit traps or night surveys.

### ***Fish***

1. Continue tri-annual trout population surveys at long term monitoring sites established by California Department of Fish and Game.
2. Gather baseline population data for fish in Boundary Creek, King Creek and Minaret Creeks using the electrofishing methods of Van Deventer and Platts (1983), or a similar and comparable method.
3. Annually monitor Reds Meadow Creek Owens tui chub abundance and distribution by electrofishing.

### ***Recreational Fishery***

Monitor Middle Fork San Joaquin River (Devils Postpile National Monument) angler survey box at the Ranger Station and consider the installation of a second box near Rainbow Falls trailhead.

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Figure 1. Thousand Island Lake (right of center), the headwaters of the Middle Fork San Joaquin River, 14.1 km (8.75 mi) upstream from the study area.

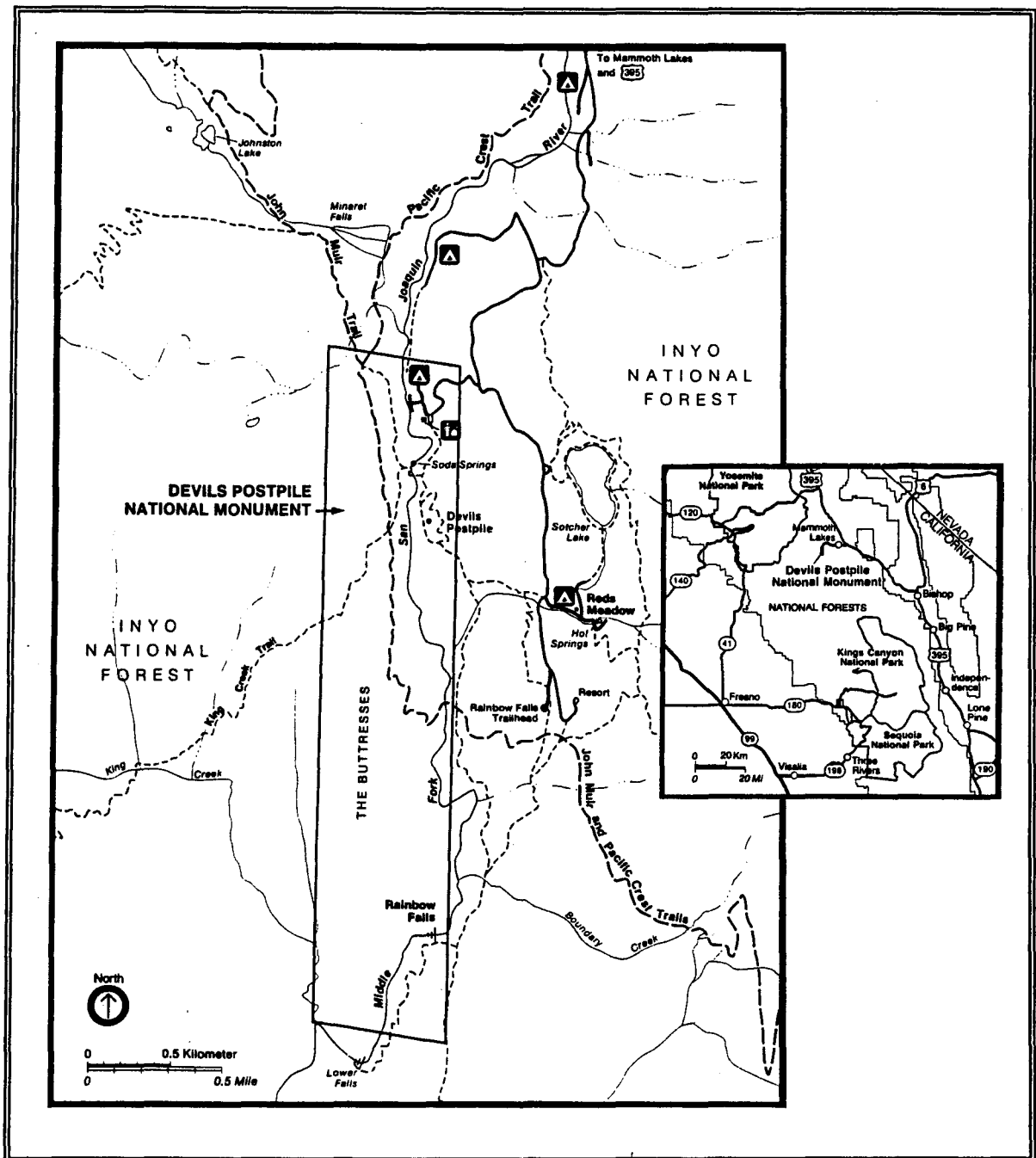


Figure 2. Devils Postpile National Monument, Madera County, vicinity map.

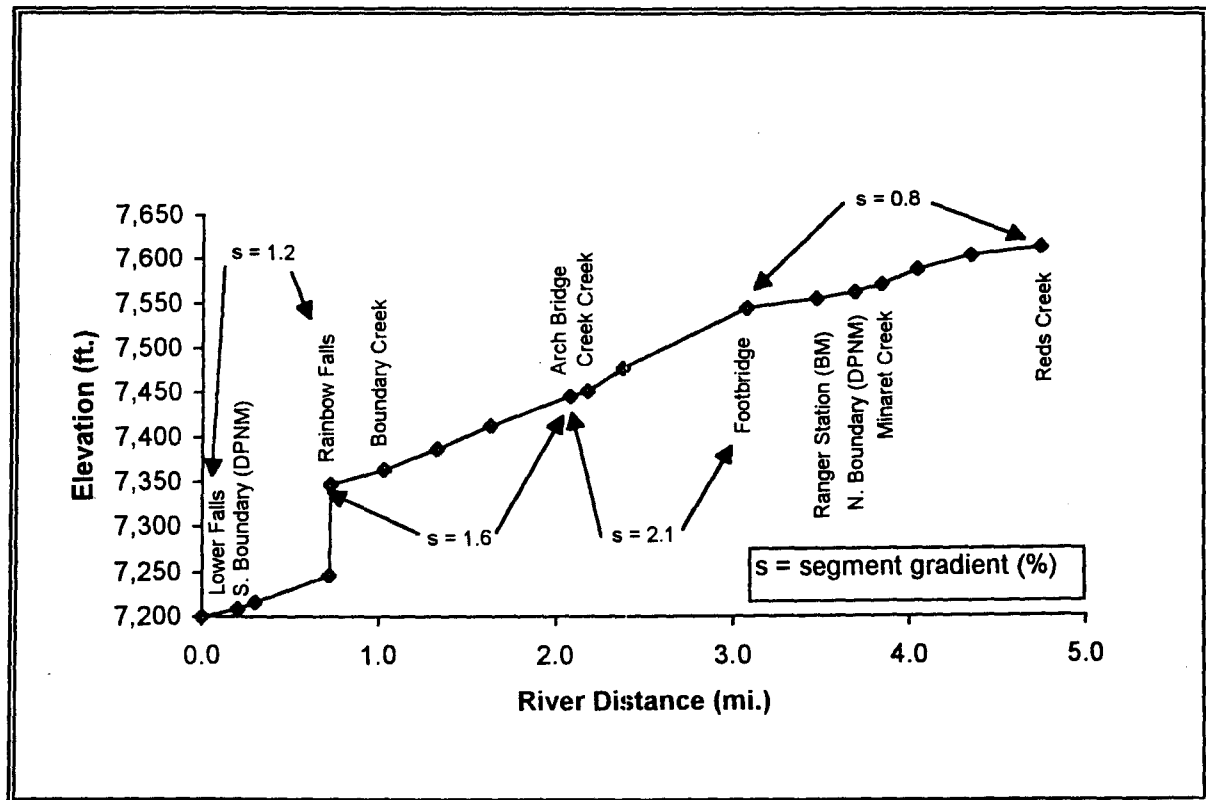


Figure 3. Longitudinal profile and segment gradients of the Middle Fork San Joaquin River through the study area.

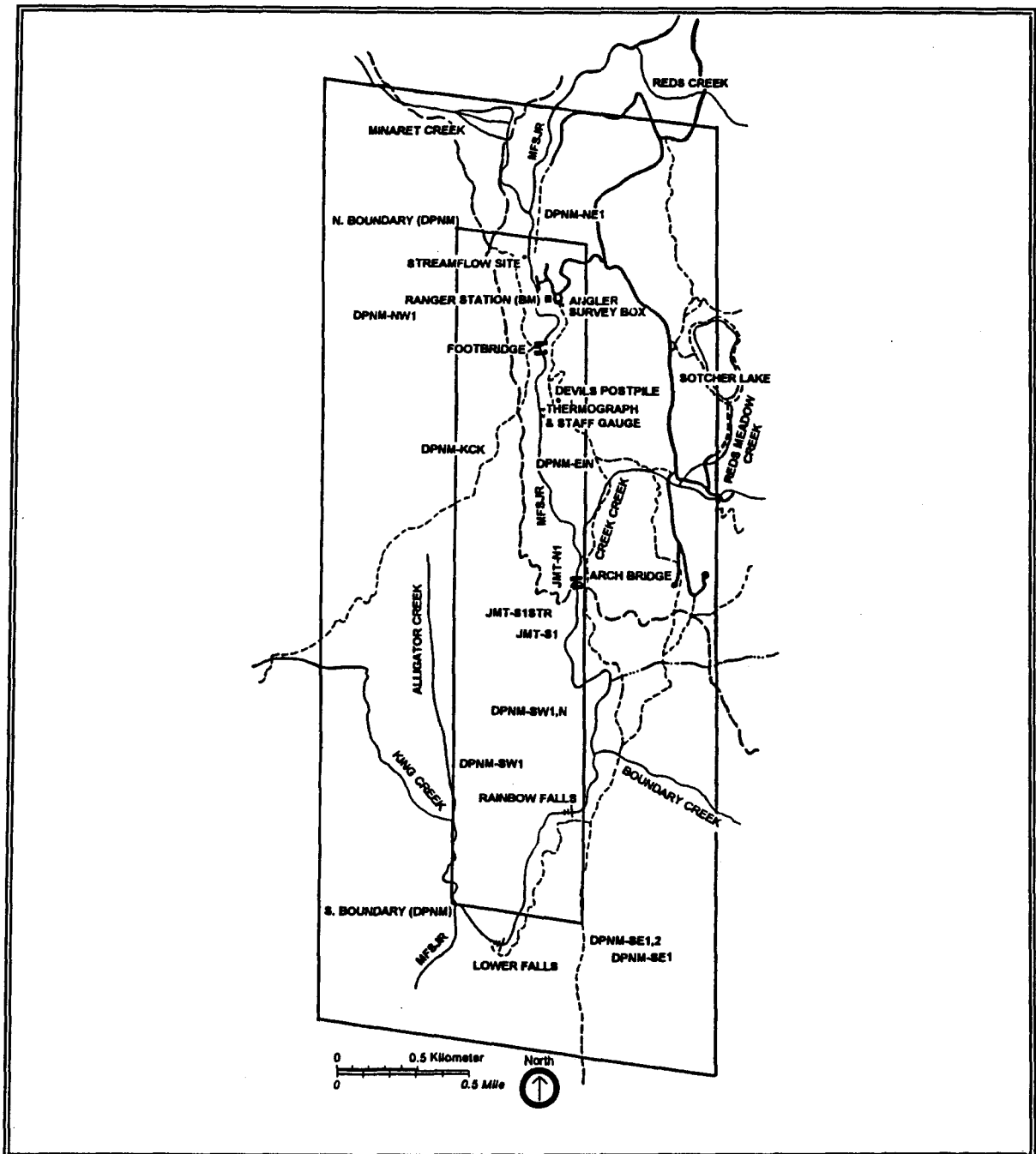


Figure 4. Study area map, Middle Fork San Joaquin River and tributaries, Devils Postpile National Monument. Physical and biological sampling sites are indicated. (See Table 5.)

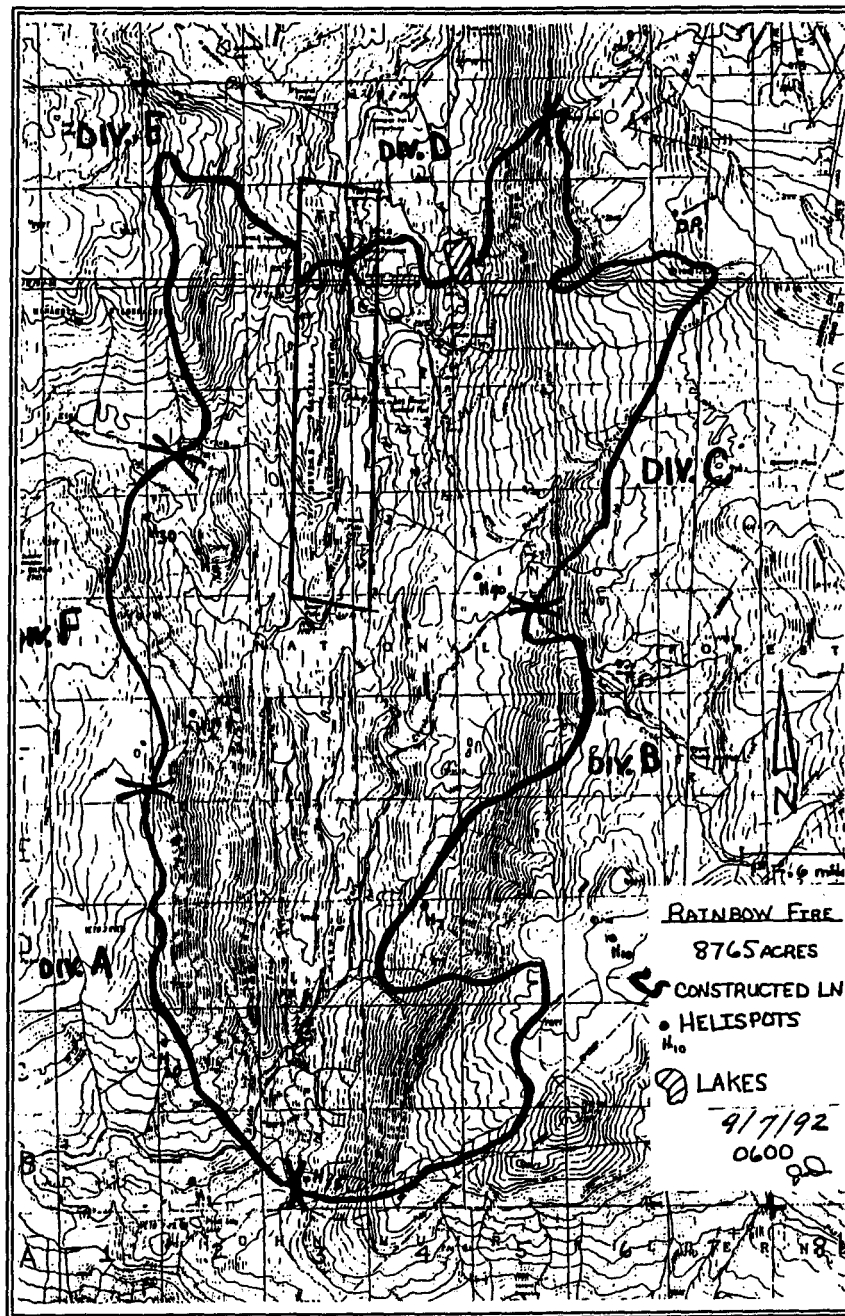


Figure 5. Burn area map, Rainbow Fire, August 1992.

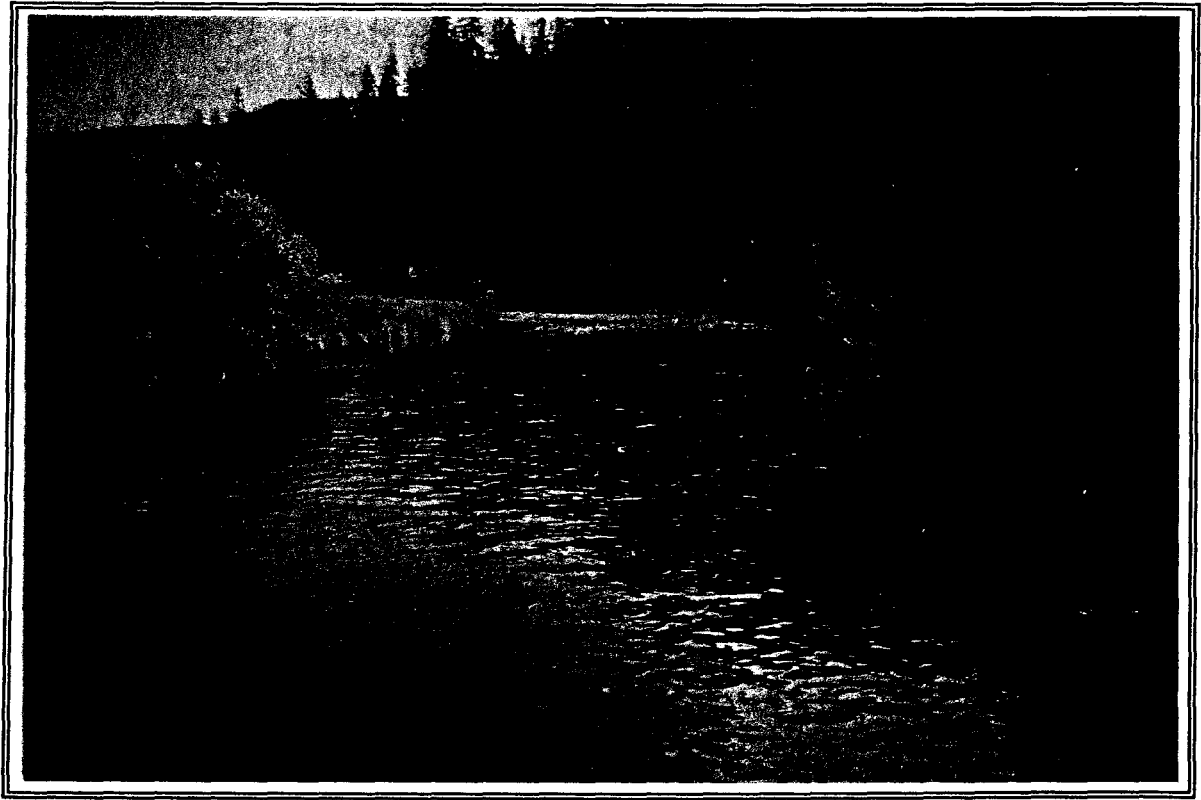


Figure 6. Glide habitat. Low gradient, slightly confined, meandering gravel bed channel in the Middle Fork San Joaquin River. (Rosgen Stream Type C-3)

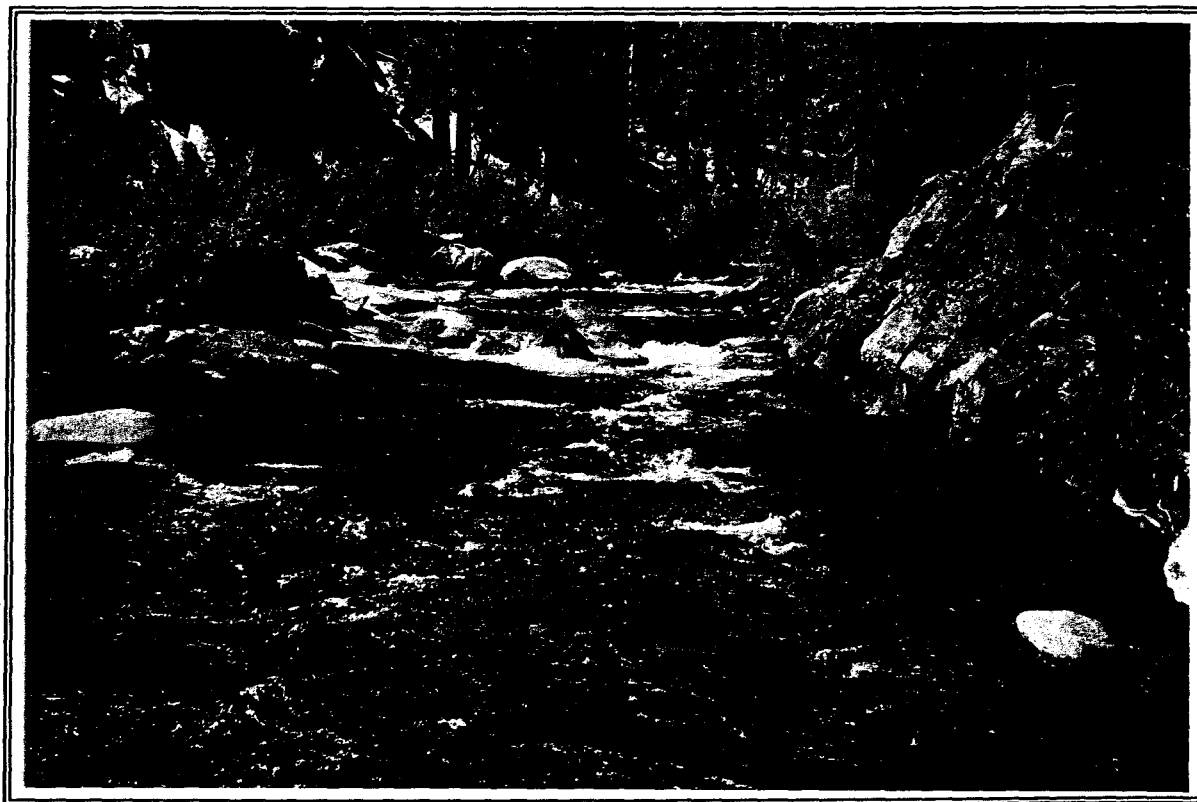


Figure 7. Riffle habitat. Moderate gradient, moderately confined, stable large cobble/coarse gravel channel in the Middle Fork San Joaquin River. (Rosgen Stream Type B-1)

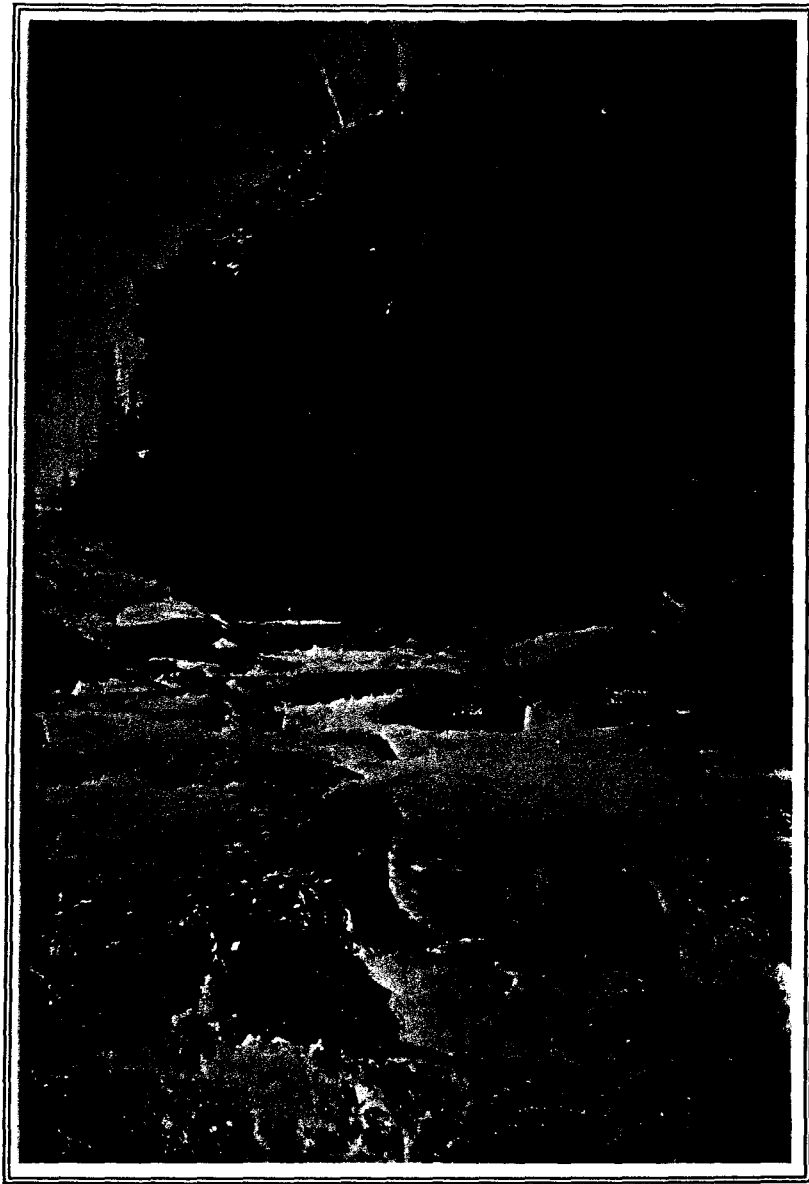


Figure 8. Riffle habitat. Moderate gradient, moderately confined, bedrock controlled channel with boulders and cobble in the Middle Fork San Joaquin River. (Rosgen Stream Type B1-1)



Figure 9. Flatwater habitat. Moderate gradient, moderately confined, stable with large cobble mixed with small boulders and coarse gravel in the Middle Fork San Joaquin River. (Rosgen Stream Type B-2)



Figure 10. Pool habitat. Moderate gradient, moderately confined, stable with large cobble mixed with small boulders and coarse gravel in the Middle Fork San Joaquin River. (Rosgen Stream Type B-2)

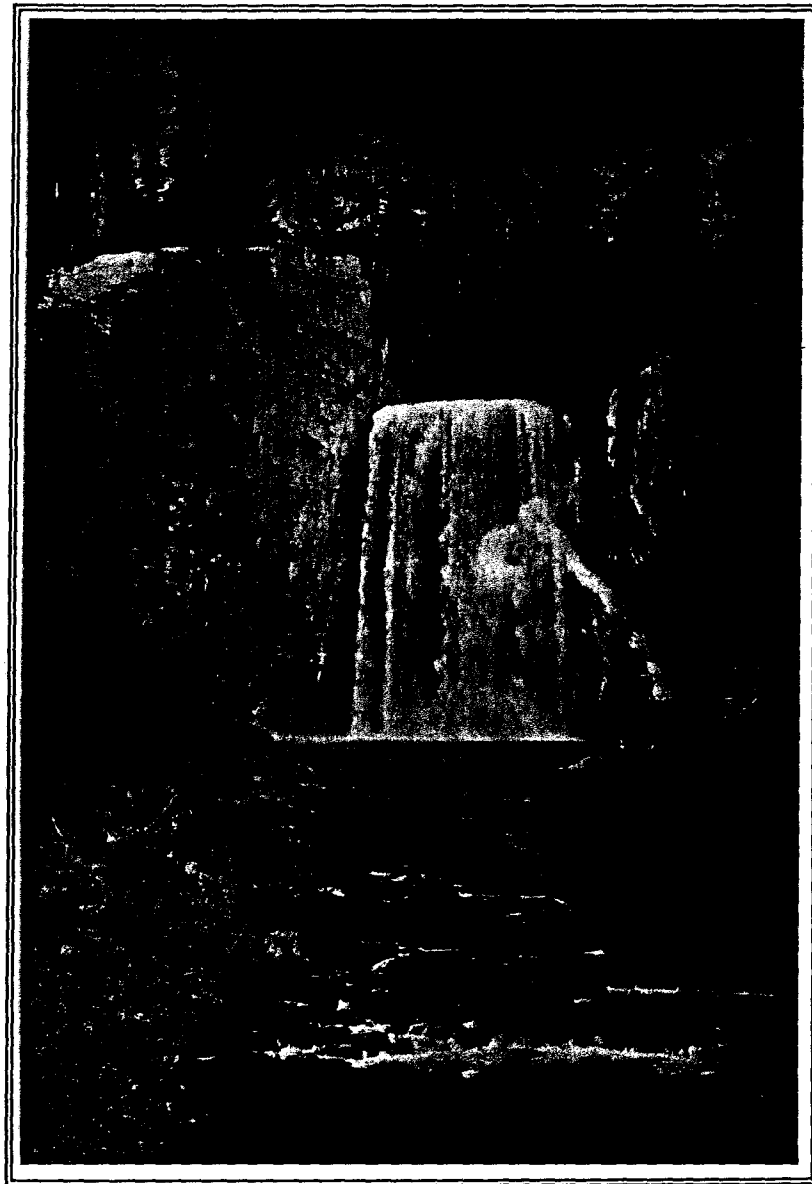


Figure 11. Rainbow Falls is the most dramatic landscape feature of the study area. Here the Middle Fork San Joaquin River plunges 101 feet over a volcanic cliff.

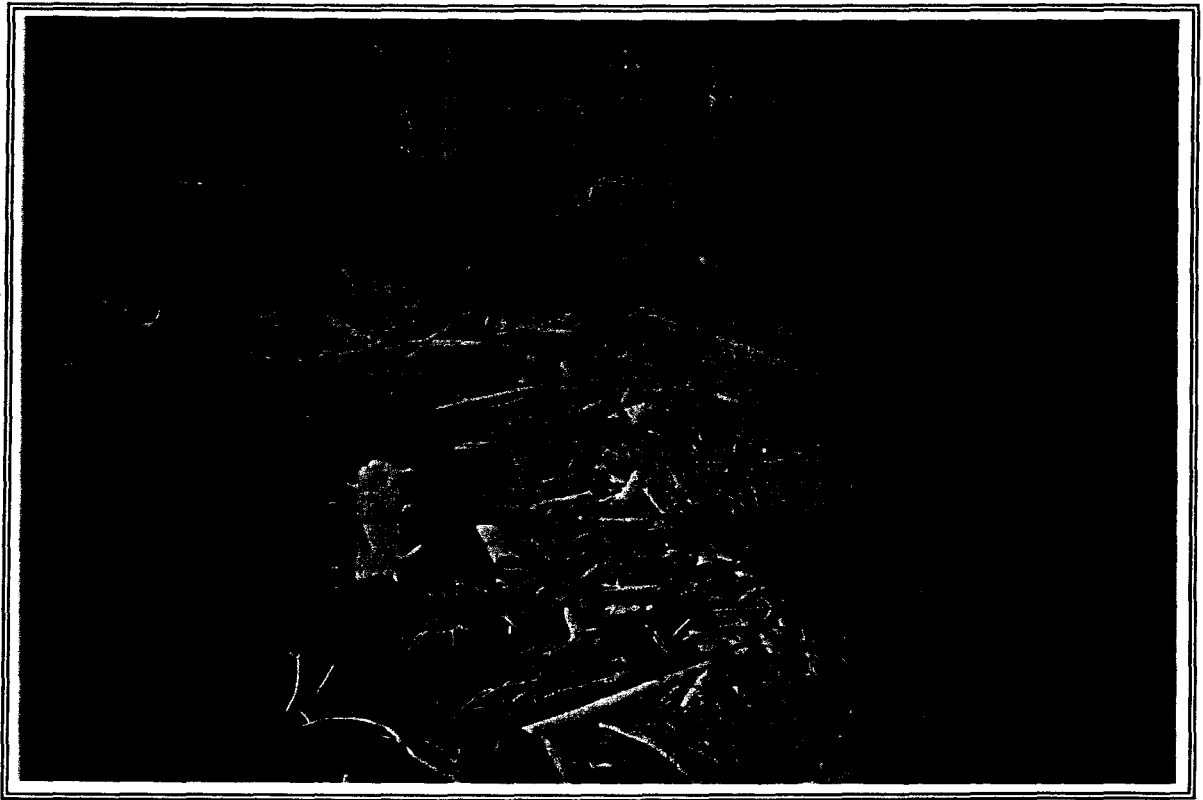


Figure 12. Beaver activity in Reds Meadow Creek.

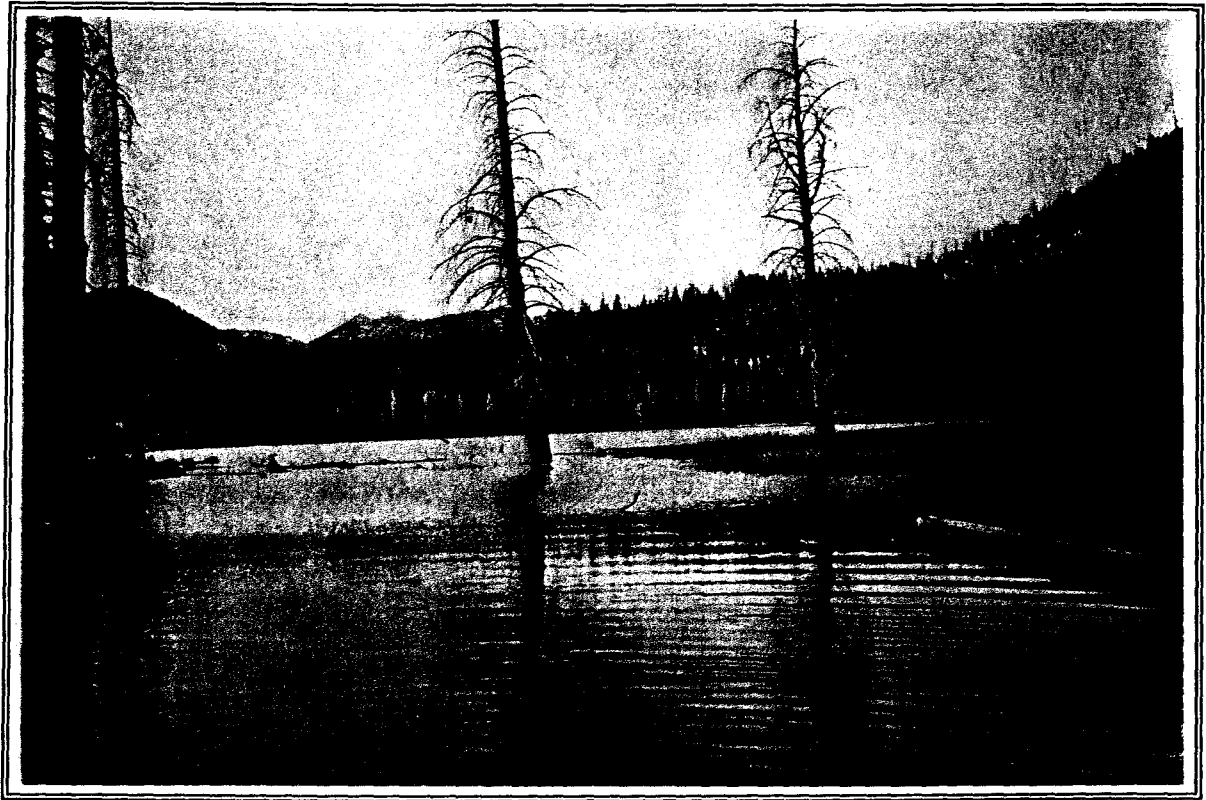


Figure 13. The effect of beaver activity on Sotcher Lake shoreline vegetation.

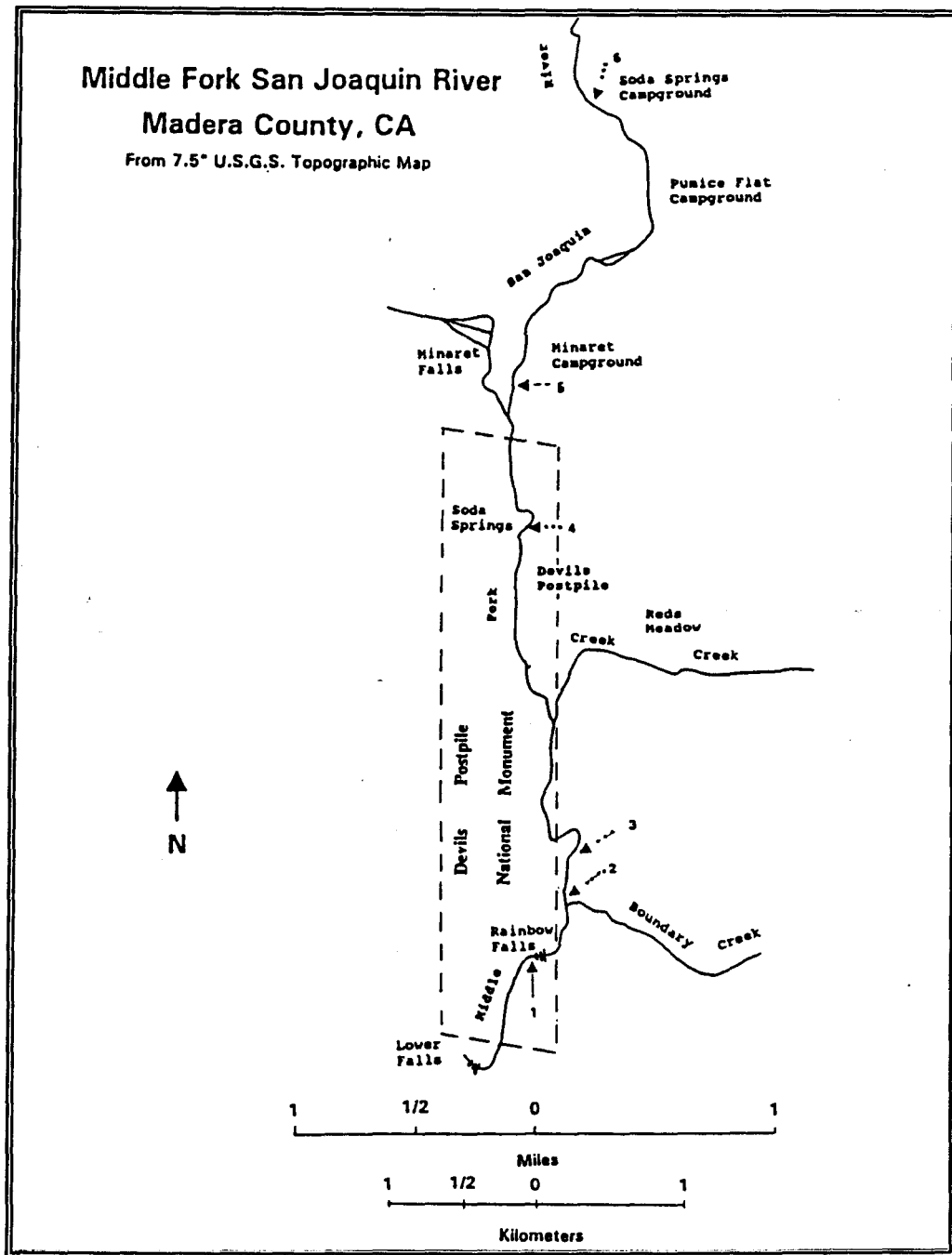


Figure 14. Benthic macroinvertebrate collection sites on the Middle Fork San Joaquin River within and north of the study area. Site 1: 100 m below Rainbow Falls. Site 2: directly above confluence with Boundary Creek. Site 3: 0.5 km above confluence with Boundary Creek. Site 4: directly above Soda Springs. Site 5: below Minaret Campground. Site 6: along upper section of Upper Soda Springs Campground (from Schroeter and Harrington 1995).



Figure 15. Portable aquarium for photographing aquatic study animals.

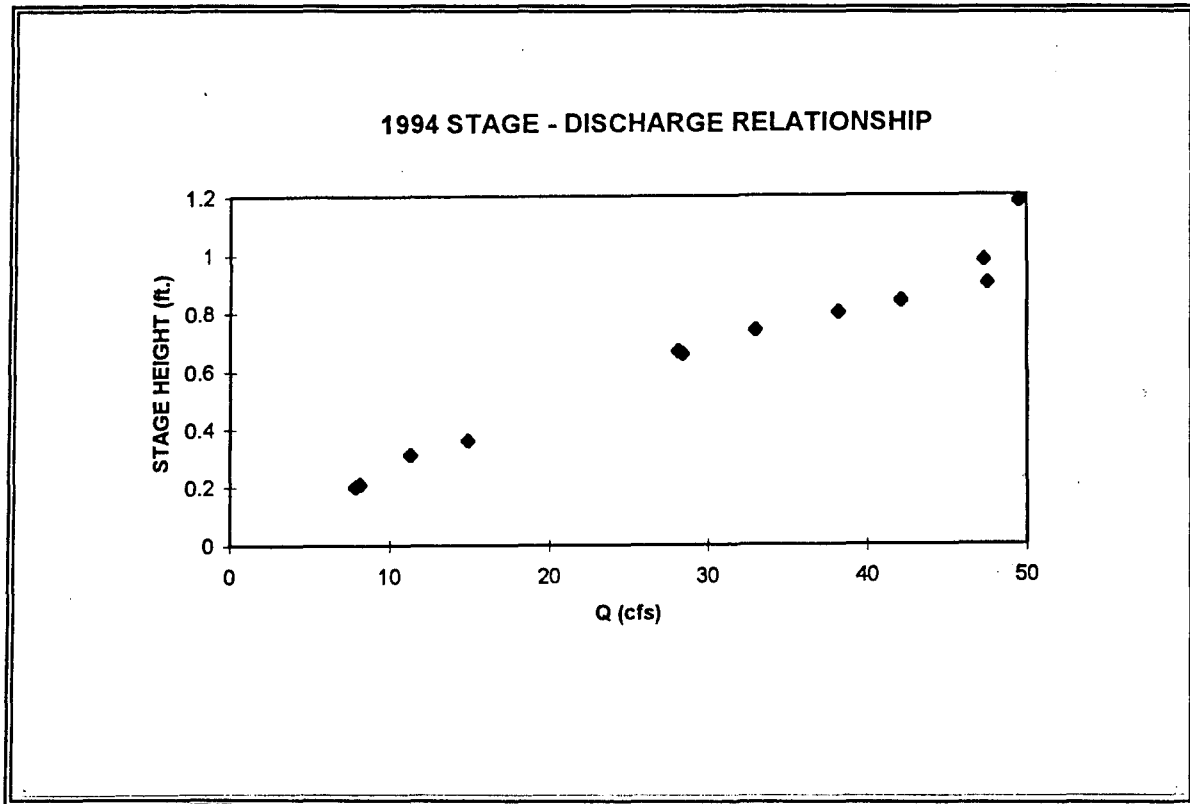


Figure 16. Stage height-Discharge relationship for Middle Fork San Joaquin River flows measured within the study area.

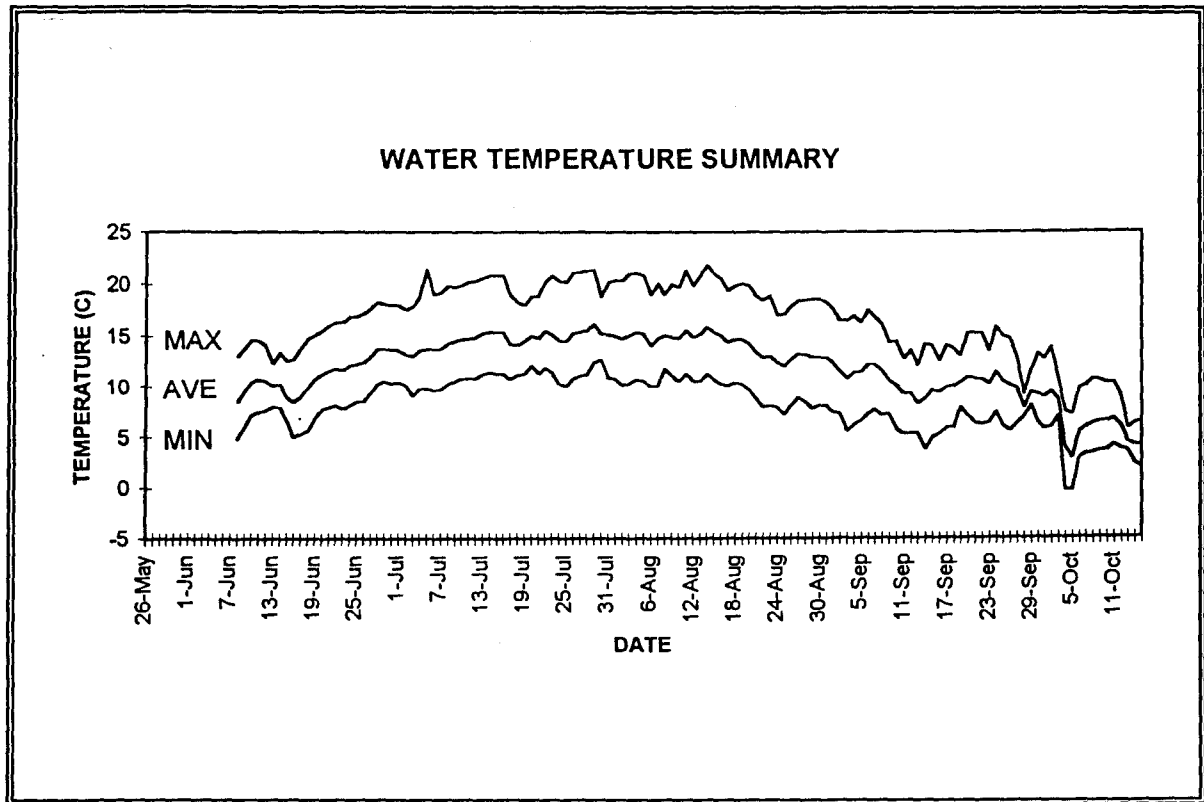


Figure 17. 1994 water temperature summary, Middle Fork San Joaquin River.

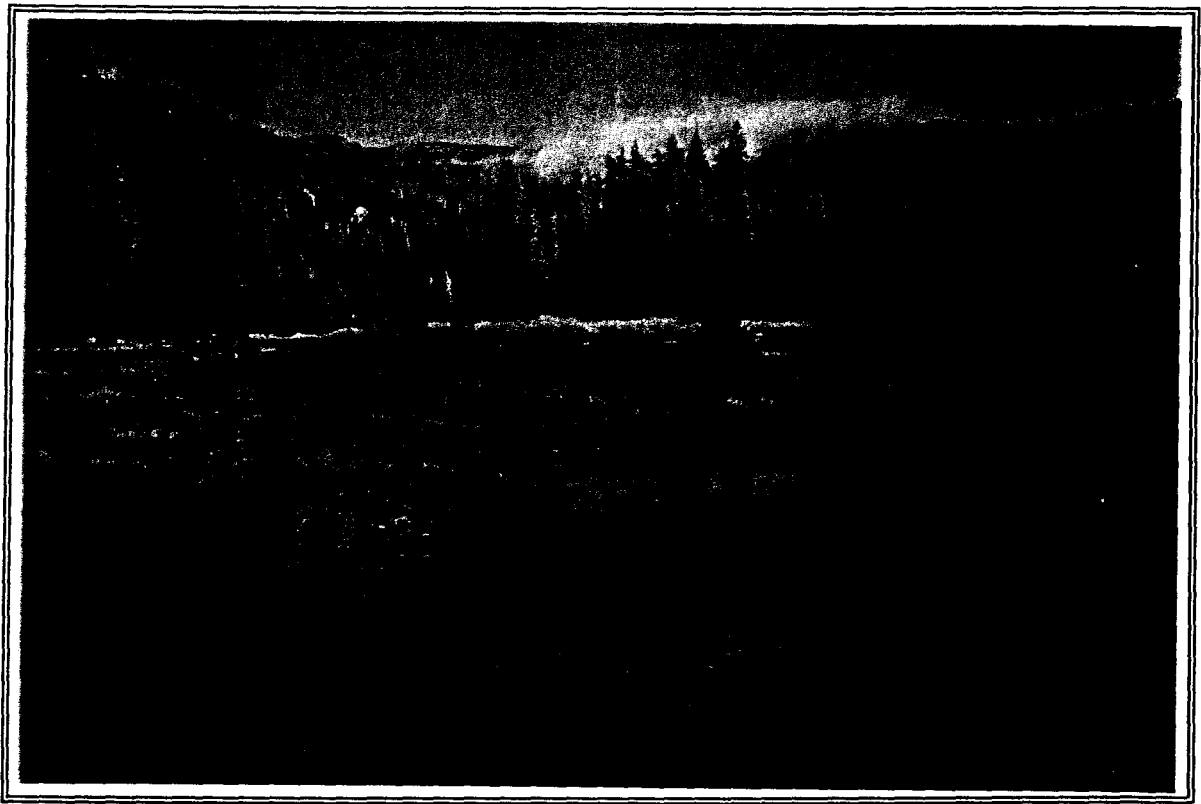


Figure 18. Flooded Soda Springs Meadow near the Devils Postpile ranger station. The Middle Fork San Joaquin River overflowed its banks during tropical storm Olivia on September 26, 1982.

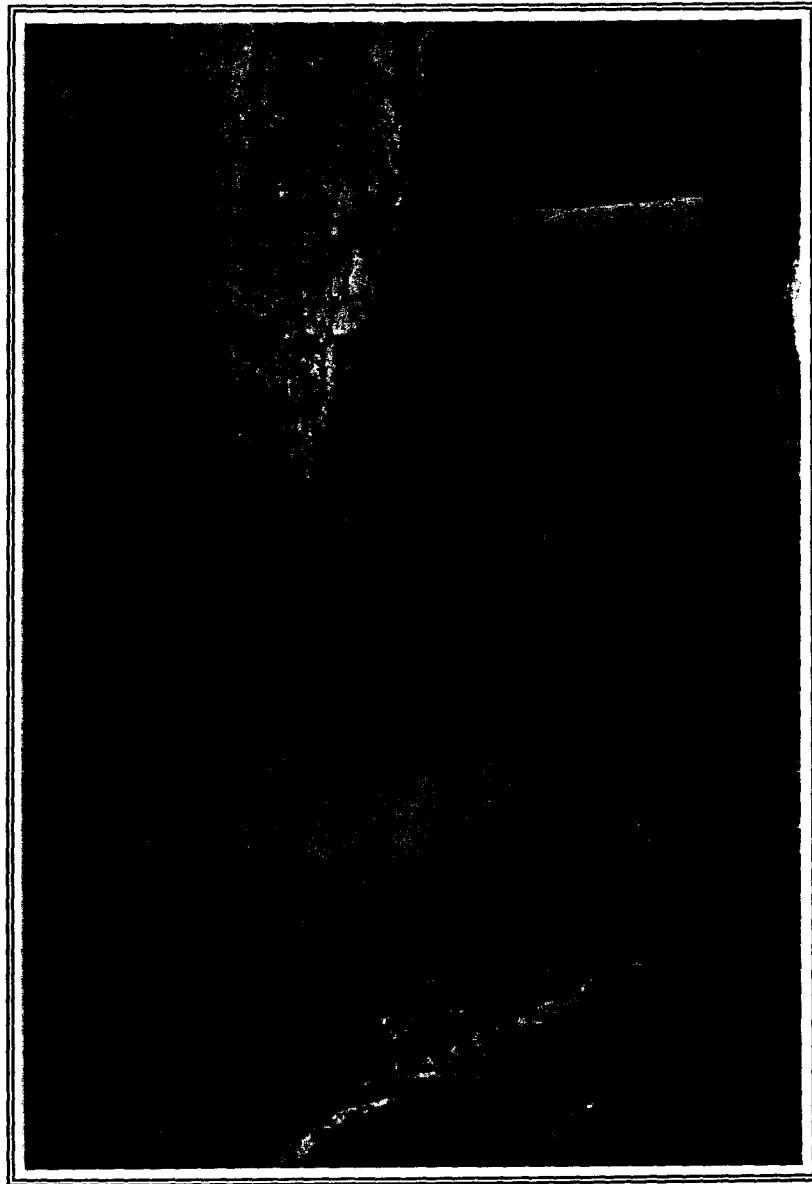


Figure 19. Turbid runoff at Rainbow Falls following the very localized and extremely severe thunderstorm on July 18, 1984 at Agnew Meadows 6.4 km (4 mi) north of the Devils Postpile ranger station.

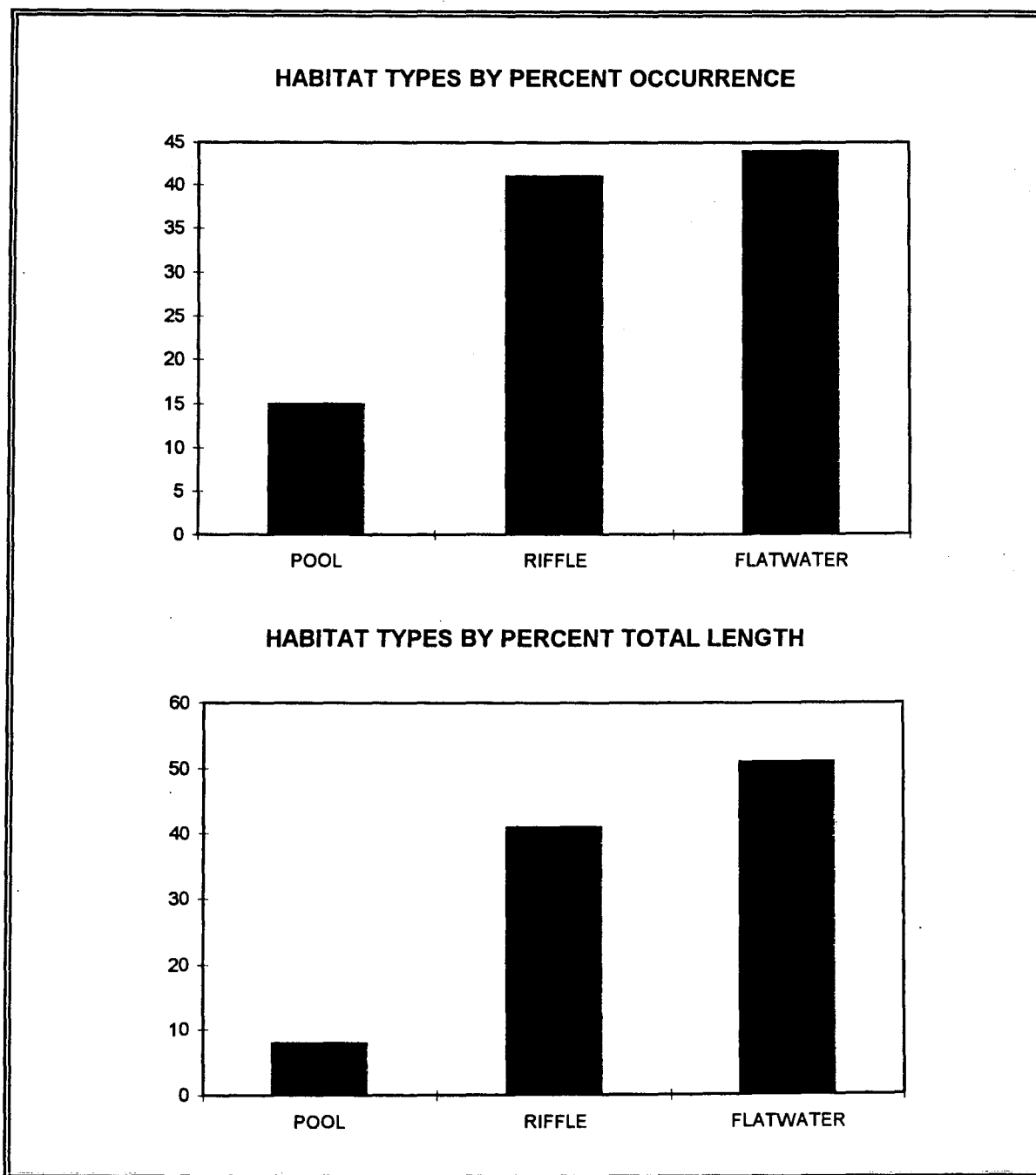


Figure 20. Habitat types, Level III, Middle Fork San Joaquin River.

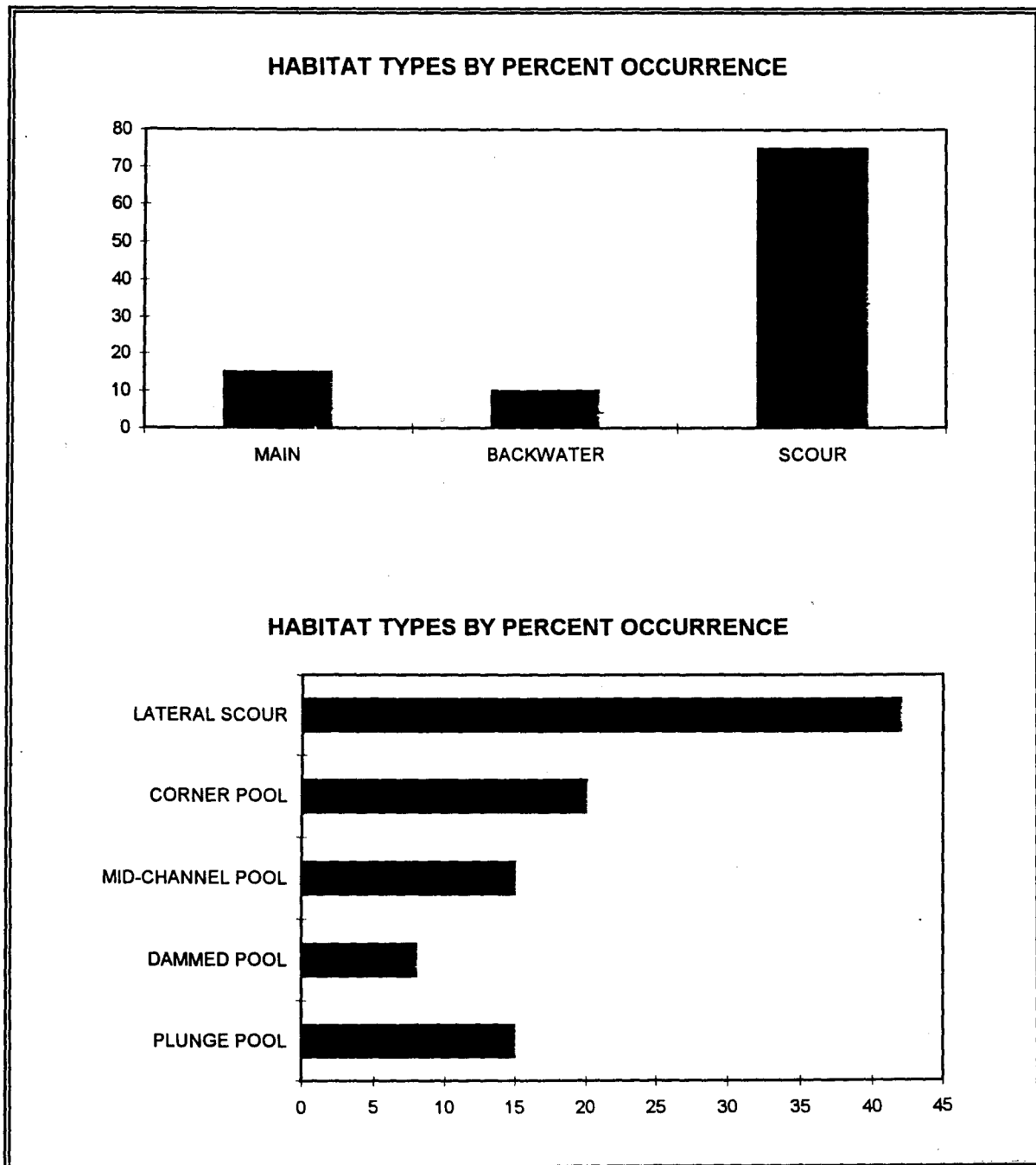


Figure 21. Pool habitat types, Level III (upper) and Level IV (lower), Middle Fork San Joaquin River.

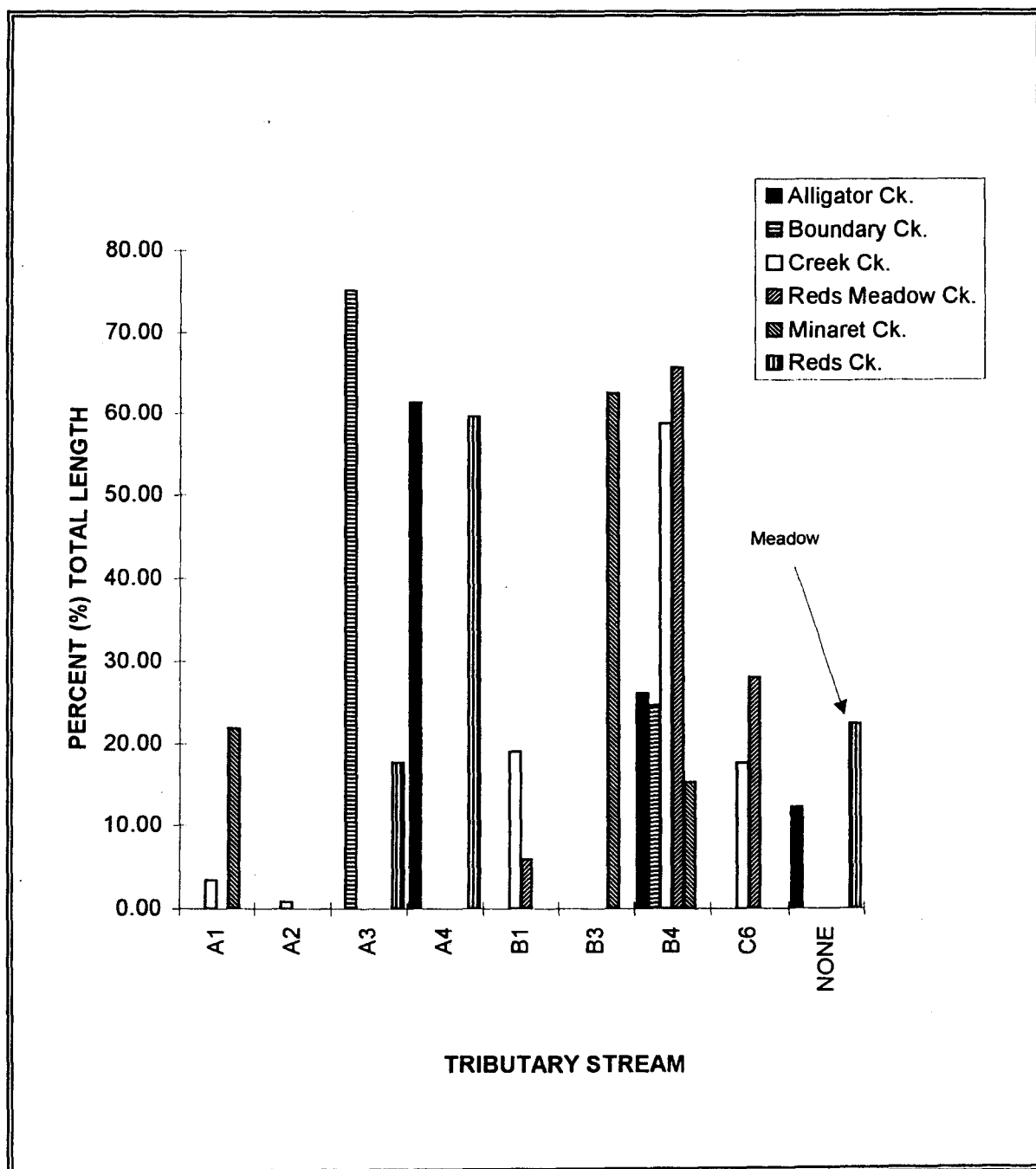


Figure 22. Rosgen stream channel type distributions among Middle Fork San Joaquin River tributary streams that were surveyed.

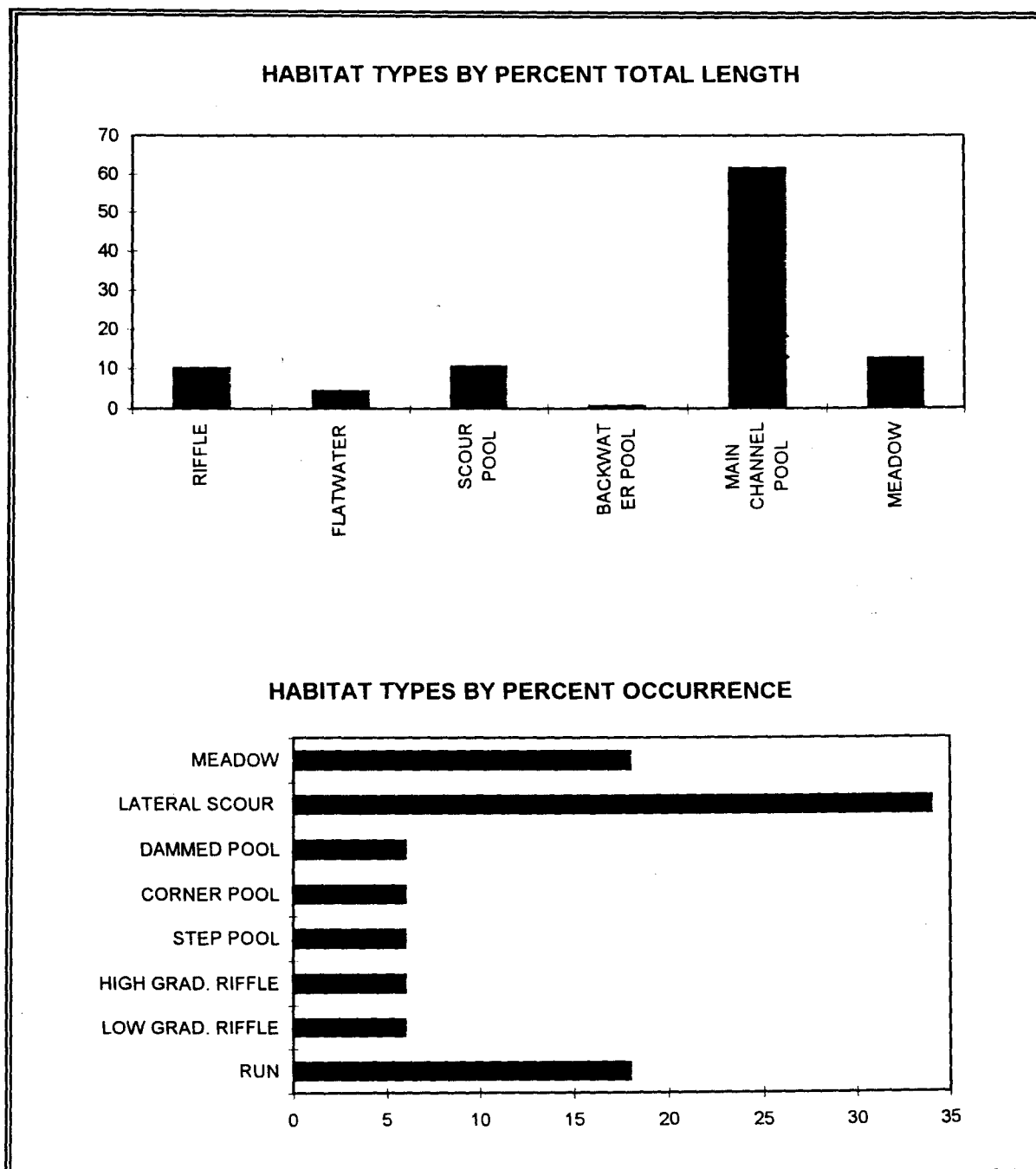


Figure 23. Habitat types, Level III (upper) and Level IV (lower), Alligator Creek.



Figure 24. Boundary Creek. This entire drainage was burned in the August 1992 Rainbow Fire (photo taken August 1993). Steep gradient, well confined exposed slopes, erodible coarse-grained channel with high sediment supply, small boulders, coarse gravel, some sands. (Rosgen Stream Type A-3)

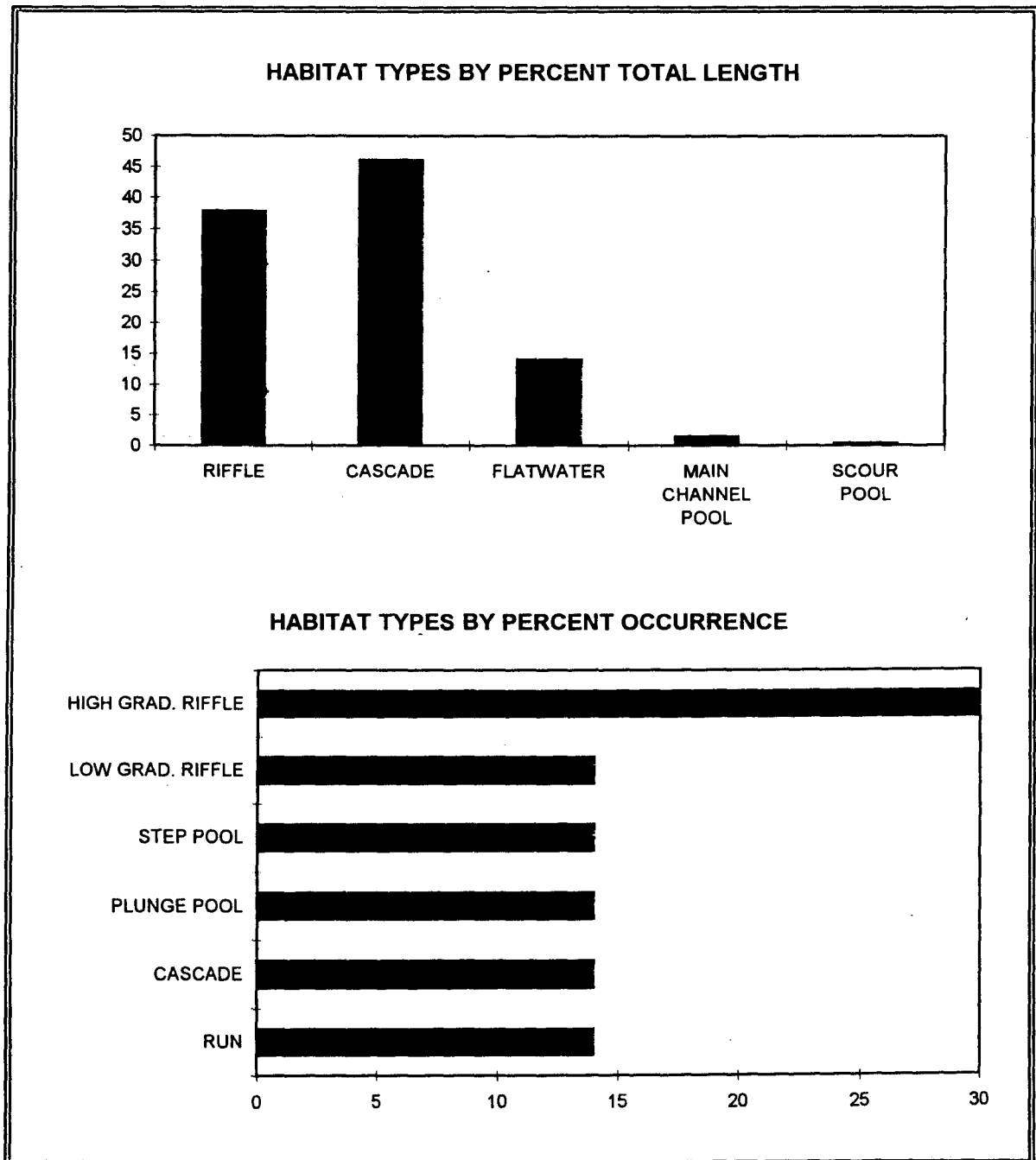


Figure 25. Habitat types, Level III (upper) and Level IV (lower), Boundary Creek.



Figure 26. A road ford -- human use impact on stream habitat in Boundary Creek.



Figure 27. A horse crossing -- livestock use impact on stream habitat in Boundary Creek.

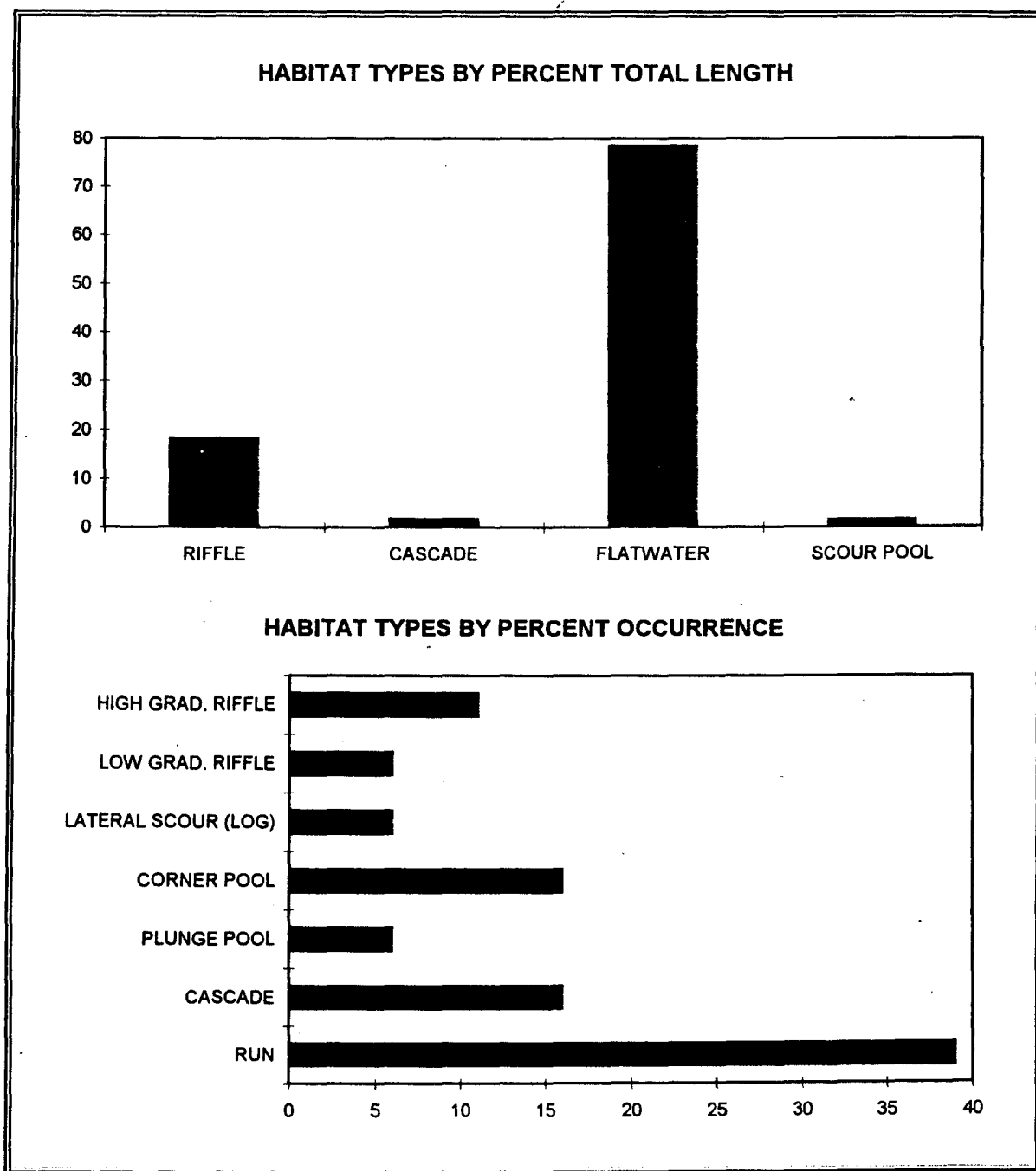


Figure 28. Habitat types, Level III (upper) and Level IV (lower), Creek Creek.



Figure 29. Creek Creek natural fish barrier at the Middle Fork San Joaquin River confluence.



Figure 30. Human made disturbance on Creek Creek in the Reds Meadow Campground.

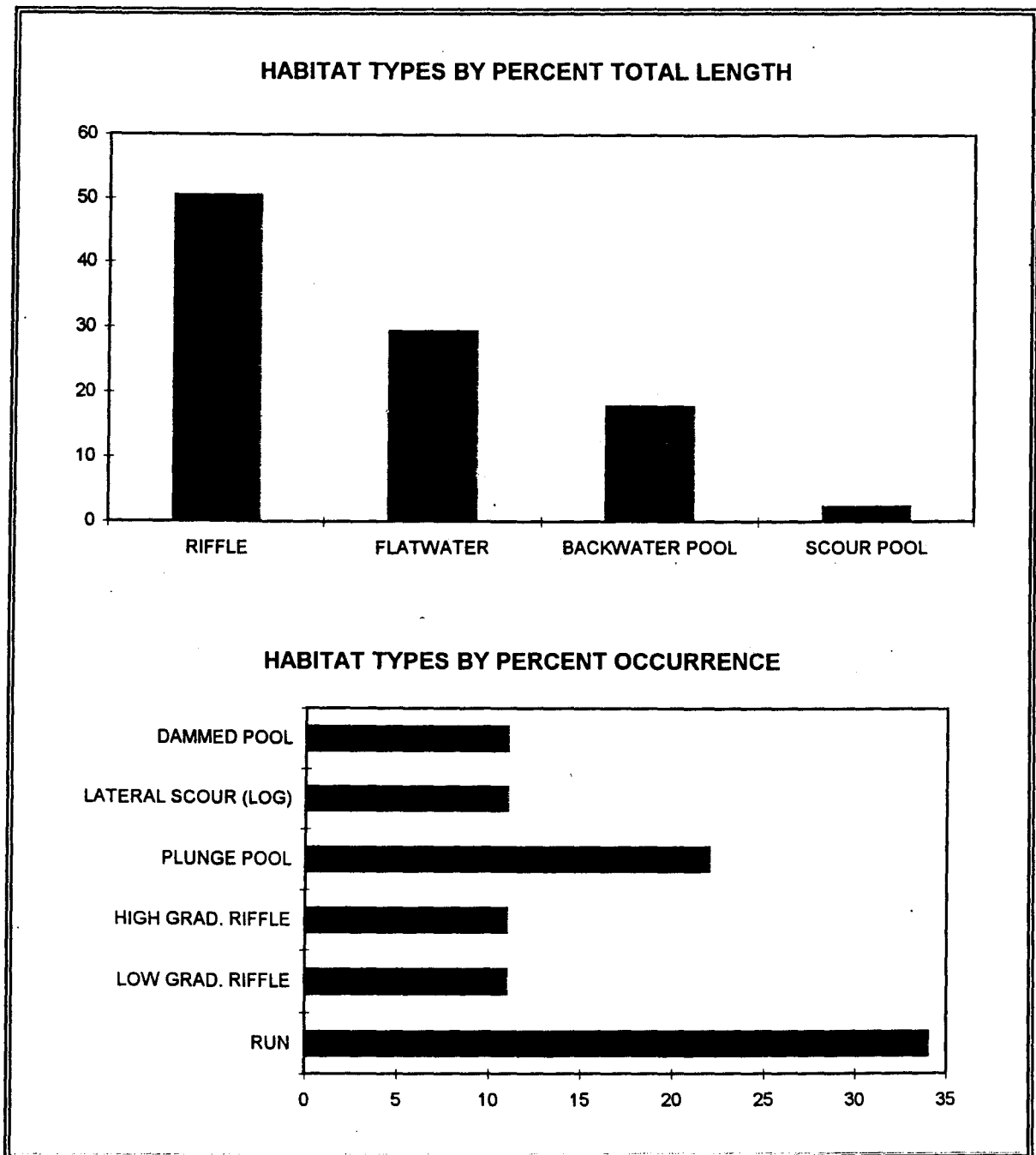


Figure 31. Habitat types, Level III (upper) and Level IV (lower), Reds Meadow Creek.

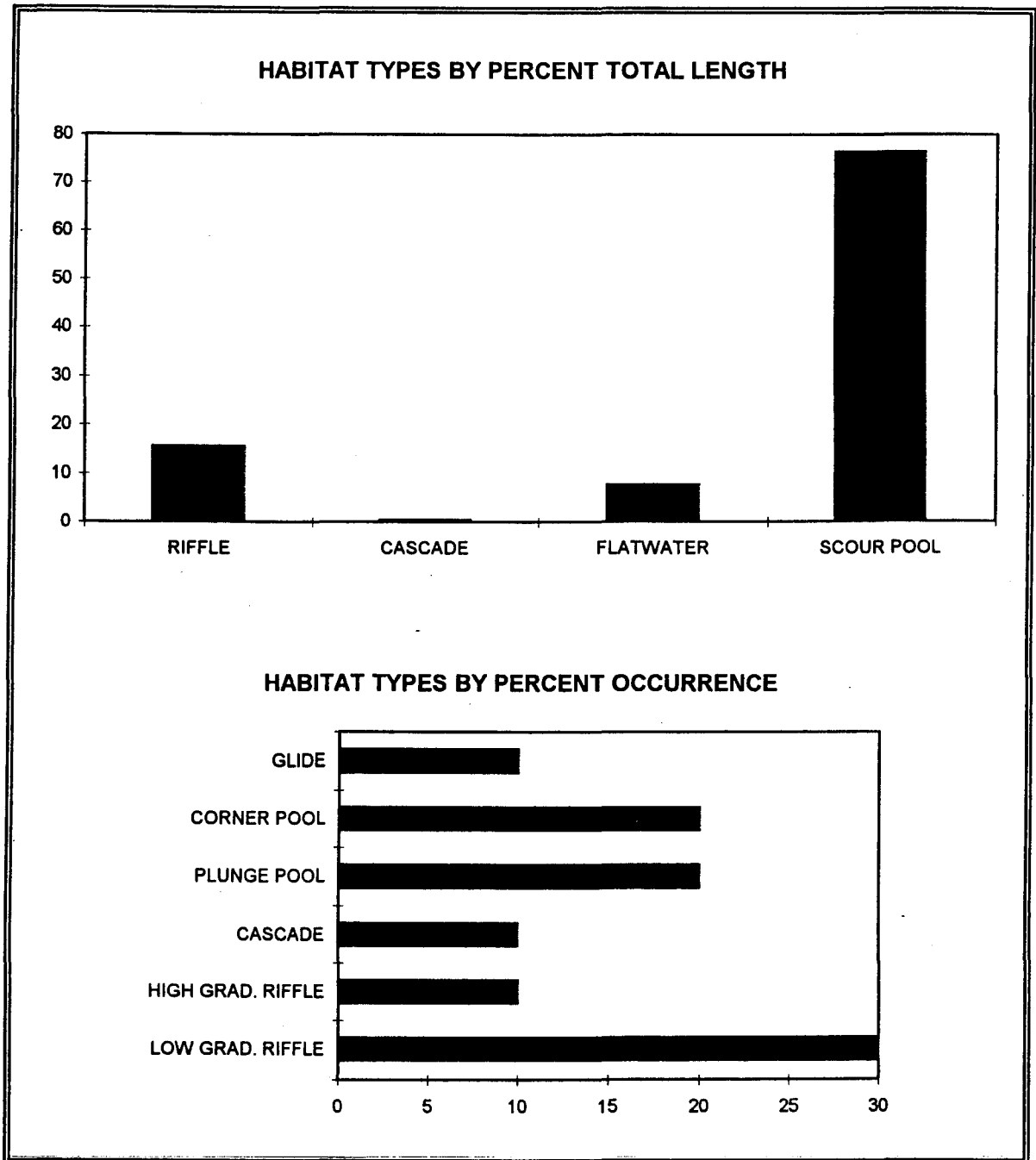


Figure 32. Habitat types, Level III (upper) and Level IV (lower), Minaret Creek.

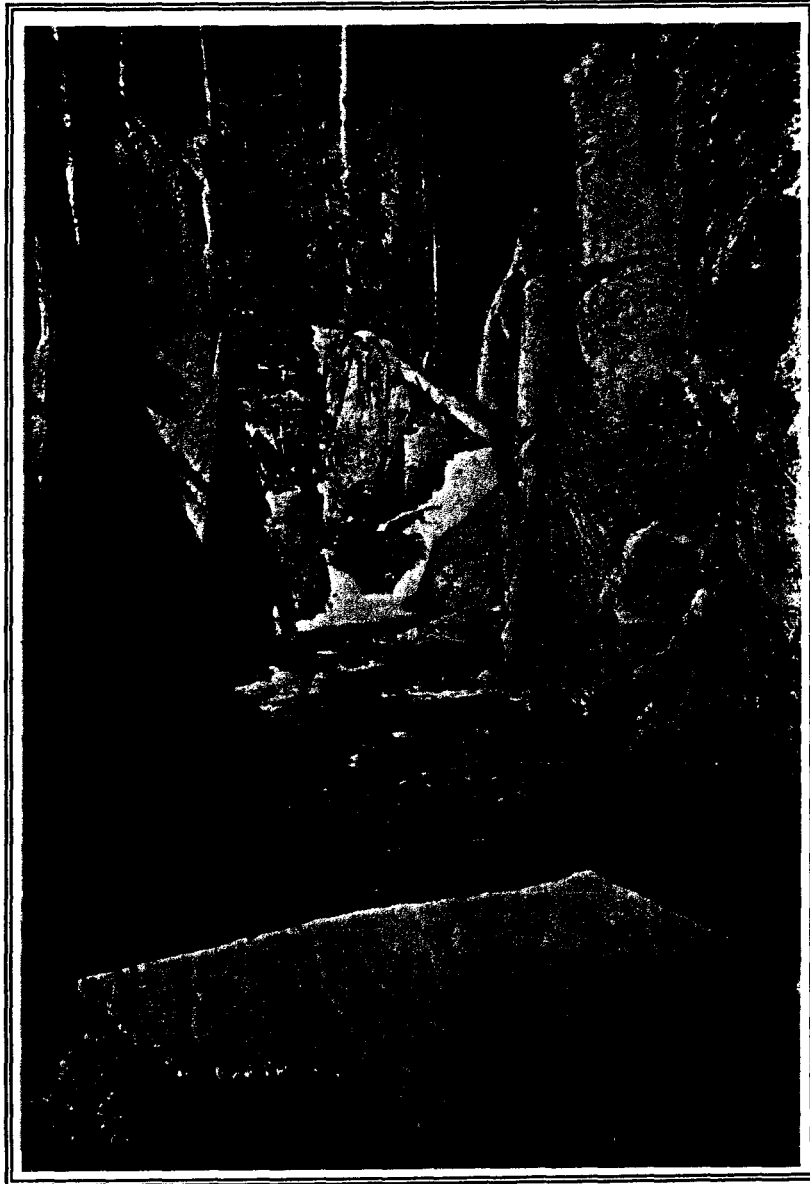


Figure 33. Pool habitat. Steep gradient, very well confined, deeply incised bedrock channel with large boulders in Minaret Creek. (Rosgen Stream Type A-1)

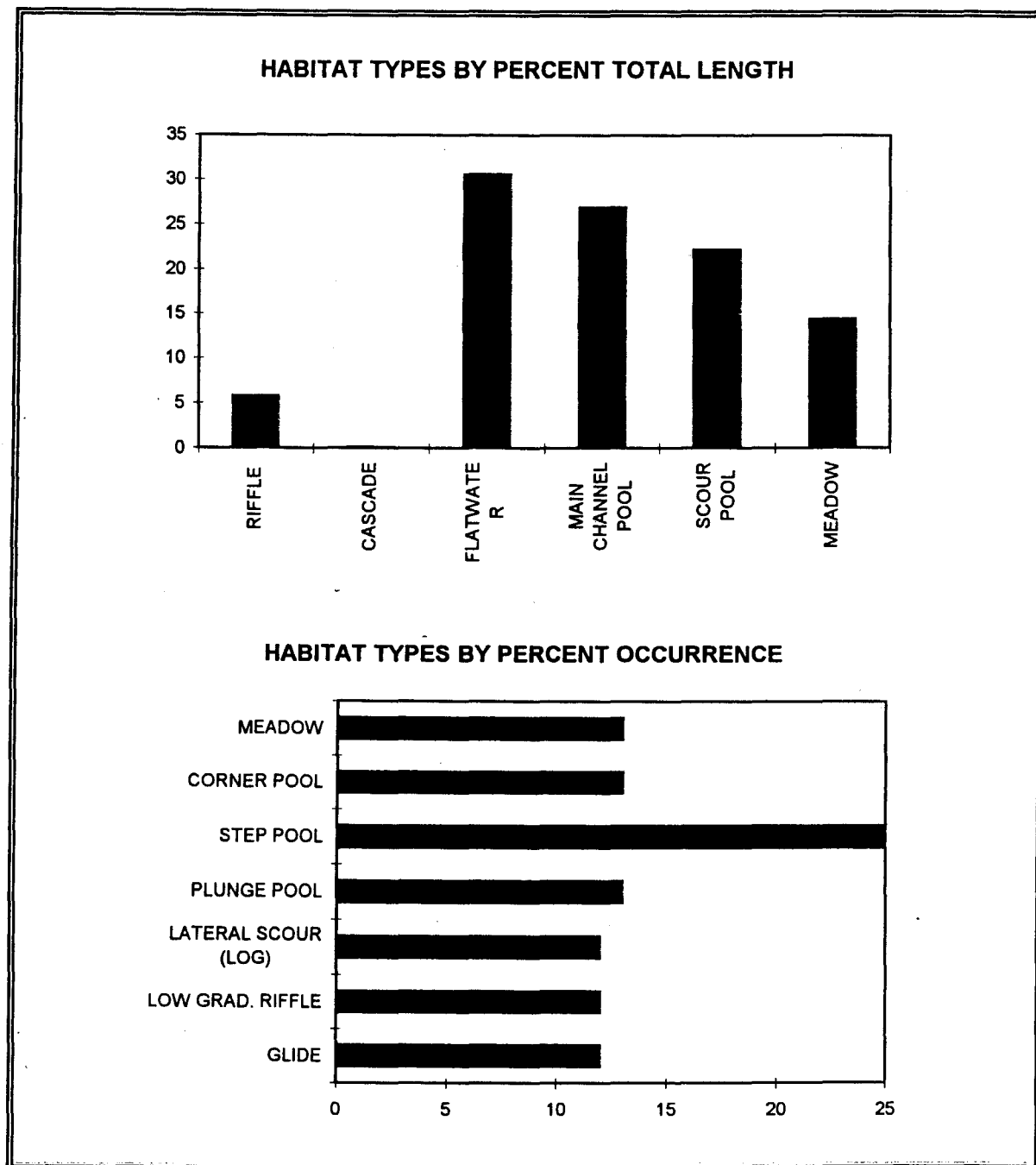


Figure 34. Habitat types, Level III (upper) and Level IV (lower), Reds Creek.



Figure 35. Site DPNM-SE1, typical lentic (standing) water body in the study area.  
(See Figure 4.)

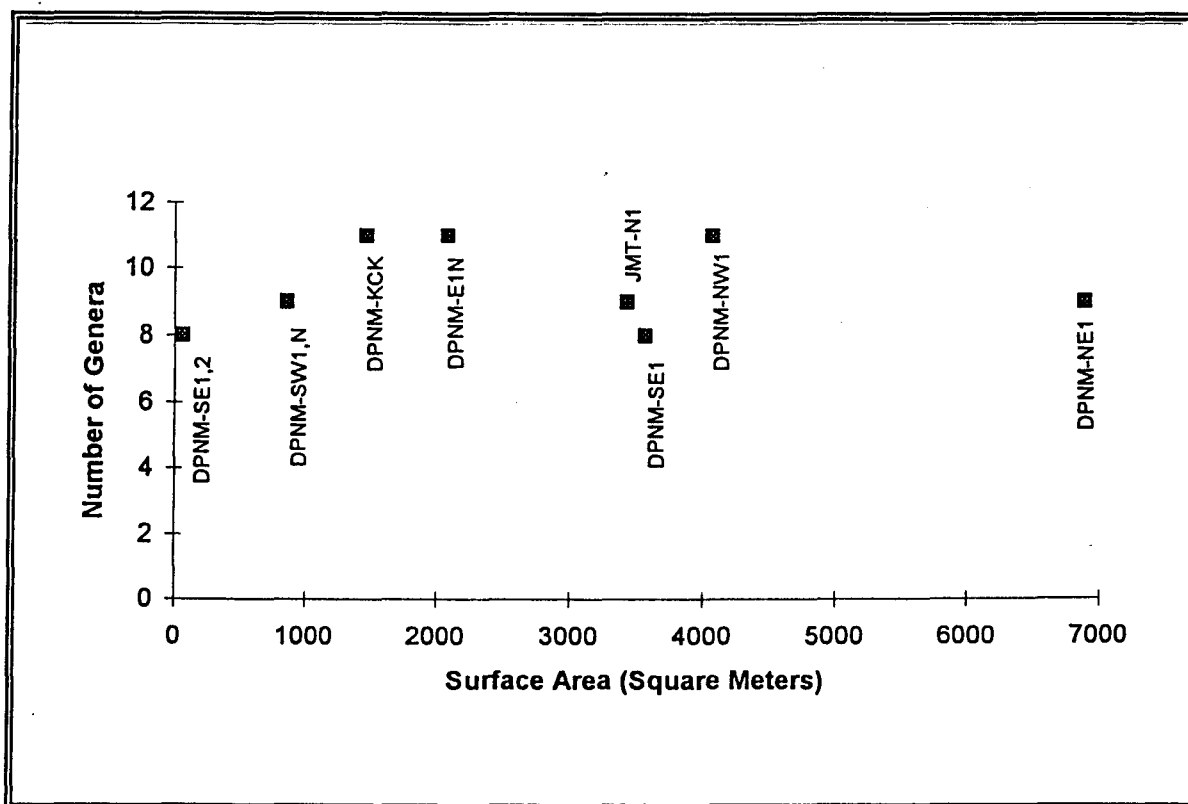


Figure 36. Aquatic macroinvertebrate genera density for lentic sites sampled in the study area.

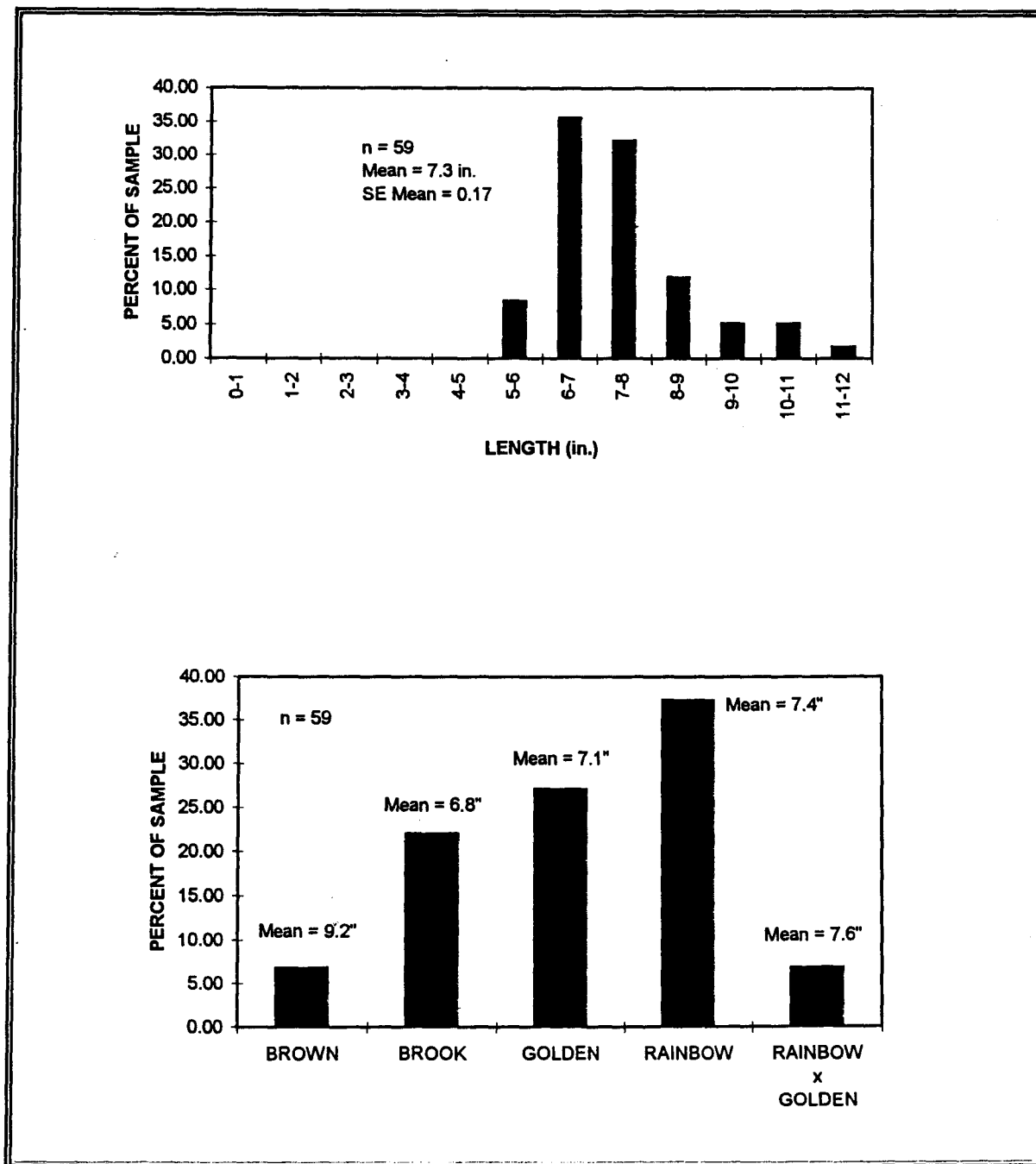


Figure 37. King Creek trout population sample (upper) and species abundance (lower), 1994.

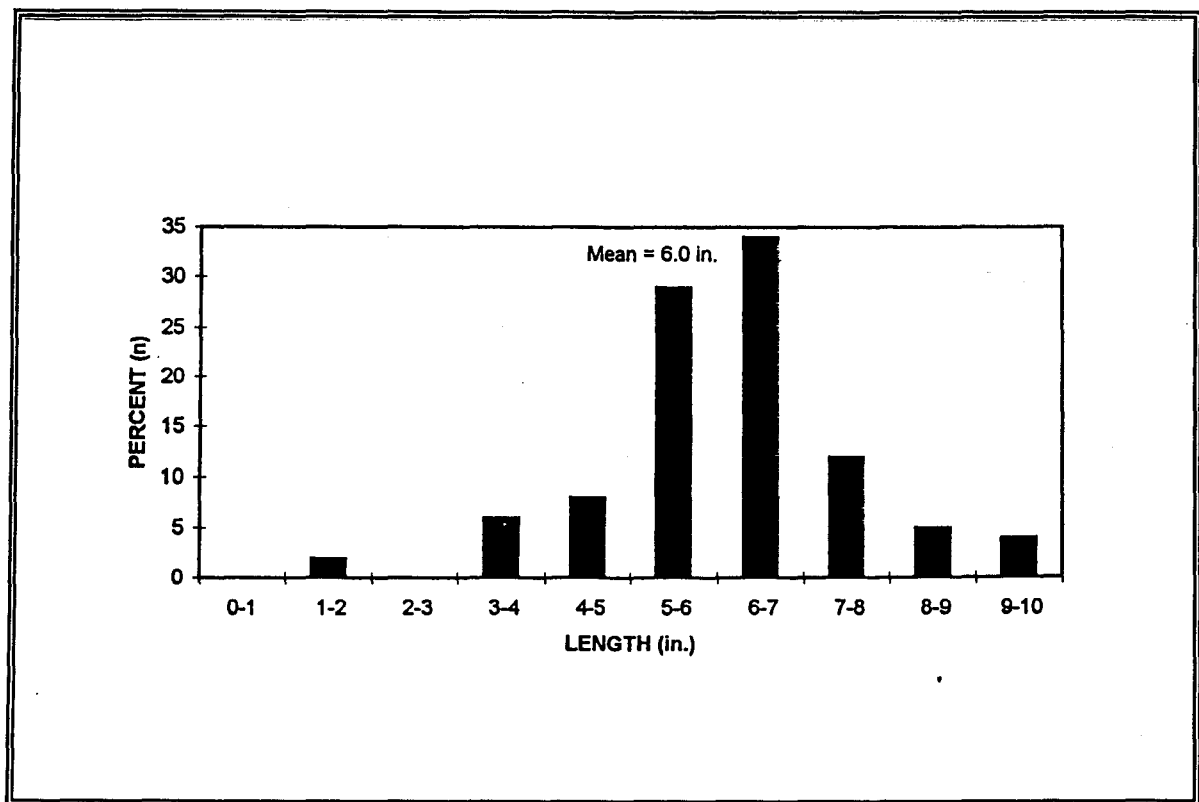


Figure 38. Creek Creek brown trout population sample, 1994.

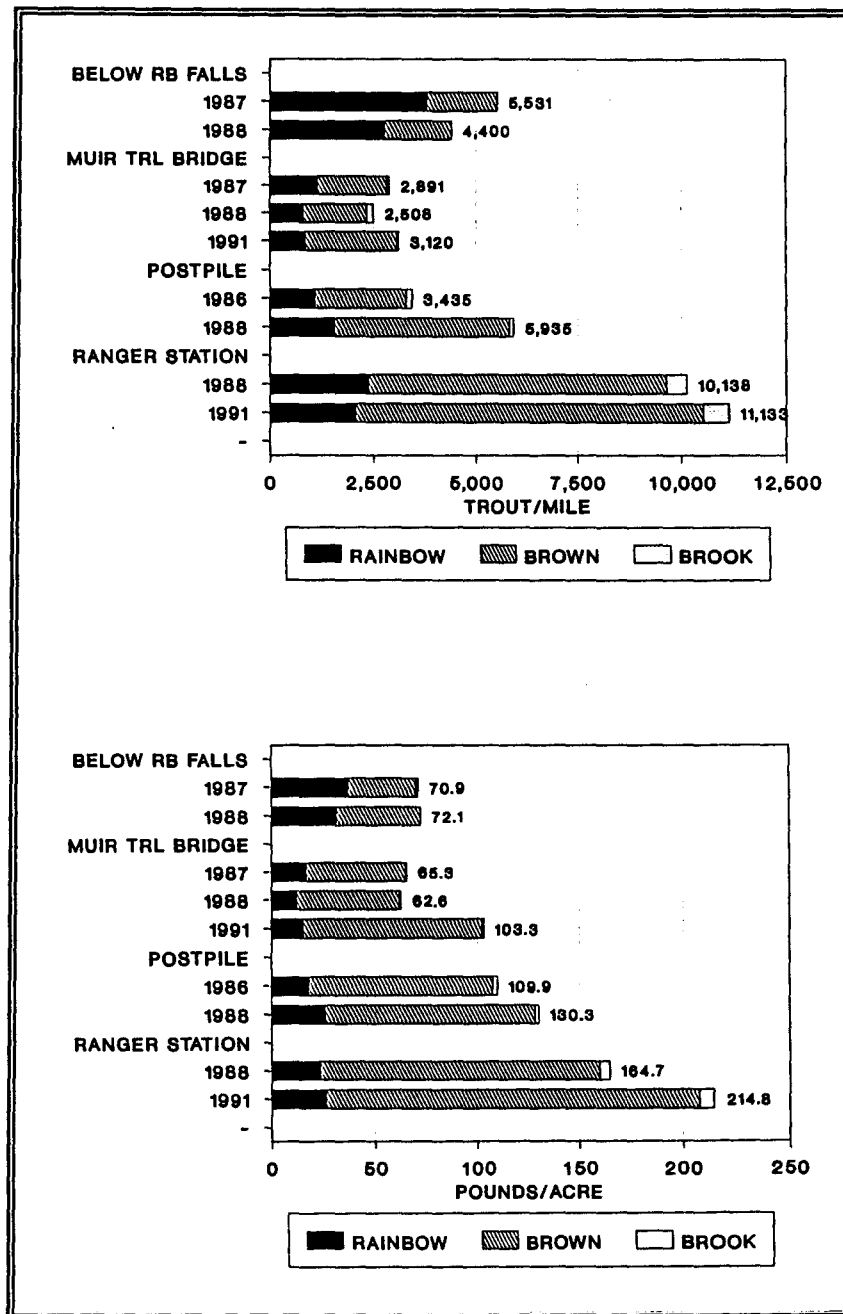


Figure 39. Summaries of trout densities (upper) and biomass (lower), Middle Fork San Joaquin River, Devils Postpile National Monument (from Deinstadt et al. 1995).

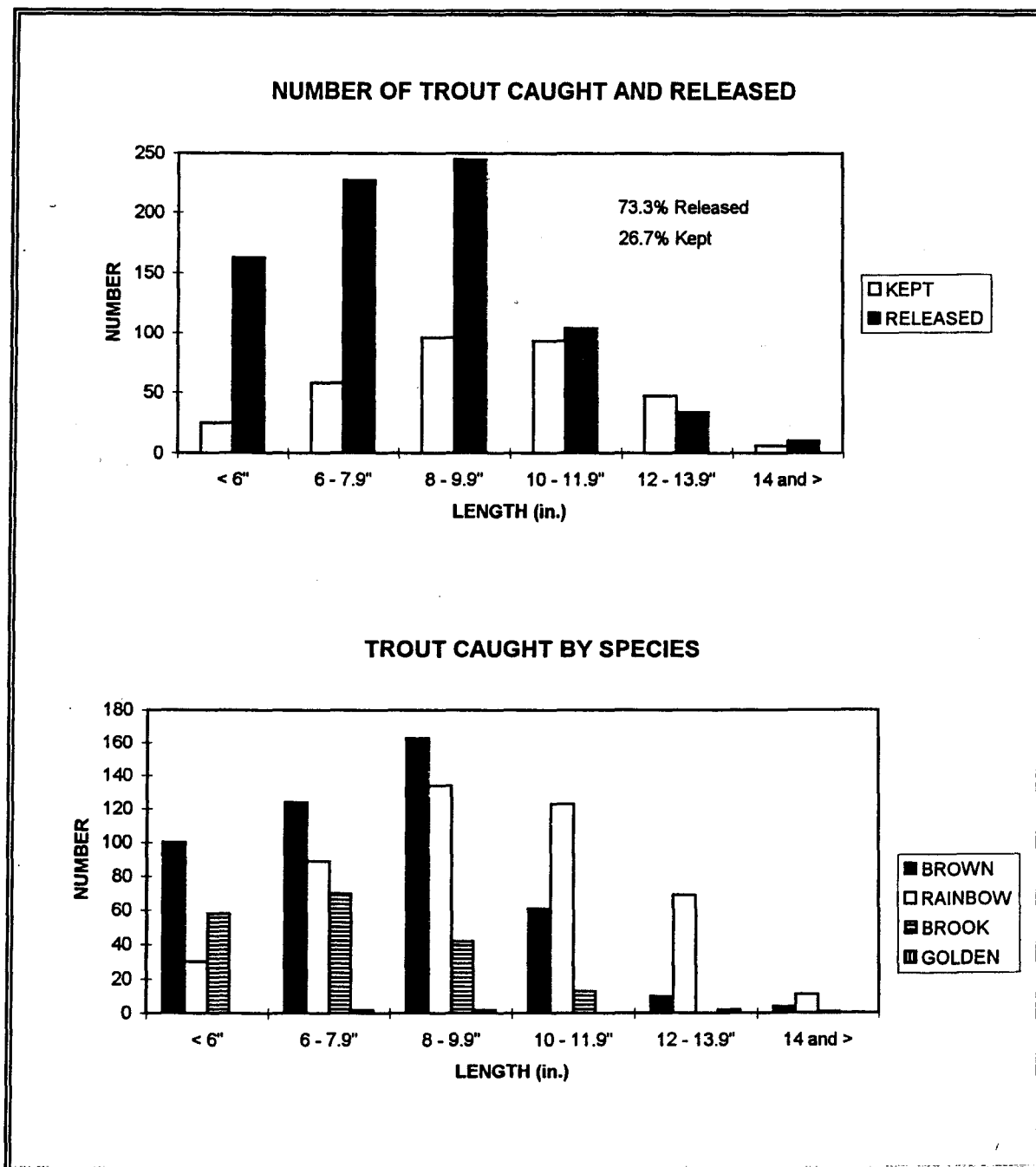


Figure 40. Total reported catch of trout kept and released (upper) and numbers caught of each trout special (lower), Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.

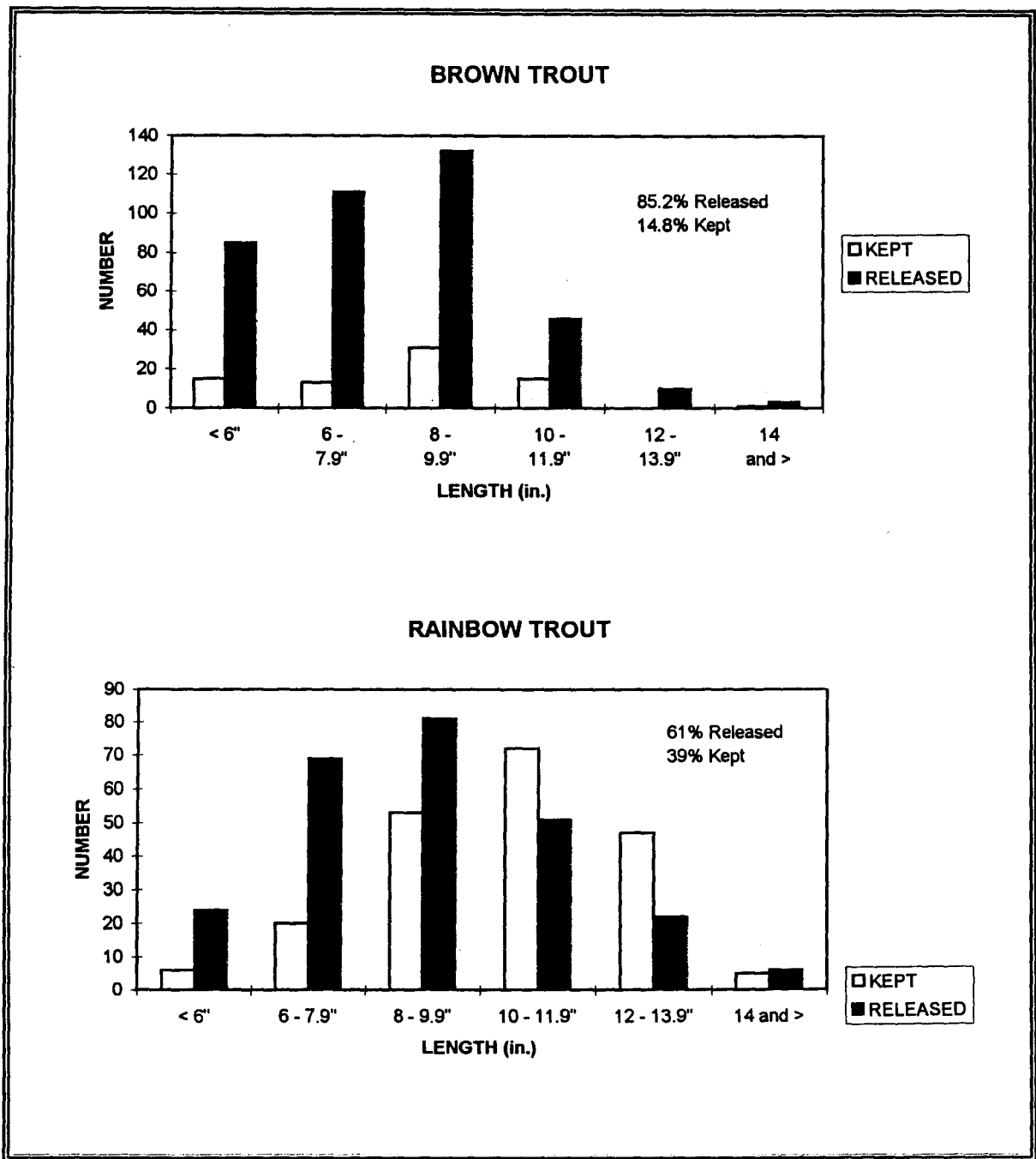


Figure 41. Angler survey box responses for brown and rainbow trout reported kept and released, Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.

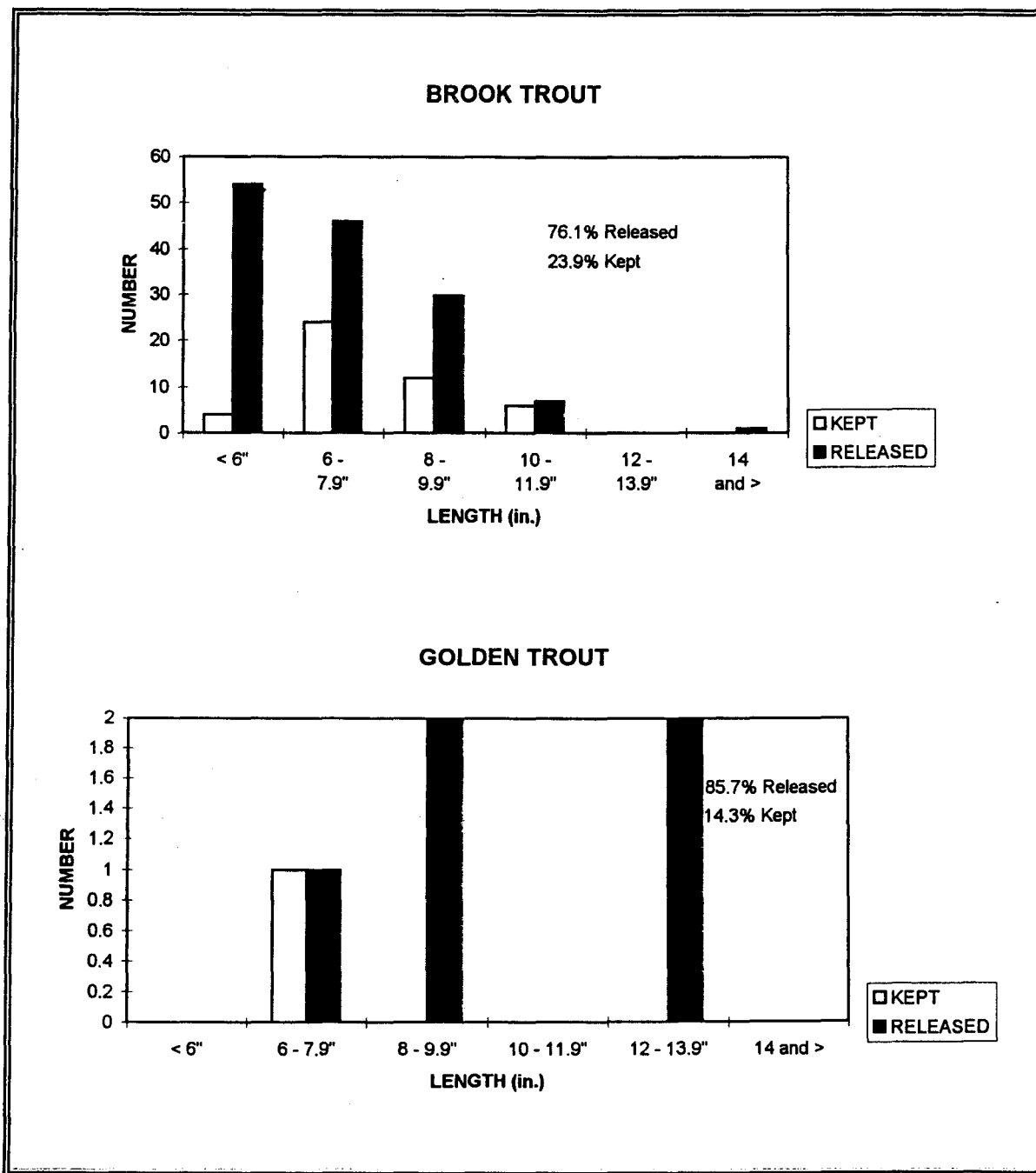


Figure 42. Angler survey box responses for brook and golden trout reported kept and released, Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.

**Table 1. Common riparian plants of Devils Postpile National Monument**

| Family       | Scientific Name                                                                   | Common Name                                          |
|--------------|-----------------------------------------------------------------------------------|------------------------------------------------------|
| BETULACEAE   | <i>Alnus tenuifolia</i>                                                           | Mountain (Creek) Alder                               |
| BRASSICACEAE | <i>Rorippa curvisiliqua</i>                                                       | Western Yellow-cress                                 |
| CORNACEAE    | <i>Cornus occidentalis</i><br><i>Cornus stolonifera</i>                           | Western Dogwood<br>Creek Dogwood                     |
| EQUISETACEAE | <i>Equisetum arvense</i>                                                          | Common Horsetail                                     |
| LILIACEAE    | <i>Lilium kelleyanum</i><br><i>Lilium pardalinum</i>                              | Kelley's Lilly<br>Leopard Lilly                      |
| SALICACEAE   | <i>Salix lemmonii</i><br><i>Populus tremuloides</i><br><i>Populus trichocarpa</i> | Lemmon's Willow<br>Quaking Aspen<br>Black Cottonwood |

**Table 2. Common riparian birds of Devils Postpile National Monument**

| Family            | Scientific Name               | Common Name                   |
|-------------------|-------------------------------|-------------------------------|
| PHALACROCORACIDAE | <i>Phalacrocorax auritus</i>  | Double-crested Cormorant      |
| ARDEIDAE          | <i>Ardea herodias</i>         | Great Blue Heron              |
| ANATINAE          | <i>Anas platyrhynchos</i>     | Mallard                       |
| SCOLOPACIDAE      | <i>Actitis macularia</i>      | Spotted Sandpiper             |
| LARIDAE           | <i>Larus californicus</i>     | California Gull               |
| ALCEDINIDAE       | <i>Ceryle alcyon</i>          | Belted Kingfisher             |
| TYRANNIDAE        | <i>Empidonax traillii</i>     | Willow Flycatcher             |
|                   | <i>Empidonax difficilis</i>   | Western Flycatcher            |
|                   | <i>Contopus sordidulus</i>    | Western Wood Pewee            |
|                   | <i>Contopus borealis</i>      | Olive-sided Flycatcher        |
| HIRUNDINIDAE      | <i>Tachycineta thalassina</i> | Violet-green Swallow          |
| CINCLIDAE         | <i>Cinclus mexicanus</i>      | American Dipper (Water Ouzel) |
| PARULIDAE         | <i>Dendroica petechia</i>     | Yellow Warbler                |
|                   | <i>Dendroica coronata</i>     | Yellow-rumped Warbler         |
|                   | <i>Dendroica occidentalis</i> | Hermit Warbler                |
|                   | <i>Wilsonia pusilla</i>       | Wilson's Warbler              |
|                   | <i>Oporornis tolmiei</i>      | MacGillivray's Warbler        |
| ICTERIDAE         | <i>Agelaius phoeniceus</i>    | Red-winged Blackbird          |
| FRINGILLIDAE      | <i>Zonotrichia leucophrys</i> | White-crowned Sparrow         |
|                   | <i>Melospiza melodia</i>      | Song Sparrow                  |

**Table 3. Reported success of bait, lure, and fly anglers on the Middle Fork San Joaquin River, June 10, 1994 to August 10, 1994, Devils Postpile National Monument from angler self-survey box.**

|                        | Bait Anglers<br>1994 | Lure Anglers<br>1994 | Fly Anglers<br>1994 | Total<br>1994 |
|------------------------|----------------------|----------------------|---------------------|---------------|
| Surveys Received       | 93                   | 36                   | 71                  | 200           |
| Hours Fished           | 320.75               | 107.00               | 242.25              | 670.00        |
| Rainbow Trout Kept     | 156                  | 51                   | 14                  | 221           |
| Rainbow Trout Released | 175                  | 58                   | 113                 | 346           |
| Total Rainbow Trout    | 331                  | 109                  | 127                 | 567           |
| Brown Trout Kept       | 54                   | 18                   | 5                   | 77            |
| Brown Trout Released   | 126                  | 79                   | 240                 | 445           |
| Total Brown Trout      | 180                  | 97                   | 245                 | 522           |
| Brook Trout Kept       | 46                   | 0                    | 3                   | 49            |
| Brook Trout Released   | 49                   | 38                   | 69                  | 156           |
| Total Brook Trout      | 95                   | 38                   | 72                  | 205           |
| Golden Trout Kept      | 0                    | 1                    | 0                   | 1             |
| Golden Trout Released  | 0                    | 2                    | 4                   | 6             |
| Total Golden Trout     | 0                    | 3                    | 4                   | 7             |
| Total Trout Kept       | 256                  | 70                   | 22                  | 348           |
| Total Trout Released   | 350                  | 177                  | 426                 | 953           |
| Total Trout Caught     | 606                  | 247                  | 448                 | 1301          |
| Overall Catch/Hour     | 1.89                 | 2.31                 | 1.85                | 1.94          |
| Mean Trout/Angler      | 6.52                 | 6.86                 | 6.31                | 6.51          |
| Mean Hr./Day           | 3.45                 | 2.97                 | 3.41                | 3.35          |

**Table 4. Reported number of each trout species caught by size on the Middle Fork San Joaquin River, June 10, 1994 to August 10, 1994, Devils Postpile National Monument from angler self-survey box.**

| Size<br>(in.) | Brown Trout |          | Rainbow Trout |          | Brook Trout |          | Golden Trout |          | Total |          |
|---------------|-------------|----------|---------------|----------|-------------|----------|--------------|----------|-------|----------|
|               | Kept        | Released | Kept          | Released | Kept        | Released | Kept         | Released | Kept  | Released |
| < 6           | 15          | 85       | 6             | 24       | 4           | 54       | 0            | 0        | 25    | 163      |
| 6 - 7.9       | 13          | 111      | 20            | 69       | 24          | 46       | 1            | 1        | 58    | 227      |
| 8 - 9.9       | 31          | 132      | 53            | 81       | 12          | 30       | 0            | 2        | 96    | 245      |
| 10 - 11.9     | 15          | 46       | 72            | 51       | 6           | 7        | 0            | 0        | 93    | 104      |
| 12 - 13.9     | 0           | 10       | 47            | 22       | 0           | 0        | 0            | 2        | 47    | 34       |
| > 14          | 1           | 3        | 5             | 6        | 0           | 1        | 0            | 0        | 6     | 10       |

Table 5. Amphibian survey physical site descriptions, Devils Postpile National Monument, 1994.

| Site        | Legal Description    | Elevation<br>(m) | Length<br>(m) | Width<br>(m) | Area<br>(m <sup>2</sup> ) | Average<br>Depth (m) | Maximum<br>Depth (m) | pH  |
|-------------|----------------------|------------------|---------------|--------------|---------------------------|----------------------|----------------------|-----|
| DPNM-NE1    | T2SR26ES34SE1/4SE1/4 | 2,330            | 167.7         | 41.2         | 6909                      | 0.46                 | 1.0                  | 7.4 |
| DPNM-NW1*   | T4SR26ES03SW1/4NW1/4 | 2,470            | 117.4         | 34.8         | 4086                      | 0.37                 | 0.6                  | 6.8 |
| SOTCHER LK. | T3SR26ES02SE1/4NW1/4 | 2,330            | 480.0         | 200.0        | 96000                     | 8.02                 | 11.3                 | 8.2 |
| DPNM-EIN    | T3SR26ES03NE1/4SE1/4 | 2,300            | 91.5          | 22.9         | 2095                      | 0.46                 | 0.7                  | 7.4 |
| DPNM-KCK*   | T3SR26ES03SW1/4NE1/4 | 2,400            | 57.0          | 25.9         | 1476                      | 0.60                 | 1.1                  | 6.6 |
| JMT-N1*     | T4SR26ES03SE1/4SE1/4 | 2,280            | 282.0         | 12.2         | 3440                      | 0.40                 | 0.7                  | 6.6 |
| JMT-S1Str.* | T4SR26ES03SE1/4SE1/4 | 2,280            | 227.0         | 0.6          | 136                       | 0.08                 | 1.8                  | 6.9 |
| JMT-S1*     | T4SR26ES03SE1/4SE1/4 | 2,280            | 50.0          | 12.0         | 600                       | 0.06                 | 0.2                  | DRY |
| DPNM-SW1,N* | T4SR26ES03SW1/4SE1/4 | 2,300            | 29.9          | 29.0         | 867                       | 0.52                 | 0.8                  | 7.6 |
| DPNM-SW1*   | T4SR26ES10SE1/4NW1/4 | 2,200            | 193.9         | 39.6         | 7678                      | 0.06                 | 1.0                  | 7.6 |
| DPNM-SE1*   | T4SR26ES10SE1/4SE1/4 | 2,250            | 71.6          | 50.0         | 3580                      | 0.24                 | 0.9                  | 8.0 |
| DPNM-SE1,2* | T4SR26ES10SE1/4SE1/4 | 2,253            | 12.2          | 5.5          | 67                        | 0.27                 | 0.6                  | 8.2 |

\* Denote sites affected by 1992 Rainbow Fire

**Table 6. Summary of riffle, flatwater, and pool habitat types of the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.**

| # Units Measured | Habitat Type | Habitat Freq. (%) | Mean Length (ft.) | Total Length (ft.) | % Total Length | Mean Width (ft.) | Mean Depth (ft.) | Mean Area (ft <sup>2</sup> ) | Total Area (ft <sup>2</sup> ) | Mean Vol. (ft <sup>3</sup> ) | Total Vol. (ft <sup>3</sup> ) | Mean Resid. Pool Vol. (ft <sup>3</sup> ) | Mean Shelter Rating |
|------------------|--------------|-------------------|-------------------|--------------------|----------------|------------------|------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------------------|---------------------|
| 107              | Riffle       | 41.15             | 114.76            | 12279              | 41.20          | 38.35            | 0.84             | 4740                         | 507193                        | 4641                         | 496638                        | 0                                        | 36.45               |
| 114              | Flatwater    | 43.85             | 132.74            | 15132              | 50.77          | 32.21            | 1.43             | 4467                         | 509185                        | 6509                         | 742063                        | 0                                        | 43.37               |
| 139              | Pool         | 15                | 61.36             | 2393               | 8.03           | 25.28            | 2.15             | 1830                         | 71366                         | 4946                         | 192893                        | 3085                                     | 59.49               |

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**Table 7. Summary of habitat types and measured parameters for the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.**

| # Units Measured | Habitat Type | Habitat Freq. (%) | Mean Length (ft.) | Total Length (ft.) | % Total Length | Mean Width (ft.) | Mean Depth (ft.) | Max. Depth (ft.) | Mean Area (ft <sup>2</sup> ) | Total Area (ft <sup>2</sup> ) | Mean Vol. (ft <sup>3</sup> ) | Total Vol. (ft <sup>3</sup> ) | Mean Resid. Pool Vol. (ft <sup>3</sup> ) | Mean Shelter Rating | Mean % Rt. Bank Veg. | Mean % Lt. Bank Veg. | Mean % Canopy |
|------------------|--------------|-------------------|-------------------|--------------------|----------------|------------------|------------------|------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------------------|---------------------|----------------------|----------------------|---------------|
| 69               | LGR          | 26.5              | 128.5             | 8865               | 29.7           | 38.9             | 0.7              | 2.4              | 5387                         | 371680                        | 4644                         | 320458                        | 0                                        | 32.5                | 77.0                 | 74.8                 | 13.8          |
| 33               | HGR          | 12.7              | 99.0              | 3268               | 11.0           | 38.2             | 1.1              | 3.9              | 3930                         | 129698                        | 5211                         | 171978                        | 0                                        | 50.0                | 61.4                 | 58.0                 | 13.3          |
| 5                | CAS          | 1.9               | 29.2              | 146                | 0.5            | 32.2             | 0.6              | 3.8              | 1163                         | 5815                          | 840                          | 4201                          | 0                                        | 1.0                 | 21.0                 | 24.0                 | 5.0           |
| 5                | POW          | 1.9               | 174.0             | 870                | 2.9            | 39.2             | 1.1              | 2.4              | 7591                         | 37596                         | 8903                         | 44516                         | 0                                        | 43.0                | 77.0                 | 67.0                 | 11.0          |
| 20               | GLD          | 7.7               | 86.0              | 1719               | 5.8            | 35.1             | 1.2              | 4.5              | 3368                         | 67359                         | 4257                         | 85144                         | 0                                        | 16.8                | 58.5                 | 68.0                 | 9.1           |
| 89               | RUN          | 34.2              | 140.9             | 12543              | 42.1           | 31.2             | 1.5              | 6.0              | 4538                         | 403869                        | 6881                         | 612404                        | 0                                        | 49.4                | 65.3                 | 67.8                 | 12.9          |
| 6                | MCP          | 2.3               | 57.2              | 343                | 1.2            | 21.3             | 1.4              | 4.5              | 1640                         | 9841                          | 3704                         | 22225                         | 2152                                     | 22.5                | 91.7                 | 78.3                 | 10.3          |
| 8                | CRP          | 3.1               | 74.4              | 595                | 2.0            | 27.0             | 2.3              | 4.6              | 2180                         | 17436                         | 5494                         | 43953                         | 2530                                     | 40.0                | 63.8                 | 73.8                 | 20.6          |
| 7                | LSL          | 2.7               | 39.7              | 278                | 0.9            | 13.7             | 1.3              | 3.0              | 560                          | 3917                          | 725                          | 5077                          | 439                                      | 102.1               | 57.9                 | 59.3                 | 25.7          |
| 2                | LSR          | 0.8               | 70.5              | 141                | 0.5            | 20.0             | 2.0              | 3.1              | 1427                         | 2853                          | 2926                         | 5853                          | 1564                                     | 20.0                | 47.5                 | 100.0                | 40.0          |
| 1                | LSBk         | 0.4               | 118.0             | 118                | 0.4            | 35.0             | 2.1              | 3.0              | 4130                         | 4130                          | 8673                         | 8673                          | 2478                                     | 60.0                | 30.0                 | 20.0                 | 10.0          |
| 5                | LSBo         | 1.9               | 68.6              | 343                | 1.2            | 32.0             | 3.3              | 6.6              | 2336                         | 11680                         | 7817                         | 39087                         | 5548                                     | 62.0                | 56.0                 | 44.0                 | 11.0          |
| 6                | PLP          | 2.3               | 76.0              | 456                | 1.5            | 39.5             | 3.3              | 16.3             | 3194                         | 19166                         | 10791                        | 64744                         | 8226                                     | 52.5                | 44.2                 | 25.8                 | 11.7          |
| 1                | BPR          | 0.4               | 15.0              | 15                 | 0.1            | 11.0             | 1.5              | 1.9              | 165                          | 165                           | 248                          | 248                           | 50                                       | 80.0                | 85.0                 | 5.0                  | 10.0          |
| 3                | DPL          | 1.2               | 34.7              | 104                | 0.4            | 21.0             | 1.4              | 2.1              | 726                          | 2178                          | 1011                         | 3034                          | 482                                      | 115.0               | 50.0                 | 65.0                 | 15.0          |

**Table 8. Summary of pool types of the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.**

| # Units<br>Measured | Habitat<br>Type | Habitat<br>Freq.<br>(%) | Mean<br>Length<br>(ft.) | Total<br>Length<br>(ft.) | % Total<br>Length | Mean<br>Width<br>(ft.) | Mean<br>Depth<br>(ft.) | Mean<br>Area<br>(ft <sup>2</sup> ) | Total<br>Area<br>(ft <sup>2</sup> ) | Mean<br>Vol.<br>(ft <sup>3</sup> ) | Total<br>Vol.<br>(ft <sup>3</sup> ) | Mean<br>Resid. Pool<br>Vol. (ft <sup>3</sup> ) | Mean<br>Shelter<br>Rating |
|---------------------|-----------------|-------------------------|-------------------------|--------------------------|-------------------|------------------------|------------------------|------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------------------|---------------------------|
| 6                   | Main            | 15.4                    | 57.2                    | 343                      | 14.3              | 21.3                   | 1.4                    | 1640                               | 9841                                | 3704                               | 22225                               | 2152                                           | 22.50                     |
| 29                  | Scour           | 74.4                    | 66.6                    | 1931                     | 80.7              | 27.0                   | 2.4                    | 2041                               | 59182                               | 5772                               | 167387                              | 3656                                           | 60.69                     |
| 4                   | Backwater       | 10.3                    | 29.8                    | 119                      | 5.0               | 18.5                   | 1.5                    | 586                                | 2343                                | 820                                | 3282                                | 349                                            | 106.25                    |

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**Table 9. Summary of maximum pool depths by habitat types for the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.**

| # Units Measured | Habitat Type | Habitat Freq. (%) | < 1 ft. Max. Depth | < 1 ft. Freq. (%) | 1-< 2 ft. Max. Depth | 1-< 2 ft. Freq. (%) | 2-<3 ft. Max. Depth | 2-<3 ft. Freq. (%) | 3-<4 ft. Max. Depth | 3-<4 ft. Freq. (%) | >=4 ft. Max. Depth | >=4 ft. Freq. (%) |
|------------------|--------------|-------------------|--------------------|-------------------|----------------------|---------------------|---------------------|--------------------|---------------------|--------------------|--------------------|-------------------|
| 6                | MCP          | 15.4              | 0                  | 0.0               | 4                    | 66.7                | 0                   | 0.0                | 1                   | 16.7               | 1                  | 16.7              |
| 8                | CRP          | 20.5              | 0                  | 0.0               | 0                    | 0.0                 | 2                   | 25.0               | 4                   | 50.0               | 2                  | 25.0              |
| 7                | LSL          | 18.0              | 1                  | 14.3              | 3                    | 42.9                | 2                   | 28.6               | 1                   | 14.3               | 0                  | 0.0               |
| 2                | LSR          | 5.1               | 0                  | 0.0               | 1                    | 50.0                | 0                   | 0.0                | 1                   | 50.0               | 0                  | 0.0               |
| 1                | LSBk         | 2.6               | 0                  | 0.0               | 0                    | 0.0                 | 0                   | 0.0                | 1                   | 100.0              | 0                  | 0.0               |
| 5                | LSBo         | 12.8              | 0                  | 0.0               | 0                    | 0.0                 | 1                   | 20.0               | 0                   | 0.0                | 4                  | 80.0              |
| 6                | PLP          | 15.4              | 0                  | 0.0               | 2                    | 33.3                | 1                   | 16.7               | 0                   | 0.0                | 3                  | 50.0              |
| 1                | BPR          | 2.6               | 0                  | 0.0               | 1                    | 100.0               | 0                   | 0.0                | 0                   | 0.0                | 0                  | 0.0               |
| 3                | DPL          | 7.7               | 0                  | 0.0               | 0                    | 0.0                 | 3                   | 100.0              | 0                   | 0.0                | 0                  | 0.0               |

**Table 10. Summary of mean percent cover by habitat type for the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.**

| # Units Measured | Habitat Type | Mean % Undercut Banks | Mean % SWD | Mean % LWD | Mean % Root Mass | Mean % Terr. Veg. | Mean % Aquatic Veg. | Mean % White Water | Mean % Boulders | Mean % Bedrock Ledges |
|------------------|--------------|-----------------------|------------|------------|------------------|-------------------|---------------------|--------------------|-----------------|-----------------------|
| 69               | LGR          | 0.7                   | 2.4        | 1.1        | 0.4              | 9.8               | 0.7                 | 4.1                | 6.2             | 0.1                   |
| 33               | HGR          | 0.3                   | 2.1        | 2.4        | 0.5              | 8.0               | 0.5                 | 8.6                | 10.0            | 1.1                   |
| 5                | CAS          | 0.0                   | 0.0        | 0.0        | 0.0              | 0.0               | 0.0                 | 1.0                | 3.0             | 0.0                   |
| 5                | POW          | 1.0                   | 0.0        | 3.0        | 0.0              | 7.0               | 1.0                 | 4.0                | 11.0            | 1.0                   |
| 20               | GLD          | 1.5                   | 1.3        | 0.8        | 0.3              | 7.3               | 1.0                 | 0.3                | 1.3             | 0.5                   |
| 89               | RUN          | 1.6                   | 3.0        | 2.0        | 0.9              | 9.9               | 1.3                 | 3.5                | 8.3             | 2.1                   |
| 6                | MCP          | 0.8                   | 3.3        | 1.7        | 0.0              | 6.7               | 0.8                 | 0.0                | 2.5             | 0.0                   |
| 8                | CRP          | 3.8                   | 1.9        | 1.9        | 0.6              | 10.0              | 0.0                 | 1.9                | 2.5             | 1.3                   |
| 7                | LSL          | 4.3                   | 5.7        | 7.9        | 1.4              | 22.1              | 0.7                 | 0.0                | 0.7             | 0.0                   |
| 2                | LSR          | 2.5                   | 0.0        | 0.0        | 0.0              | 15.0              | 0.0                 | 0.0                | 2.5             | 0.0                   |
| 1                | LSBk         | 0.0                   | 5.0        | 0.0        | 0.0              | 10.0              | 0.0                 | 0.0                | 5.0             | 10.0                  |
| 5                | LSBo         | 2.0                   | 4.0        | 4.0        | 0.0              | 3.0               | 0.0                 | 2.0                | 14.0            | 6.0                   |
| 6                | PLP          | 4.2                   | 5.8        | 0.0        | 2.5              | 3.3               | 0.0                 | 10.0               | 5.0             | 4.2                   |
| 1                | BPR          | 5.0                   | 0.0        | 0.0        | 10.0             | 10.0              | 5.0                 | 0.0                | 10.0            | 0.0                   |
| 3                | DPL          | 1.7                   | 15.0       | 13.3       | 3.3              | 6.7               | 0.0                 | 0.0                | 5.0             | 0.0                   |

**Table 11. Summary of dominant substrates by habitat type of the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.**

| # Units Measured | Habitat Type | # Units Silt/Clay | % Total Silt/Clay | # Units Sand | % Total Sand | # Units Gravel | % Total Gravel | # Units Small Cobble | % Total Small Cobble | # Units Large Cobble | % Total Large Cobble | # Units Boulder | % Total Boulder | # Units Bedrock | % Total Bedrock |
|------------------|--------------|-------------------|-------------------|--------------|--------------|----------------|----------------|----------------------|----------------------|----------------------|----------------------|-----------------|-----------------|-----------------|-----------------|
| 69               | LGR          | 0                 | 0.0               | 2            | 2.9          | 28             | 40.6           | 18                   | 26.1                 | 16                   | 23.2                 | 0               | 0.0             | 5               | 7.3             |
| 33               | HGR          | 0                 | 0.0               | 0            | 0.0          | 2              | 6.1            | 4                    | 12.1                 | 16                   | 48.5                 | 0               | 0.0             | 11              | 33.3            |
| 5                | CAS          | 0                 | 0.0               | 0            | 0.0          | 0              | 0.0            | 0                    | 0.0                  | 0                    | 0.0                  | 1               | 20.0            | 4               | 80.0            |
| 5                | POW          | 0                 | 0.0               | 0            | 0.0          | 1              | 20.0           | 2                    | 40.0                 | 2                    | 40.0                 | 0               | 0.0             | 0               | 0.0             |
| 20               | GLD          | 0                 | 0.0               | 1            | 5.0          | 12             | 60.0           | 5                    | 25.0                 | 1                    | 5.0                  | 0               | 0.0             | 1               | 5.0             |
| 89               | RUN          | 0                 | 0.0               | 1            | 1.1          | 19             | 21.4           | 34                   | 38.2                 | 23                   | 25.8                 | 1               | 1.1             | 11              | 12.4            |
| 6                | MCP          | 0                 | 0.0               | 2            | 33.3         | 1              | 16.7           | 2                    | 33.3                 | 1                    | 16.7                 | 0               | 0.0             | 0               | 0.0             |
| 8                | CRP          | 0                 | 0.0               | 1            | 12.5         | 2              | 25.0           | 2                    | 25.0                 | 0                    | 0.0                  | 0               | 0.0             | 3               | 37.5            |
| 7                | LSL          | 0                 | 0.0               | 3            | 42.9         | 2              | 28.6           | 1                    | 14.3                 | 1                    | 14.3                 | 0               | 0.0             | 0               | 0.0             |
| 2                | LSR          | 0                 | 0.0               | 0            | 0.0          | 2              | 100.0          | 0                    | 0.0                  | 0                    | 0.0                  | 0               | 0.0             | 0               | 0.0             |
| 1                | LSBk         | 0                 | 0.0               | 0            | 0.0          | 0              | 0.0            | 1                    | 100.0                | 0                    | 0.0                  | 0               | 0.0             | 0               | 0.0             |
| 5                | LSBo         | 0                 | 0.0               | 0            | 0.0          | 0              | 0.0            | 1                    | 20.0                 | 2                    | 40.0                 | 0               | 0.0             | 2               | 40.0            |
| 6                | PLP          | 0                 | 0.0               | 1            | 16.7         | 3              | 50.0           | 0                    | 0.0                  | 0                    | 0.0                  | 0               | 0.0             | 2               | 33.3            |
| 1                | BPR          | 0                 | 0.0               | 0            | 0.0          | 0              | 0.0            | 0                    | 0.0                  | 0                    | 0.0                  | 0               | 0.0             | 1               | 100.0           |
| 3                | DPL          | 0                 | 0.0               | 1            | 33.3         | 0              | 0.0            | 0                    | 0.0                  | 1                    | 33.3                 | 0               | 0.0             | 1               | 33.3            |

**Table 12. Mean percentage of dominant bank composition types sampled on Middle Fork San Joaquin River, Devils Postpile National Monument in 1994.**

| Dominant Bank Type | Right Bank (# Units) | Left Bank (# Units) | Total Mean % |
|--------------------|----------------------|---------------------|--------------|
| Bedrock            | 23                   | 32                  | 10.6         |
| Boulder            | 7                    | 4                   | 2.1          |
| Cobble/Gravel      | 28                   | 20                  | 9.2          |
| Bare Soil          | 6                    | 1                   | 1.4          |
| Grass              | 42                   | 40                  | 15.8         |
| Brush              | 7                    | 4                   | 2.1          |
| Deciduous Trees    | 146                  | 159                 | 58.7         |
| Coniferous Trees   | 0                    | 0                   | 0.0          |

**Table 13. Physical habitat characteristics of tributary streams of the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.**

| Stream Name     | Legal Description    | Drainage<br>(mi. <sup>2</sup> ) | Channel Type<br>Progression | Miles<br>Surveyed | Mean<br>Width (ft.) | Mean Pool<br>Depth (ft.) | Mean<br>Shelter (%) | Canopy<br>(%) |
|-----------------|----------------------|---------------------------------|-----------------------------|-------------------|---------------------|--------------------------|---------------------|---------------|
| Alligator Ck.   | T4SR26ES10SE1/4NW1/4 | 0.37                            | B4,A4                       | 1.00              | 6.3                 | 0.9                      | 27.8                | 33.8          |
| Boundary Ck.    | T4SR26ES10NE1/4NE1/4 | 2.13                            | A3,B4                       | 0.65              | 5.0                 | 0.4                      | 81.0                | 44.0          |
| Creek Ck.       | T4SR26ES03NE1/4SE1/4 | 3.02                            | A1,B4,C6,B4,B1,A1           | 0.90              | 8.4                 | 1.6                      | 75.6                | 50.0          |
| Reds Meadow Ck. | T4SR26ES02NE1/4SW1/4 | 1.25                            | B4,B1,C6                    | 0.40              | 5.6                 | 1.0                      | 77.5                | 35.0          |
| Minaret Ck. *   | T2SR26ES34NW1/4SE1/4 | 10.80                           | A1,B4,B3,A1,B3              | 0.84              | 32.2                | 2.0                      | 43.9                | 24.4          |
| Reds Creek **   | T3SR26ES35SW1/4NW1/4 | 0.94                            | NONE,A4,A3                  | 0.27              | 1.6                 | 0.3                      | N/A                 | 52.0          |

\* Surveyed upstream to Johnston Lake

\*\* Fish absent

|                                                                                                                                           |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <b>Table 14. Biological inventory of tributary streams of the Middle Fork San Joaquin River, Devils Postpile National Monument, 1994.</b> |  |  |  |  |
|                                                                                                                                           |  |  |  |  |

| Order (Suborder)                | Family        | Genera                                     | King | Sampled Creek and Representative Genera <sup>1</sup> |          |       |                |         |      |
|---------------------------------|---------------|--------------------------------------------|------|------------------------------------------------------|----------|-------|----------------|---------|------|
|                                 |               |                                            |      | Alligator                                            | Boundary | Creek | Reds<br>Meadow | Minaret | Reds |
| <b><u>Invertebrates</u></b>     |               |                                            |      |                                                      |          |       |                |         |      |
| Diptera                         |               |                                            |      | x                                                    |          |       |                | x       | x    |
|                                 | Culicidae     |                                            |      | x                                                    |          |       |                | x       | x    |
|                                 | Simuliidae    |                                            |      |                                                      |          |       |                |         | x    |
| Ephemeroptera                   |               |                                            | x    | x                                                    | x        | x     | x              | x       | x    |
|                                 | Baetidae      |                                            |      |                                                      | x        |       |                |         |      |
|                                 | Heptageniidae |                                            |      |                                                      | x        |       |                |         |      |
| Hemiptera                       |               |                                            | x    | x                                                    | x        |       |                |         |      |
|                                 | Gerridae      |                                            | x    | x                                                    | x        | x     | x              | x       | x    |
| Odonata                         |               |                                            |      | x                                                    |          |       |                | x       |      |
| (Anisoptera)                    |               |                                            |      |                                                      |          |       |                | x       |      |
| (Zygoptera)                     |               |                                            |      | x                                                    |          |       |                | x       |      |
| Oligochaeta                     |               |                                            |      |                                                      | x        |       |                |         |      |
| Plecoptera                      |               |                                            | x    |                                                      |          |       |                |         |      |
| Trichoptera                     |               |                                            | x    | x                                                    | x        | x     | x              | x       | x    |
| <b><u>Fishes</u></b>            |               |                                            |      |                                                      |          |       |                |         |      |
| Cypriniformes                   | Cyprinidae    | <i>Gila bicolor snyderi</i>                |      |                                                      |          |       | y              |         |      |
| Salmoniformes                   | Salmonidae    | <i>Oncorhynchus mykiss</i>                 | y    |                                                      |          |       | y              |         |      |
|                                 |               | <i>O. mykiss aguabonita</i>                | y    |                                                      |          |       | y              | y       |      |
|                                 |               | <i>O. mykiss</i> x <i>O. m. aguabonita</i> | y    |                                                      |          |       |                |         |      |
|                                 |               | <i>Salmo trutta</i>                        | y    |                                                      | y        | y     | y              |         |      |
|                                 |               | <i>Salvelinus fontinalis</i>               | y    | y                                                    |          |       |                | y       |      |
| 1. x = observed, y = identified |               |                                            |      |                                                      |          |       |                |         |      |



| Table 15 (continued). Biological inventory of amphibian survey sites, Devils Postpile National Monument, 1994. |            |                           |              |              |                                        |              |              |            |            |                |              |                |
|----------------------------------------------------------------------------------------------------------------|------------|---------------------------|--------------|--------------|----------------------------------------|--------------|--------------|------------|------------|----------------|--------------|----------------|
|                                                                                                                |            |                           |              |              |                                        |              |              |            |            |                |              |                |
|                                                                                                                |            |                           |              |              | Sampled Site and Representative Genera |              |              |            |            |                |              |                |
| Order (Suborder)                                                                                               | Family     | Genera                    | DPNM-<br>NE1 | DPNM-<br>NW1 | Sotcher<br>Lake                        | DPNM-<br>EIN | DPNM-<br>KCK | JMT-<br>N1 | JMT-<br>S1 | DPNM-<br>SW1,N | DPNM-<br>SE1 | DPNM-<br>SE1,2 |
| <b>Amphibians</b>                                                                                              |            |                           |              |              |                                        |              |              |            |            |                |              |                |
| Anura                                                                                                          | Hylidae    | <i>Hyla regilla</i>       | y            | y            |                                        | y            | y            | y          | y          | y              | y            | y              |
| <b>Reptiles</b>                                                                                                |            |                           |              |              |                                        |              |              |            |            |                |              |                |
| Squamata                                                                                                       | Colubridae | <i>Thamnophis</i>         |              |              |                                        |              |              |            |            |                |              |                |
|                                                                                                                |            | <i>T. elegans elegans</i> | y            | y            |                                        |              |              |            |            |                | y            |                |
| 1. JMT-S1 Str. and DPNM-SW1 not sampled                                                                        |            |                           |              |              |                                        |              |              |            |            |                |              |                |
| 2. x = observed, y = identified                                                                                |            |                           |              |              |                                        |              |              |            |            |                |              |                |

**Appendix A. Level III and Level IV stream habitat types.**  
**Adapted from Flosi and Reynolds (1991).**

| Level III<br>Type | Level IV<br>Type                       | Letter Code<br>Abbreviation |
|-------------------|----------------------------------------|-----------------------------|
| RIFFLE            | Low Gradient Riffle                    | LGR                         |
|                   | High Gradient Riffle                   | HGR                         |
| CASCADE           | Cascade                                | CAS                         |
|                   | Bedrock Sheet                          | BRS                         |
| FLATWATER         | Pocket Water                           | POW                         |
|                   | Glide                                  | GLD                         |
|                   | Run                                    | RUN                         |
|                   | Step Run                               | SRN                         |
|                   | Edgewater                              | EDW                         |
| MAIN CHANNEL POOL | Trench Pool                            | TRP                         |
|                   | Mid-Channel Pool                       | MCP                         |
|                   | Channel Confluence Pool                | CCP                         |
|                   | Step Pool                              | STP                         |
| SCOUR POOL        | Corner Pool                            | CRP                         |
|                   | Lateral Scour Pool (Log Enhanced)      | LSL                         |
|                   | Lateral Scour Pool (Root Wad Enhanced) | LSR                         |
|                   | Lateral Scour Pool (Bedrock Formed)    | LSBk                        |
|                   | Lateral Scour Pool (Boulder Formed)    | LSBo                        |
|                   | Plunge Pool                            | PLP                         |
| BACKWATER POOLS   | Secondary Channel Pool                 | SCP                         |
|                   | Backwater Pool (Boulder Formed)        | BPB                         |
|                   | Backwater Pool (Root Wad Formed)       | BPR                         |
|                   | Backwater Pool (Log Formed)            | BPL                         |
|                   | Dammed Pool                            | DPL                         |

Appendix B. Habitat Inventory Data: Middle Fork San Joaquin River

| Channel Type | Reach | Unit # | Unit Type | Side Chan. Type | Mean Length (ft.) | Mean Width (ft.) | Mean Depth (ft.) | Max Depth (ft.) | Depth Pool Tail Crest (ft.) | Pool Tail Embod. | Shelter Value | % Unit Covered | % Undercut Banks |
|--------------|-------|--------|-----------|-----------------|-------------------|------------------|------------------|-----------------|-----------------------------|------------------|---------------|----------------|------------------|
| B-2          | 1     | 1.00   | 3.1       |                 | 439.0             | 47.0             | 1.10             | 2.0             | 0.0                         | 0                | 2             | 30             | 0                |
| B-2          | 1     | 1.10   |           | 3.3             | 130.0             | 21.0             | 1.10             | 3.0             | 0.0                         | 0                | 2             | 55             | 10               |
| B-2          | 1     | 1.20   |           | 3.1             | 177.0             | 45.0             | 1.30             | 2.4             | 0.0                         | 0                | 2             | 45             | 5                |
| B-2          | 1     | 2.00   | 3.2       |                 | 55.0              | 47.0             | 1.20             | 2.3             | 0.0                         | 0                | 1             | 10             | 0                |
| B-2          | 1     | 3.00   | 3.1       |                 | 112.0             | 46.0             | 1.20             | 2.4             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 1     | 4.00   | 3.3       |                 | 176.0             | 46.0             | 1.50             | 3.0             | 0.0                         | 0                | 1             | 90             | 0                |
| B-2          | 1     | 5.00   | 1.1       |                 | 176.0             | 45.0             | 1.50             | 24.0            | 0.0                         | 0                | 1             | 50             | 0                |
| B-2          | 1     | 6.00   | 3.3       |                 | 90.0              | 50.0             | 1.60             | 2.4             | 0.0                         | 0                | 1             | 70             | 0                |
| B-2          | 1     | 7.00   | 1.1       |                 | 604.0             | 50.0             | 1.10             | 1.9             | 0.0                         | 0                | 1             | 60             | 0                |
| B-2          | 1     | 8.00   | 5.5       |                 | 52.0              | 25.0             | 4.00             | 6.5             | 1.2                         | 1                | 3             | 45             | 10               |
| B-2          | 1     | 9.00   | 3.3       |                 | 77.0              | 35.0             | 2.40             | 3.0             | 0.0                         | 0                | 2             | 85             | 0                |
| B-2          | 1     | 10.00  | 1.1       |                 | 650.0             | 40.0             | 1.30             | 2.0             | 0.0                         | 0                | 1             | 90             | 0                |
| B-2          | 1     | 11.00  | 5.5       |                 | 80.0              | 55.0             | 2.70             | 5.0             | 1.2                         | 1                | 1             | 40             | 0                |
| B-2          | 1     | 12.00  | 3.3       |                 | 78.0              | 25.0             | 2.00             | 5.0             | 0.0                         | 0                | 1             | 85             | 0                |
| B-2          | 1     | 13.00  | 1.2       |                 | 73.0              | 35.0             | 2.40             | 3.0             | 0.0                         | 0                | 1             | 30             | 0                |
| B-2          | 1     | 14.00  | 3.3       |                 | 100.0             | 40.0             | 2.20             | 4.0             | 0.0                         | 0                | 1             | 55             | 0                |
| B-2          | 1     | 15.00  | 1.2       |                 | 67.0              | 35.0             | 2.00             | 2.5             | 0.0                         | 0                | 2             | 70             | 0                |
| B-2          | 1     | 16.00  | 3.3       |                 | 100.0             | 35.0             | 2.50             | 6.0             | 0.0                         | 0                | 1             | 40             | 0                |
| B-2          | 1     | 17.00  | 1.2       |                 | 15.0              | 30.0             | 1.40             | 2.4             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 1     | 18.00  | 3.3       |                 | 125.0             | 38.0             | 1.90             | 4.0             | 0.0                         | 0                | 1             | 50             | 0                |
| B-2          | 1     | 19.00  | 1.1       |                 | 290.0             | 50.0             | 1.10             | 2.0             | 0.0                         | 0                | 1             | 5              | 0                |
| B-2          | 1     | 20.00  | 3.2       |                 | 150.0             | 40.0             | 0.90             | 1.0             | 0.0                         | 0                | 1             | 10             | 0                |
| B-2          | 1     | 21.00  | 5.6       |                 | 80.0              | 75.0             | 3.50             | 6.9             | 0.4                         | 1                | 1             | 10             | 0                |
| B-2          | 1     | 22.00  | 2.1       |                 | 10.0              | 45.0             | 0.80             | 1.0             | 0.0                         | 0                | 0             | 0              | 0                |
| B1-1         | 2     | 23.00  | 1.1       |                 | 65.0              | 45.0             | 0.80             | 1.0             | 0.0                         | 0                | 1             | 10             | 0                |
| B1-1         | 2     | 24.00  | 3.3       |                 | 27.0              | 45.0             | 1.40             | 3.2             | 0.0                         | 0                | 1             | 30             | 0                |
| B1-1         | 2     | 25.00  | 1.2       |                 | 65.0              | 45.0             | 0.60             | 2.1             | 0.0                         | 0                | 1             | 40             | 0                |
| B1-1         | 2     | 26.00  | 1.1       |                 | 478.0             | 45.0             | 0.60             | 1.1             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 2     | 27.00  | 1.2       |                 | 82.0              | 55.0             | 0.40             | 2.6             | 0.0                         | 0                | 2             | 50             | 0                |
| B1-1         | 2     | 28.00  | 3.3       |                 | 95.0              | 40.0             | 1.90             | 3.4             | 0.0                         | 0                | 2             | 22             | 0                |
| B2           | 2     | 29.00  | 1.1       |                 | 145.0             | 40.0             | 1.00             | 2.5             | 0.0                         | 0                | 2             | 35             | 0                |
| B2           | 2     | 30.00  | 3.2       |                 | 80.0              | 35.0             | 1.80             | 2.6             | 0.0                         | 0                | 2             | 35             | 0                |
| B2           | 2     | 31.00  | 3.3       |                 | 160.0             | 35.0             | 2.10             | 2.5             | 0.0                         | 0                | 2             | 25             | 0                |
| B2           | 2     | 32.00  | 1.1       |                 | 76.0              | 45.0             | 1.30             | 1.6             | 0.0                         | 0                | 2             | 25             | 0                |
| B2           | 2     | 33.00  | 3.3       |                 | 45.0              | 50.0             | 1.10             | 1.5             | 0.0                         | 0                | 1             | 10             | 0                |
| B2           | 2     | 34.00  | 3.2       |                 | 70.0              | 55.0             | 0.80             | 1.6             | 0.0                         | 0                | 1             | 5              | 0                |
| B2           | 2     | 35.00  | 3.3       |                 | 150.0             | 55.0             | 1.10             | 2.1             | 0.0                         | 0                | 2             | 50             | 5                |
| B2           | 2     | 35.10  |           | 5.2             | 37.0              | 20.0             | 1.40             | 1.9             | 0.3                         | 1                | 2             | 15             | 0                |
| B2           | 2     | 35.10  |           | 3.3             | 77.0              | 12.0             | 0.50             | 0.9             | 0.0                         | 0                | 1             | 85             | 5                |
| B2           | 2     | 35.20  |           | 3.3             | 77.0              | 30.0             | 1.40             | 2.1             | 0.0                         | 0                | 2             | 25             | 0                |
| B2           | 2     | 36.00  | 1.1       |                 | 25.0              | 50.0             | 0.40             | 0.5             | 0.0                         | 0                | 1             | 5              | 0                |
| B1-1         | 2     | 37.00  | 3.2       |                 | 375.0             | 50.0             | 1.20             | 1.6             | 0.0                         | 0                | 1             | 15             | 0                |
| B1-1         | 2     | 38.00  | 3.3       |                 | 125.0             | 50.0             | 1.00             | 1.3             | 0.0                         | 0                | 1             | 10             | 0                |
| B1-1         | 2     | 39.00  | 1.1       |                 | 850.0             | 50.0             | 0.50             | 0.9             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 2     | 39.10  |           | 1.1             | 115.0             | 14.0             | 0.30             | 0.9             | 0.0                         | 0                | 2             | 50             | 0                |
| B1-1         | 2     | 39.10  |           | 5.1             | 43.0              | 15.0             | 1.60             | 2.2             | 0.7                         | 1                | 2             | 35             | 5                |
| B1-1         | 2     | 39.10  |           | 3.3             | 45.0              | 28.0             | 0.80             | 1.0             | 0.0                         | 0                | 1             | 25             | 5                |
| B1-1         | 2     | 39.10  |           | 1.1             | 53.0              | 28.0             | 0.50             | 0.7             | 0.0                         | 0                | 2             | 45             | 5                |
| B1-1         | 2     | 40.00  | 5.5       |                 | 40.0              | 15.0             | 2.00             | 2.4             | 0.9                         | 1                | 2             | 30             | 0                |
| B1-1         | 2     | 41.00  | 6.5       |                 | 20.0              | 20.0             | 1.60             | 2.0             | 0.6                         | 4                | 2             | 30             | 5                |
| B1-1         | 2     | 41.10  |           | 1.1             | 70.0              | 12.0             | 0.40             | 1.1             | 0.0                         | 0                | 2             | 70             | 10               |
| B1-1         | 2     | 41.10  |           | 5.1             | 32.0              | 15.0             | 1.60             | 2.2             | 0.7                         | 1                | 2             | 35             | 5                |
| B1-1         | 2     | 39.10  |           | 3.2             | 20.0              | 30.0             | 0.80             | 1.2             | 0.0                         | 0                | 1             | 25             | 0                |
| B1-1         | 2     | 39.10  |           | 5.6             | 100.0             | 25.0             | 2.20             | 2.7             | 0.4                         | 1                | 1             | 45             | 15               |
| B1-1         | 2     | 39.10  |           | 3.3             | 117.0             | 7.0              | 1.10             | 1.5             | 0.0                         | 0                | 3             | 95             | 10               |
| B2           | 2     | 39.20  |           | 1.1             | 20.0              | 30.0             | 0.30             | 0.4             | 0.0                         | 0                | 1             | 15             | 0                |
| B2           | 2     | 39.20  |           | 5.2             | 35.0              | 15.0             | 1.20             | 1.6             | 0.2                         | 1                | 3             | 65             | 5                |
| B2           | 2     | 39.20  |           | 6.5             | 38.0              | 25.0             | 1.30             | 2.0             | 0.2                         | 1                | 3             | 75             | 0                |
| B2           | 2     | 39.20  |           | 1.1             | 20.0              | 11.0             | 0.30             | 0.7             | 0.0                         | 0                | 2             | 85             | 0                |
| B2           | 2     | 39.20  |           | 5.2             | 33.0              | 10.0             | 0.90             | 2.0             | 0.4                         | 1                | 3             | 95             | 10               |
| B2           | 2     | 39.20  |           | 1.2             | 12.0              | 12.0             | 0.40             | 0.5             | 0.0                         | 0                | 2             | 80             | 0                |
| B2           | 2     | 42.00  | 3.3       |                 | 60.0              | 40.0             | 0.50             | 3.2             | 0.0                         | 0                | 2             | 30             | 10               |
| B2           | 2     | 43.00  | 3.2       |                 | 15.0              | 38.0             | 1.00             | 1.4             | 0.0                         | 0                | 1             | 0              | 0                |
| B2           | 2     | 44.00  | 5.1       |                 | 90.0              | 40.0             | 2.60             | 3.5             | 0.8                         | 1                | 1             | 25             | 0                |
| B2           | 2     | 45.00  | 3.3       |                 | 222.0             | 35.0             | 1.10             | 2.0             | 0.0                         | 0                | 1             | 50             | 5                |
| B1-1         | 2     | 46.00  | 1.1       |                 | 152.0             | 35.0             | 1.10             | 1.5             | 0.0                         | 0                | 1             | 30             | 0                |
| B1-1         | 2     | 47.00  | 3.3       |                 | 448.0             | 30.0             | 1.50             | 3.6             | 0.0                         | 0                | 1             | 25             | 0                |
| B2           | 2     | 48.00  | 5.1       |                 | 60.0              | 30.0             | 3.00             | 4.6             | 1.6                         | 1                | 1             | 10             | 0                |
| B2           | 2     | 49.00  | 3.3       |                 | 465.0             | 35.0             | 1.50             | 2.9             | 0.0                         | 0                | 2             | 70             | 0                |
| B2           | 2     | 50.00  | 5.4       |                 | 118.0             | 35.0             | 2.10             | 3.0             | 1.5                         | 1                | 2             | 30             | 0                |
| B2           | 2     | 51.00  | 3.3       |                 | 243.0             | 25.0             | 2.10             | 3.6             | 0.0                         | 0                | 2             | 55             | 0                |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | % swd<br>(d<12") | % lwd<br>(d>12") | % Root<br>Mass | % Terr.<br>Veg. | % Aquat.<br>Veg. | % White-<br>water | % Boulder<br>(d>10") | % Bedrock<br>Ledge | Silt/Clay | Sand<br>(<0.08") | Gravel<br>(0.08-2.5") | Sm. Cobble<br>(2.5-5") | Lg. Cobble<br>(5-10") |
|--------|------------------|------------------|----------------|-----------------|------------------|-------------------|----------------------|--------------------|-----------|------------------|-----------------------|------------------------|-----------------------|
| 1.00   | 0                | 5                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 0                     |
| 1.10   | 5                | 10               | 0              | 15              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 1.20   | 0                | 5                | 0              | 10              | 0                | 5                 | 20                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 2.00   | 0                | 0                | 0              | 0               | 0                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 3.00   | 0                | 0                | 0              | 5               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 4.00   | 0                | 0                | 0              | 10              | 0                | 10                | 15                   | 55                 | 0         | 0                | 0                     | 0                      | 1                     |
| 5.00   | 0                | 0                | 0              | 10              | 0                | 20                | 20                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 6.00   | 0                | 0                | 0              | 15              | 0                | 15                | 40                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 7.00   | 0                | 0                | 0              | 15              | 0                | 20                | 25                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 8.00   | 5                | 10               | 0              | 0               | 0                | 5                 | 20                   | 0                  | 0         | 0                | 0                     | 1                      | 0                     |
| 9.00   | 0                | 5                | 0              | 5               | 0                | 10                | 60                   | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 10.00  | 0                | 0                | 0              | 25              | 0                | 25                | 40                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 11.00  | 0                | 0                | 0              | 5               | 0                | 0                 | 15                   | 20                 | 0         | 0                | 0                     | 0                      | 1                     |
| 12.00  | 0                | 0                | 0              | 0               | 0                | 15                | 65                   | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 13.00  | 0                | 0                | 0              | 5               | 0                | 20                | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 14.00  | 10               | 10               | 0              | 10              | 0                | 5                 | 20                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 15.00  | 0                | 5                | 0              | 0               | 0                | 30                | 35                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 16.00  | 0                | 0                | 0              | 5               | 0                | 10                | 25                   | 10                 | 0         | 0                | 0                     | 0                      | 1                     |
| 17.00  | 0                | 0                | 0              | 0               | 0                | 20                | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 18.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 30                   | 10                 | 0         | 0                | 0                     | 0                      | 1                     |
| 19.00  | 0                | 0                | 0              | 0               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 20.00  | 0                | 0                | 0              | 0               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 21.00  | 0                | 0                | 0              | 0               | 0                | 10                | 0                    | 0                  | 0         | 1                | 2                     | 0                      | 0                     |
| 22.00  | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 23.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 24.00  | 0                | 0                | 0              | 5               | 0                | 15                | 0                    | 10                 | 0         | 0                | 0                     | 0                      | 0                     |
| 25.00  | 0                | 0                | 0              | 5               | 0                | 20                | 0                    | 15                 | 0         | 0                | 0                     | 0                      | 0                     |
| 26.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 27.00  | 5                | 5                | 0              | 5               | 0                | 25                | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 28.00  | 5                | 5                | 0              | 5               | 2                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 2                     |
| 29.00  | 5                | 0                | 0              | 15              | 0                | 10                | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 30.00  | 0                | 5                | 0              | 25              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 31.00  | 0                | 10               | 0              | 10              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 32.00  | 5                | 5                | 0              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 33.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 34.00  | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 35.00  | 5                | 0                | 0              | 15              | 20               | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 35.10  | 0                | 10               | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 35.10  | 0                | 0                | 0              | 80              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 35.20  | 5                | 0                | 0              | 15              | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 36.00  | 0                | 0                | 0              | 0               | 0                | 5                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 37.00  | 0                | 5                | 0              | 5               | 0                | 0                 | 0                    | 5                  | 0         | 0                | 0                     | 2                      | 0                     |
| 38.00  | 5                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 39.00  | 0                | 5                | 0              | 10              | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 2                      | 0                     |
| 39.10  | 5                | 10               | 0              | 30              | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 2                     |
| 39.10  | 5                | 0                | 0              | 25              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 2                     | 0                      | 0                     |
| 39.10  | 5                | 0                | 5              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 39.10  | 10               | 0                | 5              | 15              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 40.00  | 10               | 10               | 0              | 5               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 2                      | 0                     |
| 41.00  | 5                | 0                | 5              | 15              | 0                | 0                 | 0                    | 0                  | 0         | 2                | 0                     | 0                      | 0                     |
| 41.10  | 0                | 0                | 10             | 45              | 0                | 5                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 41.10  | 0                | 0                | 0              | 30              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 39.10  | 0                | 0                | 0              | 20              | 0                | 0                 | 0                    | 5                  | 0         | 0                | 0                     | 1                      | 2                     |
| 39.10  | 0                | 0                | 0              | 15              | 0                | 0                 | 5                    | 10                 | 0         | 0                | 0                     | 0                      | 0                     |
| 39.10  | 10               | 10               | 5              | 55              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 2                     |
| 39.20  | 0                | 0                | 0              | 10              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 0                     |
| 39.20  | 10               | 35               | 0              | 10              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 39.20  | 35               | 30               | 0              | 0               | 0                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 39.20  | 10               | 10               | 5              | 60              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 39.20  | 10               | 5                | 0              | 70              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 39.20  | 5                | 0                | 0              | 70              | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 42.00  | 0                | 5                | 10             | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 43.00  | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 44.00  | 5                | 10               | 0              | 5               | 0                | 0                 | 5                    | 0                  | 0         | 2                | 0                     | 0                      | 0                     |
| 45.00  | 0                | 0                | 0              | 30              | 0                | 10                | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 46.00  | 0                | 5                | 0              | 25              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 47.00  | 0                | 0                | 0              | 20              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 2                     |
| 48.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 49.00  | 5                | 5                | 0              | 45              | 0                | 10                | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 50.00  | 5                | 0                | 0              | 10              | 0                | 0                 | 5                    | 10                 | 0         | 0                | 0                     | 1                      | 2                     |
| 51.00  | 5                | 10               | 0              | 0               | 0                | 10                | 20                   | 10                 | 0         | 0                | 0                     | 0                      | 2                     |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | Boulder<br>(>10") | Bedrock | % Exposed<br>Substrate | % Canopy | % Decid.<br>Trees | % Conif.<br>Trees | RtBk Dom.<br>Type | % RtBk<br>Cover | LtBk Dom.<br>Type | % RtBk<br>Cover |
|--------|-------------------|---------|------------------------|----------|-------------------|-------------------|-------------------|-----------------|-------------------|-----------------|
| 1.00   | 2                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 85              | 7                 | 90              |
| 1.10   | 2                 | 0       | 0                      | 25       | 25                | 0                 | 7                 | 55              | 7                 | 95              |
| 1.20   | 2                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 20              | 7                 | 50              |
| 2.00   | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 5               | 2                 | 50              |
| 3.00   | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 95              | 1                 | 90              |
| 4.00   | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 25              | 1                 | 40              |
| 5.00   | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 65              | 7                 | 50              |
| 6.00   | 2                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 95              | 7                 | 50              |
| 7.00   | 2                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 90              | 7                 | 80              |
| 8.00   | 2                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 95              | 7                 | 20              |
| 9.00   | 2                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 95              | 6                 | 5               |
| 10.00  | 2                 | 0       | 0                      | 30       | 25                | 5                 | 7                 | 95              | 7                 | 80              |
| 11.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 2                 | 5               | 7                 | 50              |
| 12.00  | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 80              | 1                 | 5               |
| 13.00  | 2                 | 1       | 0                      | 10       | 10                | 0                 | 7                 | 95              | 7                 | 10              |
| 14.00  | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 85              | 7                 | 65              |
| 15.00  | 2                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 90              | 7                 | 15              |
| 16.00  | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 6                 | 15              | 7                 | 15              |
| 17.00  | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 40              | 1                 | 0               |
| 18.00  | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 70              | 7                 | 20              |
| 19.00  | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 80              | 7                 | 90              |
| 20.00  | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 2                 | 5               | 5                 | 55              |
| 21.00  | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 2                 | 0               | 2                 | 0               |
| 22.00  | 1                 | 1       | 0                      | 5        | 5                 | 0                 | 1                 | 0               | 1                 | 0               |
| 23.00  | 0                 | 1       | 0                      | 5        | 5                 | 0                 | 7                 | 95              | 7                 | 20              |
| 24.00  | 0                 | 1       | 0                      | 5        | 5                 | 0                 | 7                 | 95              | 7                 | 50              |
| 25.00  | 0                 | 1       | 0                      | 10       | 10                | 0                 | 7                 | 85              | 5                 | 20              |
| 26.00  | 2                 | 1       | 0                      | 5        | 5                 | 0                 | 7                 | 85              | 7                 | 5               |
| 27.00  | 2                 | 1       | 0                      | 5        | 5                 | 0                 | 6                 | 55              | 7                 | 25              |
| 28.00  | 0                 | 1       | 0                      | 0        | 5                 | 0                 | 7                 | 90              | 7                 | 65              |
| 29.00  | 2                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 85              | 7                 | 95              |
| 30.00  | 2                 | 0       | 0                      | 40       | 25                | 15                | 6                 | 85              | 7                 | 100             |
| 31.00  | 0                 | 0       | 0                      | 20       | 15                | 5                 | 6                 | 50              | 7                 | 100             |
| 32.00  | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 30              | 7                 | 55              |
| 33.00  | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 60              | 7                 | 95              |
| 34.00  | 0                 | 0       | 0                      | 25       | 5                 | 20                | 7                 | 75              | 5                 | 90              |
| 35.00  | 0                 | 0       | 0                      | 25       | 20                | 5                 | 7                 | 95              | 7                 | 100             |
| 35.10  | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 100             | 7                 | 95              |
| 35.10  | 0                 | 0       | 0                      | 80       | 80                | 0                 | 5                 | 70              | 7                 | 100             |
| 35.20  | 0                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 95              | 5                 | 30              |
| 36.00  | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 7                 | 95              | 7                 | 100             |
| 37.00  | 0                 | 1       | 0                      | 10       | 5                 | 5                 | 7                 | 75              | 7                 | 15              |
| 38.00  | 0                 | 1       | 0                      | 15       | 10                | 5                 | 7                 | 95              | 7                 | 75              |
| 39.00  | 0                 | 1       | 0                      | 20       | 15                | 5                 | 7                 | 90              | 7                 | 95              |
| 39.10  | 0                 | 1       | 0                      | 35       | 30                | 5                 | 7                 | 75              | 7                 | 95              |
| 39.10  | 0                 | 1       | 0                      | 35       | 25                | 10                | 7                 | 100             | 5                 | 95              |
| 39.10  | 0                 | 0       | 0                      | 20       | 10                | 10                | 7                 | 85              | 7                 | 95              |
| 39.10  | 0                 | 0       | 0                      | 25       | 15                | 10                | 3                 | 5               | 7                 | 95              |
| 40.00  | 0                 | 1       | 0                      | 20       | 10                | 10                | 7                 | 100             | 7                 | 95              |
| 41.00  | 0                 | 1       | 0                      | 30       | 30                | 0                 | 3                 | 0               | 7                 | 95              |
| 41.10  | 0                 | 0       | 0                      | 45       |                   | 10                | 7                 | 95              | 5                 | 95              |
| 41.10  | 0                 | 0       | 0                      | 60       | 30                | 30                | 7                 | 100             | 5                 | 35              |
| 39.10  | 0                 | 0       | 0                      | 30       | 20                | 10                | 7                 | 95              | 7                 | 30              |
| 39.10  | 2                 | 1       | 0                      | 50       | 30                | 20                | 7                 | 85              | 7                 | 40              |
| 39.10  | 0                 | 1       | 0                      | 90       | 80                | 10                | 7                 | 90              | 7                 | 90              |
| 39.20  | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 95              | 7                 | 90              |
| 39.20  | 0                 | 0       | 0                      | 30       | 10                | 20                | 7                 | 90              | 5                 | 20              |
| 39.20  | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 65              | 7                 | 85              |
| 39.20  | 0                 | 0       | 0                      | 35       | 35                | 0                 | 7                 | 65              | 7                 | 85              |
| 39.20  | 2                 | 0       | 0                      | 70       | 70                | 0                 | 7                 | 55              | 2                 | 0               |
| 39.20  | 2                 | 0       | 0                      | 50       | 50                | 0                 | 7                 | 95              | 5                 | 10              |
| 42.00  | 0                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 95              | 7                 | 95              |
| 43.00  | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 95              | 7                 | 95              |
| 44.00  | 0                 | 1       | 0                      | 15       | 5                 | 10                | 5                 | 60              | 7                 | 95              |
| 45.00  | 0                 | 0       | 0                      | 35       | 35                | 0                 | 7                 | 90              | 7                 | 95              |
| 46.00  | 0                 | 0       | 0                      | 60       | 25                | 5                 | 7                 | 95              | 7                 | 95              |
| 47.00  | 0                 | 1       | 0                      | 25       | 20                | 5                 | 5                 | 35              | 7                 | 95              |
| 48.00  | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 7                 | 50              | 7                 | 70              |
| 49.00  | 0                 | 0       | 0                      | 40       | 30                | 10                | 7                 | 80              | 7                 | 80              |
| 50.00  | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 30              | 1                 | 20              |
| 51.00  | 0                 | 1       | 0                      | 5        | 5                 | 0                 | 7                 | 35              | 1                 | 5               |

## Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Channel Type | Reach | Unit # | Unit Type | Side Chan. Type | Mean Length (ft.) | Mean Width (ft.) | Mean Depth (ft.) | Max Depth (ft.) | Depth Pool Tail Crest (ft.) | Pool Tail Embed. | Shelter Value | % Unit Covered | % Undercut Banks |
|--------------|-------|--------|-----------|-----------------|-------------------|------------------|------------------|-----------------|-----------------------------|------------------|---------------|----------------|------------------|
| B1-1         | 2     | 52.00  | 5.1       |                 | 52.0              | 25.0             | 2.40             | 3.8             | 1.0                         | 4                | 2             | 40             | 0                |
| B1-1         | 2     | 53.00  | 1.2       |                 | 48.0              | 40.0             | 0.90             | 1.6             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 2     | 54.00  | 3.3       |                 | 103.0             | 25.0             | 2.50             | 6.0             | 0.0                         | 0                | 1             | 50             | 0                |
| B1-1         | 2     | 55.00  | 1.1       |                 | 284.0             | 40.0             | 1.00             | 1.7             | 0.0                         | 0                | 1             | 65             | 0                |
| B1-1         | 2     | 56.00  | 3.3       |                 | 143.0             | 35.0             | 2.30             | 3.6             | 0.0                         | 0                | 2             | 45             | 0                |
| B1-1         | 2     | 57.00  | 1.2       |                 | 74.0              | 40.0             | 0.90             | 1.9             | 0.0                         | 0                | 2             | 40             | 0                |
| B1-1         | 2     | 58.00  | 1.1       |                 | 45.0              | 35.0             | 1.10             | 2.1             | 0.0                         | 0                | 2             | 25             | 0                |
| B2           | 2     | 59.00  | 1.1       |                 | 82.0              | 60.0             | 0.50             | 1.6             | 0.0                         | 0                | 1             | 20             | 0                |
| B2           | 2     | 60.00  | 3.3       |                 | 188.0             | 28.0             | 1.60             | 2.4             | 0.0                         | 0                | 2             | 45             | 0                |
| B2           | 2     | 61.00  | 1.2       |                 | 50.0              | 40.0             | 1.10             | 1.6             | 0.0                         | 0                | 2             | 40             | 0                |
| B2           | 2     | 62.00  | 3.3       |                 | 113.0             | 35.0             | 1.60             | 3.8             | 0.0                         | 0                | 2             | 55             | 5                |
| B2           | 2     | 62.00  | 4.2       |                 | 125.0             | 35.0             | 2.80             | 3.6             | 1.1                         | 1                | 2             | 30             | 0                |
| B2           | 2     | 64.00  | 3.3       |                 | 233.0             | 35.0             | 1.60             | 2.3             | 0.0                         | 0                | 1             | 30             | 0                |
| B2           | 2     | 65.00  | 1.1       |                 | 145.0             | 35.0             | 1.20             | 1.7             | 0.0                         | 0                | 2             | 40             | 0                |
| B2           | 2     | 66.00  | 3.3       |                 | 76.0              | 30.0             | 2.40             | 3.6             | 0.0                         | 0                | 1             | 35             | 5                |
| B2           | 2     | 67.00  | 1.2       |                 | 50.0              | 35.0             | 1.20             | 1.6             | 0.0                         | 0                | 2             | 50             | 5                |
| B2           | 2     | 68.00  | 1.1       |                 | 260.0             | 40.0             | 1.40             | 2.6             | 0.0                         | 0                | 2             | 50             | 5                |
| B2           | 2     | 69.00  | 3.3       |                 | 77.0              | 35.0             | 1.60             | 2.3             | 0.0                         | 0                | 1             | 25             | 0                |
| B2           | 2     | 70.00  | 1.1       |                 | 151.0             | 40.0             | 1.10             | 2.0             | 0.0                         | 0                | 1             | 25             | 0                |
| B2           | 2     | 71.00  | 3.3       |                 | 141.0             | 32.0             | 2.30             | 4.6             | 0.0                         | 0                | 2             | 30             | 0                |
| B2           | 2     | 72.00  | 1.1       |                 | 117.0             | 35.0             | 1.30             | 1.9             | 0.0                         | 0                | 1             | 30             | 0                |
| B2           | 3     | 73.00  | 3.3       |                 | 130.0             | 28.0             | 2.00             | 5.0             | 0.0                         | 0                | 1             | 30             | 0                |
| B2           | 3     | 74.00  | 1.1       |                 | 82.0              | 40.0             | 1.20             | 2.0             | 0.0                         | 0                | 1             | 20             | 0                |
| B2           | 3     | 75.00  | 3.3       |                 | 44.0              | 45.0             | 2.00             | 4.2             | 0.0                         | 0                | 1             | 30             | 0                |
| B1-1         | 3     | 76.00  | 1.1       |                 | 18.0              | 55.0             | 0.70             | 1.5             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 3     | 77.00  | 3.3       |                 | 125.0             | 32.0             | 2.70             | 5.0             | 0.0                         | 0                | 1             | 55             | 10               |
| B1-1         | 3     | 78.00  | 1.2       |                 | 178.0             | 40.0             | 1.50             | 2.3             | 0.0                         | 0                | 1             | 30             | 0                |
| B1-1         | 3     | 79.00  | 5.5       |                 | 50.0              | 35.0             | 3.80             | 6.6             | 0.4                         | 1                | 1             | 35             | 0                |
| B1-1         | 3     | 80.00  | 3.3       |                 | 50.0              | 30.0             | 1.50             | 2.6             | 0.0                         | 0                | 2             | 20             | 0                |
| B1-1         | 3     | 81.00  | 1.2       |                 | 369.0             | 40.0             | 1.40             | 3.0             | 0.0                         | 0                | 1             | 25             | 0                |
| B1-1         | 3     | 82.00  | 3.3       |                 | 72.0              | 35.0             | 3.50             | 6.0             | 0.0                         | 0                | 2             | 35             | 0                |
| B1-1         | 3     | 83.00  | 1.2       |                 | 224.0             | 40.0             | 1.60             | 3.9             | 0.0                         | 0                | 1             | 40             | 0                |
| B1-1         | 3     | 84.00  | 5.6       |                 | 50.0              | 30.0             | 7.00             | 16.3            | 1.5                         | 1                | 1             | 50             | 10               |
| B1-1         | 3     | 85.00  | 2.1       |                 | 8.0               | 12.0             | 0.00             | 0.0             | 0.0                         | 0                | 0             | 0              | 0                |
| B2           | 3     | 86.00  | 1.1       |                 | 129.0             | 41.8             | 1.40             | 2.0             | 0.0                         | 0                | 1             | 30             | 0                |
| B2           | 3     | 87.00  | 3.1       |                 | 75.0              | 40.0             | 1.60             | 2.4             | 0.0                         | 0                | 1             | 30             | 0                |
| B2           | 3     | 88.00  | 1.2       |                 | 67.0              | 46.0             | 1.30             | 2.3             | 0.0                         | 0                | 1             | 20             | 0                |
| B2           | 3     | 89.00  | 3.3       |                 | 98.0              | 45.0             | 3.20             | 4.6             | 0.0                         | 0                | 1             | 30             | 0                |
| B2           | 3     | 90.00  | 1.2       |                 | 126.0             | 45.0             | 1.30             | 2.3             | 0.0                         | 0                | 1             | 30             | 0                |
| B2           | 3     | 91.00  | 1.1       |                 | 80.0              | 43.4             | 1.40             | 2.3             | 0.0                         | 0                | 1             | 35             | 0                |
| B2           | 3     | 92.00  | 3.3       |                 | 133.0             | 25.0             | 2.40             | 4.6             | 0.0                         | 0                | 1             | 25             | 0                |
| B1-1         | 3     | 93.00  | 1.2       |                 | 189.0             | 30.0             | 2.40             | 3.2             | 0.0                         | 0                | 2             | 40             | 0                |
| B1-1         | 3     | 94.00  | 1.1       |                 | 101.0             | 35.8             | 0.90             | 3.3             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 3     | 95.00  | 2.1       |                 | 39.0              | 17.0             | 1.00             | 1.7             | 0.0                         | 0                | 1             | 5              | 0                |
| B1-1         | 3     | 96.00  | 1.2       |                 | 290.0             | 43.5             | 1.40             | 2.5             | 0.0                         | 0                | 1             | 35             | 0                |
| B1-1         | 3     | 96.10  |           | 1.2             | 85.0              | 10.0             | 1.20             | 2.5             | 0.0                         | 0                | 2             | 80             | 0                |
| B1-1         | 3     | 96.20  |           | 1.2             | 85.0              | 35.0             | 1.10             | 2.0             | 0.0                         | 0                | 2             | 30             | 0                |
| B1-1         | 3     | 97.00  | 1.1       |                 | 95.0              | 43.0             | 1.10             | 2.0             | 0.0                         | 0                | 1             | 30             | 0                |
| B1-1         | 3     | 98.00  | 3.3       |                 | 250.0             | 35.0             | 3.10             | 4.6             | 0.0                         | 0                | 1             | 25             | 0                |
| B1-1         | 3     | 99.00  | 1.2       |                 | 76.0              | 32.0             | 1.60             | 3.2             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 3     | 100.00 | 3.3       |                 | 152.0             | 28.0             | 2.80             | 3.6             | 0.0                         | 0                | 1             | 35             | 0                |
| B1-1         | 3     | 101.00 | 1.2       |                 | 87.0              | 30.0             | 1.90             | 3.9             | 0.0                         | 0                | 1             | 15             | 0                |
| B1-1         | 3     | 102.00 | 3.3       |                 | 136.0             | 30.0             | 1.90             | 3.6             | 0.0                         | 0                | 1             | 15             | 0                |
| B1-1         | 3     | 103.00 | 1.2       |                 | 177.0             | 40.0             | 1.30             | 3.0             | 0.0                         | 0                | 1             | 25             | 0                |
| B1-1         | 3     | 104.00 | 3.3       |                 | 88.0              | 40.5             | 1.40             | 2.6             | 0.0                         | 0                | 1             | 25             | 0                |
| B1-1         | 3     | 105.00 | 1.2       |                 | 205.0             | 61.0             | 1.70             | 3.1             | 0.0                         | 0                | 2             | 60             | 0                |
| B1-1         | 3     | 106.00 | 3.3       |                 | 72.0              | 33.0             | 2.30             | 3.4             | 0.0                         | 0                | 1             | 35             | 0                |
| B1-1         | 3     | 107.00 | 1.2       |                 | 101.0             | 35.0             | 1.40             | 2.5             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 3     | 108.00 | 3.3       |                 | 80.0              | 44.5             | 1.40             | 1.9             | 0.0                         | 0                | 2             | 35             | 5                |
| B1-1         | 3     | 109.00 | 1.2       |                 | 69.0              | 51.2             | 0.70             | 1.5             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 3     | 110.00 | 3.3       |                 | 209.0             | 36.0             | 1.40             | 2.8             | 0.0                         | 0                | 2             | 30             | 0                |
| B1-1         | 3     | 111.00 | 1.2       |                 | 51.0              | 51.2             | 0.50             | 1.4             | 0.0                         | 0                | 1             | 15             | 0                |
| B1-1         | 3     | 112.00 | 1.1       |                 | 61.0              | 50.0             | 0.60             | 1.1             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 3     | 113.00 | 3.3       |                 | 135.0             | 40.0             | 2.00             | 2.9             | 0.0                         | 0                | 2             | 35             | 0                |
| B1-1         | 3     | 114.00 | 1.2       |                 | 58.0              | 50.7             | 1.10             | 2.8             | 0.0                         | 0                | 1             | 15             | 0                |
| B2           | 3     | 115.00 | 3.3       |                 | 105.0             | 44.0             | 1.20             | 1.9             | 0.0                         | 0                | 1             | 20             | 0                |
| C3           | 3     | 116.10 |           | 1.1             | 254.0             | 50.0             | 0.60             | 1.9             | 0.0                         | 0                | 0             | 0              | 0                |
| C3           | 3     | 116.20 |           | 3.3             | 70.0              | 21.0             | 0.90             | 1.9             | 0.0                         | 0                | 1             | 20             | 0                |
| C3           | 3     | 116.20 |           | 1.1             | 87.0              | 40.0             | 0.40             | 1.1             | 0.0                         | 0                | 1             | 15             | 0                |
| C3           | 3     | 117.10 |           | 3.2             | 120.0             | 39.2             | 1.40             | 4.5             | 0.0                         | 0                | 1             | 20             | 5                |
| C3           | 3     | 117.20 |           | 5.2             | 23.0              | 9.0              | 0.50             | 0.7             | 0.4                         | 1                | 1             | 45             | 0                |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | % swd<br>(d<12") | % lwd<br>(d>12") | % Root<br>Mass | % Terr.<br>Veg. | % Aquat.<br>Veg. | % White-<br>water | % Boulder<br>(d>10") | % Bedrock<br>Ledge | Silt/Clay | Sand<br>(<0.08") | Gravel<br>(0.08-2.5") | Sm. Cobble<br>(2.5-5") | Lg. Cobble<br>(5-10") |
|--------|------------------|------------------|----------------|-----------------|------------------|-------------------|----------------------|--------------------|-----------|------------------|-----------------------|------------------------|-----------------------|
| 52.00  | 5                | 5                | 0              | 0               | 0                | 10                | 10                   | 10                 | 0         | 0                | 0                     | 0                      | 0                     |
| 53.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 54.00  | 0                | 0                | 0              | 15              | 0                | 0                 | 20                   | 15                 | 0         | 0                | 0                     | 1                      | 2                     |
| 55.00  | 0                | 0                | 0              | 35              | 0                | 5                 | 25                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 56.00  | 5                | 0                | 0              | 25              | 0                | 0                 | 5                    | 10                 | 0         | 0                | 0                     | 0                      | 0                     |
| 57.00  | 5                | 10               | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 58.00  | 5                | 0                | 0              | 10              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 59.00  | 0                | 0                | 0              | 10              | 0                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 60.00  | 15               | 0                | 0              | 15              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 61.00  | 5                | 10               | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 62.00  | 5                | 15               | 0              | 15              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 63.00  | 5                | 10               | 0              | 10              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 64.00  | 0                | 5                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 65.00  | 10               | 5                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 66.00  | 0                | 0                | 0              | 10              | 0                | 10                | 5                    | 5                  | 0         | 0                | 0                     | 1                      | 0                     |
| 67.00  | 5                | 15               | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 68.00  | 0                | 5                | 0              | 15              | 0                | 10                | 15                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 69.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 70.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 71.00  | 5                | 0                | 0              | 10              | 0                | 0                 | 10                   | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 72.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 15                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 73.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 10                   | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 74.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 75.00  | 0                | 0                | 0              | 15              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 76.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 77.00  | 0                | 0                | 0              | 15              | 0                | 5                 | 15                   | 10                 | 0         | 0                | 0                     | 0                      | 1                     |
| 78.00  | 0                | 5                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 79.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 15                   | 10                 | 0         | 0                | 0                     | 0                      | 0                     |
| 80.00  | 5                | 0                | 0              | 0               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 81.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 82.00  | 5                | 0                | 0              | 10              | 0                | 5                 | 5                    | 10                 | 0         | 2                | 0                     | 0                      | 0                     |
| 83.00  | 0                | 0                | 0              | 10              | 0                | 10                | 15                   | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 84.00  | 0                | 0                | 0              | 0               | 0                | 10                | 15                   | 15                 | 0         | 0                | 0                     | 0                      | 0                     |
| 85.00  | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 86.00  | 0                | 0                | 0              | 15              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 87.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 15                   | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 88.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 89.00  | 0                | 0                | 0              | 10              | 0                | 0                 | 20                   | 0                  | 0         | 2                | 0                     | 0                      | 0                     |
| 90.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 15                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 91.00  | 0                | 0                | 0              | 10              | 0                | 10                | 5                    | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 92.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 15                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 93.00  | 10               | 0                | 0              | 10              | 0                | 10                | 5                    | 5                  | 0         | 0                | 0                     | 0                      | 0                     |
| 94.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 2                      | 0                     |
| 95.00  | 0                | 0                | 0              | 0               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 96.00  | 0                | 0                | 0              | 10              | 0                | 5                 | 20                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 96.10  | 10               | 10               | 0              | 40              | 0                | 5                 | 10                   | 5                  | 0         | 0                | 0                     | 0                      | 0                     |
| 96.20  | 5                | 5                | 0              | 5               | 0                | 10                | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 97.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 20                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 98.00  | 0                | 0                | 0              | 0               | 0                | 5                 | 15                   | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 99.00  | 0                | 0                | 0              | 5               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 100.00 | 0                | 0                | 0              | 5               | 0                | 10                | 15                   | 5                  | 0         | 0                | 0                     | 0                      | 0                     |
| 101.00 | 0                | 0                | 0              | 0               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 102.00 | 0                | 0                | 0              | 0               | 0                | 5                 | 5                    | 5                  | 0         | 0                | 0                     | 0                      | 1                     |
| 103.00 | 0                | 0                | 0              | 5               | 0                | 5                 | 15                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 104.00 | 0                | 0                | 0              | 10              | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 105.00 | 0                | 5                | 0              | 5               | 0                | 20                | 30                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 106.00 | 0                | 0                | 0              | 5               | 0                | 5                 | 25                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 107.00 | 0                | 0                | 0              | 5               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 108.00 | 5                | 5                | 5              | 5               | 0                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 109.00 | 0                | 5                | 0              | 0               | 0                | 5                 | 5                    | 5                  | 0         | 0                | 0                     | 0                      | 0                     |
| 110.00 | 5                | 0                | 0              | 5               | 10               | 0                 | 5                    | 5                  | 0         | 0                | 0                     | 0                      | 0                     |
| 111.00 | 0                | 0                | 0              | 5               | 5                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 2                      | 0                     |
| 112.00 | 0                | 0                | 0              | 15              | 5                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 113.00 | 5                | 0                | 0              | 10              | 15               | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 114.00 | 0                | 0                | 5              | 5               | 0                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 115.00 | 0                | 0                | 0              | 10              | 5                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 116.10 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 116.20 | 0                | 0                | 0              | 10              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 116.20 | 0                | 0                | 0              | 10              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 117.10 | 0                | 0                | 0              | 15              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 117.20 | 0                | 0                | 5              | 40              | 0                | 0                 | 0                    | 0                  | 0         | 1                | 2                     | 0                      | 0                     |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | Boulder<br>(>10") | Bedrock | % Exposed<br>Substrate | % Canopy | % Decid.<br>Trees | % Conif.<br>Trees | RtBk Dom.<br>Type | % RtBk<br>Cover | LtBk Dom.<br>Type | % RtBk<br>Cover |
|--------|-------------------|---------|------------------------|----------|-------------------|-------------------|-------------------|-----------------|-------------------|-----------------|
| 52.00  | 2                 | 1       | 0                      | 10       | 5                 | 5                 | 7                 | 95              | 1                 | 10              |
| 53.00  | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 0               | 1                 | 0               |
| 54.00  | 0                 | 0       | 0                      | 25       | 20                | 5                 | 7                 | 0               | 1                 | 0               |
| 55.00  | 2                 | 0       | 0                      | 25       | 20                | 5                 | 7                 | 95              | 7                 | 95              |
| 56.00  | 2                 | 1       | 0                      | 30       | 25                | 5                 | 1                 | 5               | 7                 | 95              |
| 57.00  | 2                 | 1       | 0                      | 20       | 15                | 5                 | 5                 | 75              | 7                 | 95              |
| 58.00  | 0                 | 0       | 0                      | 10       | 10                | 0                 | 5                 | 35              | 7                 | 90              |
| 59.00  | 0                 | 0       | 0                      | 20       | 15                | 5                 | 5                 | 85              | 7                 | 100             |
| 60.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 5                 | 20              | 7                 | 90              |
| 61.00  | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 95              | 7                 | 90              |
| 62.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 95              | 7                 | 90              |
| 63.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 95              | 7                 | 90              |
| 64.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 80              | 7                 | 95              |
| 65.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 5                 | 35              | 7                 | 80              |
| 66.00  | 2                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 55              | 1                 | 0               |
| 67.00  | 2                 | 0       | 0                      | 35       | 35                | 0                 | 7                 | 85              | 7                 | 15              |
| 68.00  | 2                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 95              | 7                 | 90              |
| 69.00  | 2                 | 0       | 0                      | 50       | 50                | 0                 | 7                 | 95              | 1                 | 0               |
| 70.00  | 2                 | 0       | 0                      | 40       | 35                | 5                 | 7                 | 85              | 7                 | 80              |
| 71.00  | 2                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 70              | 7                 | 80              |
| 72.00  | 2                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 95              | 7                 | 85              |
| 73.00  | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 100             | 1                 | 5               |
| 74.00  | 2                 | 0       | 0                      | 30       | 15                | 15                | 7                 | 95              | 7                 | 90              |
| 75.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 100             | 7                 | 70              |
| 76.00  | 2                 | 0       | 0                      | 30       | 10                | 20                | 7                 | 95              | 7                 | 90              |
| 77.00  | 2                 | 0       | 0                      | 30       | 15                | 15                | 1                 | 10              | 7                 | 90              |
| 78.00  | 2                 | 0       | 0                      | 25       | 15                | 10                | 7                 | 95              | 7                 | 90              |
| 79.00  | 2                 | 1       | 0                      | 15       | 10                | 5                 | 7                 | 55              | 1                 | 25              |
| 80.00  | 2                 | 1       | 0                      | 10       | 10                | 0                 | 7                 | 75              | 1                 | 0               |
| 81.00  | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 90              | 7                 | 95              |
| 82.00  | 0                 | 1       | 0                      | 10       | 10                | 0                 | 1                 | 15              | 7                 | 95              |
| 83.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 1                 | 30              | 7                 | 15              |
| 84.00  | 2                 | 1       | 0                      | 0        | 0                 | 0                 | 1                 | 0               | 1                 | 0               |
| 85.00  | 0                 | 1       | 0                      | 0        | 0                 | 0                 | 1                 | 0               | 1                 | 0               |
| 86.00  | 2                 | 0       | 0                      | 25       | 15                | 10                | 7                 | 90              | 7                 | 90              |
| 87.00  | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 85              | 1                 | 5               |
| 88.00  | 2                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 70              | 7                 | 90              |
| 89.00  | 1                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 95              | 7                 | 85              |
| 90.00  | 2                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 85              | 7                 | 85              |
| 91.00  | 2                 | 0       | 0                      | 10       | 10                | 1                 | 1                 | 80              | 7                 | 0               |
| 92.00  | 2                 | 0       | 0                      | 10       | 5                 | 5                 | 1                 | 5               | 7                 | 75              |
| 93.00  | 2                 | 1       | 0                      | 15       | 10                | 5                 | 7                 | 70              | 1                 | 50              |
| 94.00  | 0                 | 1       | 0                      | 20       | 10                | 10                | 7                 | 95              | 7                 | 90              |
| 95.00  | 2                 | 1       | 0                      | 20       | 10                | 10                | 7                 | 95              | 7                 | 95              |
| 96.00  | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 70              | 7                 | 80              |
| 96.10  | 2                 | 1       | 0                      | 55       | 55                | 0                 | 7                 | 50              | 7                 | 90              |
| 96.20  | 2                 | 1       | 0                      | 10       | 10                | 0                 | 2                 | 20              | 7                 | 50              |
| 97.00  | 2                 | 0       | 0                      | 10       | 5                 | 5                 | 7                 | 50              | 7                 | 90              |
| 98.00  | 2                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 85              | 1                 | 5               |
| 99.00  | 2                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 95              | 7                 | 45              |
| 100.00 | 2                 | 1       | 0                      | 0        | 5                 | 0                 | 1                 | 0               | 7                 | 50              |
| 101.00 | 2                 | 1       | 0                      | 0        | 5                 | 0                 | 6                 | 55              | 7                 | 70              |
| 102.00 | 2                 | 0       | 0                      | 10       | 5                 | 5                 | 1                 | 0               | 7                 | 85              |
| 103.00 | 2                 | 0       | 0                      | 15       | 10                | 5                 | 1                 | 10              | 7                 | 40              |
| 104.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 1                 | 0               | 7                 | 95              |
| 105.00 | 2                 | 0       | 0                      | 15       | 5                 | 10                | 7                 | 25              | 7                 | 95              |
| 106.00 | 2                 | 0       | 0                      | 25       | 5                 | 20                | 7                 | 95              | 2                 | 5               |
| 107.00 | 2                 | 0       | 0                      | 15       | 5                 | 10                | 7                 | 90              | 7                 | 80              |
| 108.00 | 2                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 80              | 7                 | 70              |
| 109.00 | 2                 | 1       | 0                      | 10       | 5                 | 5                 | 1                 | 30              | 7                 | 60              |
| 110.00 | 2                 | 1       | 0                      | 5        | 5                 | 0                 | 1                 | 20              | 7                 | 95              |
| 111.00 | 0                 | 1       | 0                      | 10       | 5                 | 5                 | 6                 | 40              | 7                 | 95              |
| 112.00 | 0                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 90              | 7                 | 90              |
| 113.00 | 2                 | 0       | 0                      | 20       | 10                | 10                | 1                 | 40              | 7                 | 70              |
| 114.00 | 2                 | 0       | 0                      | 10       | 5                 | 5                 | 4                 | 15              | 7                 | 90              |
| 115.00 | 0                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 60              | 7                 | 90              |
| 116.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 80              | 5                 | 55              |
| 116.20 | 0                 | 0       | 0                      | 20       | 5                 | 15                | 7                 | 95              | 5                 | 45              |
| 116.20 | 0                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 95              | 5                 | 45              |
| 117.10 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 95              | 5                 | 100             |
| 117.20 | 0                 | 0       | 0                      | 40       | 40                | 0                 | 5                 | 75              | 7                 | 95              |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Channel Type | Reach | Unit # | Unit Type | Side Chan. Type | Mean Length (ft.) | Mean Width (ft.) | Mean Depth (ft.) | Max Depth (ft.) | Depth Pool Tail Crest (ft.) | Pool Tail Embed. | Shelter Value | % Unit Covered | % Undercut Banks |
|--------------|-------|--------|-----------|-----------------|-------------------|------------------|------------------|-----------------|-----------------------------|------------------|---------------|----------------|------------------|
| C3           | 3     | 117.20 |           | 1.1             | 25.0              | 8.0              | 0.10             | 0.2             | 0.0                         | 0                | 1             | 15             | 0                |
| C3           | 3     | 117.30 |           | 1.1             | 48.0              | 11.0             | 0.40             | 0.8             | 0.0                         | 0                | 2             | 60             | 5                |
| C3           | 3     | 117.10 |           | 3.3             | 67.0              | 39.2             | 1.40             | 2.5             | 0.0                         | 0                | 1             | 15             | 5                |
| C3           | 3     | 117.10 |           | 3.2             | 60.0              | 6.0              | 2.00             | 3.9             | 0.0                         | 0                | 1             | 15             | 5                |
| C3           | 3     | 117.20 |           | 5.1             | 146.0             | 20.0             | 2.40             | 3.6             | 0.2                         | 1                | 2             | 20             | 5                |
| C3           | 3     | 117.20 |           | 3.3             | 30.0              | 14.0             | 0.40             | 0.7             | 0.0                         | 0                | 0             | 0              | 0                |
| C3           | 3     | 117.20 |           | 1.1             | 41.0              | 19.0             | 0.30             | 0.4             | 0.0                         | 0                | 0             | 10             | 5                |
| C3           | 3     | 117.20 |           | 5.2             | 82.0              | 15.0             | 1.10             | 1.7             | 0.2                         | 1                | 2             | 35             | 5                |
| C3           | 4     | 118.00 | 4.2       |                 | 86.0              | 43.8             | 2.30             | 4.5             | 0.9                         | 1                | 1             | 15             | 5                |
| C3           | 4     | 119.00 | 3.3       |                 | 114.0             | 38.0             | 1.60             | 2.3             | 0.0                         | 0                | 1             | 20             | 0                |
| C3           | 4     | 120.00 | 1.1       |                 | 48.0              | 39.0             | 0.30             | 0.6             | 0.0                         | 0                | 0             | 0              | 0                |
| C3           | 4     | 121.00 | 3.2       |                 | 136.0             | 37.3             | 1.50             | 3.2             | 0.0                         | 0                | 2             | 40             | 5                |
| C3           | 4     | 122.00 | 3.3       |                 | 108.0             | 40.5             | 1.70             | 2.6             | 0.0                         | 0                | 1             | 10             | 5                |
| C3           | 4     | 123.00 | 1.1       |                 | 162.0             | 64.2             | 0.90             | 1.4             | 0.0                         | 0                | 0             | 10             | 0                |
| C3           | 4     | 124.00 | 3.2       |                 | 137.0             | 43.0             | 2.00             | 3.0             | 0.0                         | 0                | 0             | 10             | 5                |
| C3           | 4     | 125.00 | 5.1       |                 | 125.0             | 43.0             | 2.60             | 4.1             | 2.5                         | 1                | 1             | 20             | 15               |
| C3           | 4     | 126.00 | 1.1       |                 | 117.0             | 47.6             | 0.50             | 0.9             | 0.0                         | 0                | 0             | 10             | 0                |
| C3           | 4     | 127.00 | 3.2       |                 | 75.0              | 49.5             | 1.50             | 2.5             | 0.0                         | 0                | 1             | 20             | 0                |
| C3           | 4     | 128.00 | 3.3       |                 | 125.0             | 49.5             | 1.50             | 2.6             | 0.0                         | 0                | 2             | 35             | 5                |
| B2           | 5     | 129.10 |           | 1.1             | 93.0              | 40.0             | 0.40             | 1.0             | 0.0                         | 0                | 0             | 10             | 0                |
| B2           | 5     | 129.10 |           | 5.3             | 76.0              | 23.0             | 2.40             | 3.1             | 0.8                         | 1                | 1             | 30             | 5                |
| B2           | 5     | 129.20 |           | 3.3             | 105.0             | 26.0             | 2.20             | 3.9             | 0.0                         | 0                | 1             | 20             | 0                |
| B2           | 5     | 129.20 |           | 1.1             | 71.0              | 50.0             | 0.60             | 1.0             | 0.0                         | 0                | 1             | 15             | 0                |
| B2           | 5     | 129.20 |           | 3.3             | 208.0             | 31.8             | 1.50             | 1.9             | 0.0                         | 0                | 2             | 35             | 0                |
| B2           | 5     | 129.20 |           | 1.1             | 62.0              | 31.8             | 0.90             | 1.5             | 0.0                         | 0                | 1             | 40             | 0                |
| B2           | 5     | 129.10 |           | 1.1             | 85.0              | 24.0             | 0.50             | 1.2             | 0.0                         | 0                | 1             | 40             | 0                |
| B3           | 5     | 129.10 |           | 5.6             | 131.0             | 26.0             | 1.50             | 1.9             | 0.5                         | 2                | 2             | 20             | 0                |
| B3           | 5     | 129.10 |           | 1.2             | 14.0              | 62.0             | 0.30             | 0.7             | 0.0                         | 0                | 1             | 45             | 0                |
| B3           | 5     | 130.00 | 3.3       |                 | 87.0              | 22.0             | 1.20             | 2.7             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 5     | 131.00 | 2.1       |                 | 74.0              | 56.0             | 0.70             | 3.8             | 0.0                         | 0                | 0             | 15             | 0                |
| B1-1         | 5     | 132.00 | 1.2       |                 | 30.0              | 47.0             | 0.40             | 1.1             | 0.0                         | 0                | 1             | 25             | 0                |
| B2           | 5     | 133.00 | 3.3       |                 | 78.0              | 48.2             | 1.10             | 2.2             | 0.0                         | 0                | 2             | 40             | 0                |
| B2           | 5     | 134.00 | 1.1       |                 | 100.0             | 57.0             | 0.70             | 1.2             | 0.0                         | 0                | 1             | 40             | 0                |
| B2           | 5     | 135.00 | 5.6       |                 | 85.0              | 66.0             | 4.00             | 8.6             | 1.4                         | 3                | 2             | 40             | 0                |
| B2           | 5     | 136.00 | 2.1       |                 | 15.0              | 30.8             | 0.60             | 1.6             | 0.0                         | 0                | 0             | 0              | 0                |
| B1-1         | 5     | 137.00 | 3.3       |                 | 139.0             | 30.0             | 1.50             | 2.7             | 0.0                         | 0                | 2             | 40             | 0                |
| B1-1         | 5     | 138.00 | 1.1       |                 | 35.0              | 52.5             | 0.60             | 1.0             | 0.0                         | 0                | 0             | 20             | 0                |
| B1-1         | 5     | 139.00 | 3.2       |                 | 82.0              | 33.5             | 1.20             | 2.4             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 5     | 140.00 | 3.3       |                 | 78.0              | 18.0             | 1.50             | 2.2             | 0.0                         | 0                | 1             | 20             | 0                |
| B1-1         | 5     | 141.00 | 1.1       |                 | 14.0              | 92.0             | 0.50             | 0.7             | 0.0                         | 0                | 1             | 15             | 0                |
| B1-1         | 5     | 142.00 | 3.3       |                 | 485.0             | 35.0             | 1.00             | 3.0             | 0.0                         | 0                | 1             | 15             | 5                |
| B1-1         | 6     | 143.00 | 1.1       |                 | 86.0              | 51.0             | 0.50             | 1.0             | 0.0                         | 0                | 1             | 30             | 0                |
| C3           | 6     | 144.00 | 3.3       |                 | 420.0             | 25.0             | 0.90             | 3.1             | 0.0                         | 0                | 2             | 30             | 5                |
| C3           | 6     | 145.10 |           | 5.2             | 45.0              | 12.0             | 1.60             | 2.1             | 1.8                         | 1                | 2             | 30             | 5                |
| C3           | 6     | 145.10 |           | 3.3             | 24.0              | 11.0             | 1.10             | 1.8             | 0.0                         | 0                | 2             | 30             | 10               |
| C3           | 6     | 145.10 |           | 3.2             | 11.0              | 16.0             | 0.60             | 0.9             | 0.0                         | 0                | 1             | 5              | 5                |
| C3           | 6     | 145.10 |           | 5.2             | 23.0              | 15.0             | 2.30             | 3.0             | 0.7                         | 1                | 2             | 15             | 5                |
| C3           | 6     | 145.10 |           | 3.3             | 33.0              | 7.0              | 1.70             | 2.2             | 0.0                         | 0                | 1             | 25             | 5                |
| C3           | 6     | 145.10 |           | 1.1             | 15.0              | 19.0             | 0.40             | 0.6             | 0.0                         | 0                | 1             | 20             | 5                |
| C3           | 6     | 145.10 |           | 3.2             | 68.0              | 19.0             | 0.70             | 2.4             | 0.0                         | 0                | 1             | 10             | 0                |
| C3           | 6     | 145.10 |           | 1.1             | 20.0              | 24.0             | 0.50             | 0.6             | 0.0                         | 0                | 2             | 35             | 0                |
| C3           | 6     | 145.10 |           | 3.2             | 39.0              | 18.8             | 0.80             | 1.4             | 0.0                         | 0                | 0             | 5              | 0                |
| C3           | 6     | 145.10 |           | 1.1             | 47.0              | 25.0             | 0.50             | 0.7             | 0.0                         | 0                | 0             | 0              | 0                |
| C3           | 6     | 145.10 |           | 3.2             | 71.0              | 22.0             | 0.90             | 1.3             | 0.0                         | 0                | 0             | 5              | 5                |
| C3           | 6     | 145.10 |           | 5.3             | 65.0              | 17.0             | 1.50             | 1.8             | 1.2                         | 1                | 1             | 10             | 0                |
| C3           | 6     | 145.10 |           | 3.3             | 82.0              | 13.0             | 0.60             | 1.4             | 0.0                         | 0                | 1             | 30             | 0                |
| C3           | 6     | 145.10 |           | 1.2             | 30.0              | 10.0             | 0.30             | 0.5             | 0.0                         | 0                | 2             | 10             | 0                |
| C3           | 6     | 145.11 |           | 1.1             | 24.0              | 10.8             | 0.50             | 0.7             | 0.0                         | 0                | 1             | 15             | 0                |
| C3           | 6     | 145.11 |           | 3.3             | 27.0              | 8.0              | 0.80             | 1.2             | 0.0                         | 0                | 2             | 10             | 0                |
| C3           | 6     | 145.20 |           | 3.3             | 167.0             | 17.0             | 1.20             | 2.1             | 0.0                         | 0                | 2             | 40             | 5                |
| C3           | 6     | 145.20 |           | 1.1             | 24.0              | 41.0             | 0.50             | 0.9             | 0.0                         | 0                | 1             | 25             | 5                |
| C3           | 6     | 145.20 |           | 3.3             | 260.0             | 36.0             | 0.90             | 2.1             | 0.0                         | 0                | 2             | 20             | 0                |
| C3           | 6     | 145.20 |           | 1.1             | 61.0              | 23.0             | 0.70             | 0.8             | 0.0                         | 0                | 1             | 10             | 0                |
| C3           | 6     | 145.20 |           | 5.6             | 10.0              | 15.0             | 1.30             | 1.8             | 1.2                         | 1                | 2             | 45             | 0                |
| C3           | 6     | 145.20 |           | 3.3             | 74.0              | 35.6             | 1.00             | 1.7             | 0.0                         | 0                | 1             | 5              | 0                |
| C3           | 6     | 145.30 |           | 4.2             | 25.0              | 15.0             | 1.30             | 1.7             | 1.2                         | 2                | 2             | 15             | 0                |
| C3           | 6     | 145.30 |           | 1.1             | 28.0              | 25.0             | 0.30             | 0.4             | 0.0                         | 0                | 1             | 10             | 0                |
| C3           | 6     | 145.30 |           | 3.3             | 34.0              | 12.0             | 0.40             | 0.6             | 0.0                         | 0                | 1             | 10             | 0                |
| C3           | 6     | 145.30 |           | 4.2             | 21.0              | 7.0              | 0.80             | 1.2             | 0.5                         | 1                | 1             | 0              | 0                |
| C3           | 6     | 146.00 | 3.3       |                 | 195.0             | 25.0             | 1.30             | 2.5             | 0.0                         | 0                | 1             | 15             | 0                |
| C3           | 6     | 147.00 | 1.1       |                 | 41.0              | 52.0             | 0.50             | 0.8             | 0.0                         | 0                | 1             | 10             | 0                |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | % swd<br>(d<12") | % lwd<br>(d>12") | % Root<br>Mass | % Terr.<br>Veg. | % Aquat.<br>Veg. | % White-<br>water | % Boulder<br>(d>10") | % Bedrock<br>Ledge | Silt/Clay | Sand<br>(< 0.08") | Gravel<br>(0.08-2.5") | Sm. Cobble<br>(2.5-5") | Lg. Cobble<br>(5-10") |
|--------|------------------|------------------|----------------|-----------------|------------------|-------------------|----------------------|--------------------|-----------|-------------------|-----------------------|------------------------|-----------------------|
| 117.20 | 10               | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 117.30 | 5                | 0                | 0              | 45              | 0                | 0                 | 5                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 117.10 | 0                | 0                | 0              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 117.10 | 0                | 0                | 0              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 117.20 | 0                | 0                | 5              | 5               | 0                | 0                 | 5                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 117.20 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 117.20 | 5                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 117.20 | 15               | 0                | 5              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 118.00 | 0                | 0                | 0              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 119.00 | 0                | 0                | 0              | 10              | 5                | 0                 | 5                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 120.00 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 121.00 | 5                | 5                | 5              | 5               | 15               | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 122.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 123.00 | 5                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 124.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 125.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 126.00 | 0                | 0                | 0              | 5               | 5                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 127.00 | 5                | 0                | 0              | 10              | 5                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 128.00 | 5                | 5                | 5              | 5               | 5                | 0                 | 5                    | 0                  | 0         | 0                 | 1                     | 0                      | 2                     |
| 129.10 | 0                | 0                | 0              | 5               | 0                | 0                 | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 129.10 | 0                | 0                | 0              | 20              | 0                | 0                 | 5                    | 0                  | 0         | 0                 | 1                     | 0                      | 2                     |
| 129.20 | 0                | 5                | 5              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 129.20 | 0                | 5                | 5              | 0               | 0                | 0                 | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 129.20 | 0                | 5                | 0              | 15              | 0                | 5                 | 10                   | 0                  | 0         | 0                 | 0                     | 0                      | 1                     |
| 129.20 | 5                | 0                | 0              | 15              | 0                | 5                 | 15                   | 0                  | 0         | 0                 | 0                     | 0                      | 1                     |
| 129.10 | 5                | 0                | 0              | 20              | 0                | 0                 | 15                   | 0                  | 0         | 0                 | 0                     | 0                      | 1                     |
| 129.10 | 5                | 0                | 10             | 0               | 0                | 5                 | 0                    | 0                  | 0         | 0                 | 1                     | 0                      | 2                     |
| 129.10 | 5                | 0                | 0              | 0               | 0                | 10                | 30                   | 0                  | 0         | 0                 | 1                     | 0                      | 2                     |
| 130.00 | 0                | 0                | 0              | 5               | 0                | 10                | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 131.00 | 0                | 0                | 0              | 0               | 0                | 5                 | 10                   | 0                  | 0         | 0                 | 0                     | 0                      | 0                     |
| 132.00 | 0                | 5                | 5              | 0               | 0                | 5                 | 10                   | 0                  | 0         | 0                 | 0                     | 0                      | 0                     |
| 133.00 | 5                | 0                | 0              | 15              | 0                | 5                 | 10                   | 5                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 134.00 | 5                | 0                | 0              | 5               | 0                | 15                | 15                   | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 135.00 | 15               | 0                | 5              | 0               | 0                | 15                | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 136.00 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 0                     | 0                      | 0                     |
| 137.00 | 10               | 5                | 0              | 10              | 5                | 0                 | 10                   | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 138.00 | 5                | 0                | 0              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 139.00 | 5                | 0                | 0              | 15              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 140.00 | 5                | 0                | 0              | 15              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 141.00 | 0                | 0                | 0              | 0               | 0                | 10                | 5                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 142.00 | 5                | 0                | 0              | 0               | 0                | 0                 | 5                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 143.00 | 5                | 0                | 0              | 15              | 0                | 5                 | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 144.00 | 5                | 0                | 0              | 10              | 5                | 0                 | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 5                | 0                | 0              | 20              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 5                | 0                | 0              | 15              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 5                | 0              | 0               | 5                | 0                 | 0                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 145.10 | 10               | 0                | 0              | 5               | 5                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 5                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 5                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 10               | 5                | 0              | 10              | 0                | 10                | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 0                | 0              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 0                | 0                | 0              | 30              | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.10 | 5                | 0                | 5              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.11 | 5                | 5                | 5              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.11 | 5                | 0                | 5              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.20 | 5                | 10               | 5              | 10              | 5                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.20 | 5                | 0                | 0              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 145.20 | 5                | 5                | 5              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.20 | 0                | 5                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.20 | 0                | 5                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.20 | 15               | 0                | 0              | 5               | 0                | 20                | 5                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.20 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.30 | 10               | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 1                 | 2                     | 0                      | 0                     |
| 145.30 | 5                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |
| 145.30 | 5                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 145.30 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 146.00 | 5                | 5                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 0                     | 1                      | 2                     |
| 147.00 | 10               | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                 | 1                     | 2                      | 0                     |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | Boulder<br>(>10") | Bedrock | % Exposed<br>Substrate | % Canopy | % Decid.<br>Trees | % Conif.<br>Trees | RtBk Dom.<br>Type | % RtBk<br>Cover | LtBk Dom.<br>Type | % RtBk<br>Cover |
|--------|-------------------|---------|------------------------|----------|-------------------|-------------------|-------------------|-----------------|-------------------|-----------------|
| 117.20 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 3                 | 30              | 5                 | 5               |
| 117.30 | 0                 | 0       | 0                      | 45       | 45                | 0                 | 7                 | 90              | 5                 | 85              |
| 117.10 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 100             | 5                 | 100             |
| 117.10 | 0                 | 0       | 0                      | 15       | 10                | 5                 | 3                 | 90              | 7                 | 10              |
| 117.20 | 0                 | 0       | 0                      | 25       | 5                 | 20                | 7                 | 95              | 5                 | 100             |
| 117.20 | 0                 | 0       | 0                      | 35       | 5                 | 30                | 7                 | 35              | 5                 | 60              |
| 117.20 | 0                 | 0       | 0                      | 35       | 5                 | 30                | 7                 | 55              | 3                 | 5               |
| 117.20 | 0                 | 0       | 0                      | 35       | 10                | 25                | 7                 | 75              | 3                 | 25              |
| 118.00 | 0                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 60              | 7                 | 90              |
| 119.00 | 0                 | 0       | 0                      | 20       | 10                | 10                | 7                 | 90              | 3                 | 60              |
| 120.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 7                 | 80              | 5                 | 100             |
| 121.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 7                 | 80              | 5                 | 100             |
| 122.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 90              | 5                 | 100             |
| 123.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 70              | 7                 | 100             |
| 124.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 5               | 5                 | 100             |
| 125.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 5               | 5                 | 100             |
| 126.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 70              | 5                 | 80              |
| 127.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 20              | 5                 | 100             |
| 128.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 3                 | 40              | 5                 | 100             |
| 129.10 | 0                 | 0       | 0                      | 30       | 70                | 30                | 7                 | 90              | 5                 | 100             |
| 129.10 | 0                 | 0       | 0                      | 70       | 60                | 10                | 7                 | 95              | 5                 | 100             |
| 129.20 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 7                 | 50              | 3                 | 10              |
| 129.20 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 4                 | 5               | 6                 | 90              |
| 129.20 | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 95              | 7                 | 90              |
| 129.20 | 2                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 95              | 7                 | 90              |
| 129.10 | 2                 | 0       | 0                      | 20       | 15                | 5                 | 7                 | 95              | 7                 | 95              |
| 129.10 | 0                 | 0       | 0                      | 15       | 10                | 5                 | 7                 | 95              | 7                 | 95              |
| 129.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 95              | 1                 | 10              |
| 130.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 60              | 1                 | 15              |
| 131.00 | 2                 | 1       | 0                      | 0        | 0                 | 0                 | 1                 | 5               | 1                 | 25              |
| 132.00 | 2                 | 1       | 0                      | 0        | 0                 | 0                 | 1                 | 10              | 1                 | 5               |
| 133.00 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 0                 | 90              | 1                 | 10              |
| 134.00 | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 2                 | 90              | 1                 | 5               |
| 135.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 1                 | 10              | 1                 | 10              |
| 136.00 | 2                 | 1       | 0                      | 0        | 0                 | 0                 | 1                 | 5               | 1                 | 0               |
| 137.00 | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 1                 | 5               | 1                 | 5               |
| 138.00 | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 3                 | 30              | 3                 | 10              |
| 139.00 | 0                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 100             | 3                 | 65              |
| 140.00 | 0                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 100             | 7                 | 100             |
| 141.00 | 0                 | 0       | 0                      | 15       | 15                | 0                 | 7                 | 100             | 7                 | 100             |
| 142.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 90              | 3                 | 70              |
| 143.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 100             | 7                 | 100             |
| 144.00 | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 3                 | 70              | 3                 | 70              |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 10              | 7                 | 100             |
| 145.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 3                 | 5               | 7                 | 95              |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 0               | 5                 | 15              |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 0               | 5                 | 80              |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 5               | 5                 | 100             |
| 145.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 3                 | 5               | 5                 | 100             |
| 145.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 60              | 7                 | 70              |
| 145.10 | 0                 | 0       | 0                      | 60       | 60                | 0                 | 7                 | 100             | 3                 | 5               |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 15              | 3                 | 5               |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 70              | 3                 | 60              |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 90              | 5                 | 90              |
| 145.10 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 3                 | 0               | 7                 | 100             |
| 145.10 | 0                 | 0       | 0                      | 45       | 45                | 0                 | 3                 | 5               | 7                 | 100             |
| 145.10 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 0               | 7                 | 100             |
| 145.11 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 15              | 3                 | 5               |
| 145.11 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 15              | 3                 | 5               |
| 145.20 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 80              | 7                 | 80              |
| 145.20 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 90              | 7                 | 100             |
| 145.20 | 0                 | 0       | 0                      | 2        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 145.20 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 5                 | 90              | 7                 | 100             |
| 145.20 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 75              | 3                 | 10              |
| 145.20 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 100             | 5                 | 70              |
| 145.30 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 100             | 7                 | 85              |
| 145.30 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 100             | 7                 | 70              |
| 145.30 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 90              | 7                 | 70              |
| 145.30 | 0                 | 0       | 0                      | 2        | 2                 | 0                 | 7                 | 95              | 3                 | 5               |
| 146.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 3                 | 60              | 7                 | 100             |
| 147.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 25              | 5                 | 75              |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Channel Type | Reach | Unit # | Unit Type | Side Chan. Type | Mean Length (ft.) | Mean Width (ft.) | Mean Depth (ft.) | Max Depth (ft.) | Depth Pool Tail Crest (ft.) | Pool Tail Embed. | Shelter Value | % Unit Covered | % Undercut Banks |
|--------------|-------|--------|-----------|-----------------|-------------------|------------------|------------------|-----------------|-----------------------------|------------------|---------------|----------------|------------------|
| C-3          | 6     | 148.00 | 3.3       |                 | 203.0             | 24.0             | 1.20             | 2.1             | 0.0                         | 0                | 1             | 15             | 0                |
| C-3          | 6     | 149.00 | 1.1       |                 | 14.0              | 35.0             | 0.60             | 0.7             | 0.0                         | 0                | 0             | 0              | 0                |
| C-3          | 6     | 150.00 | 3.3       |                 | 351.0             | 30.0             | 1.20             | 2.6             | 0.0                         | 0                | 3             | 65             | 5                |
| C-3          | 6     | 151.00 | 1.1       |                 | 173.0             | 35.0             | 0.70             | 1.2             | 0.0                         | 0                | 1             | 10             | 0                |
| C-3          | 6     | 152.00 | 3.3       |                 | 97.0              | 35.0             | 0.80             | 1.5             | 0.0                         | 0                | 1             | 5              | 0                |
| C-3          | 6     | 153.00 | 3.2       |                 | 70.0              | 30.0             | 1.20             | 2.0             | 0.0                         | 0                | 1             | 10             | 0                |
| C-3          | 6     | 154.00 | 3.3       |                 | 400.0             | 30.0             | 1.20             | 2.6             | 0.0                         | 0                | 1             | 20             | 0                |
| C-3          | 6     | 155.00 | 1.1       |                 | 192.0             | 46.6             | 0.60             | 1.5             | 0.0                         | 0                | 1             | 5              | 0                |
| C-3          | 6     | 156.00 | 3.2       |                 | 18.0              | 46.6             | 1.40             | 2.0             | 0.0                         | 0                | 1             | 5              | 0                |
| C-3          | 6     | 157.00 | 5.1       |                 | 47.0              | 28.0             | 2.50             | 3.4             | 1.4                         | 1                | 1             | 5              | 0                |
| C-3          | 6     | 158.00 | 3.3       |                 | 126.0             | 25.0             | 1.10             | 2.6             | 0.0                         | 0                | 2             | 40             | 0                |
| C-3          | 6     | 159.00 | 1.1       |                 | 28.0              | 62.0             | 0.50             | 1.0             | 0.0                         | 0                | 1             | 5              | 0                |
| C-3          | 6     | 160.00 | 3.3       |                 | 57.5              | 40.0             | 1.10             | 2.0             | 0.0                         | 0                | 1             | 5              | 5                |
| C-3          | 6     | 161.00 | 1.1       |                 | 38.0              | 58.0             | 0.50             | 0.9             | 0.0                         | 0                | 1             | 5              | 0                |
| B-2          | 6     | 162.00 | 3.2       |                 | 67.0              | 45.0             | 0.90             | 1.9             | 0.0                         | 0                | 1             | 15             | 0                |
| B-2          | 6     | 163.00 | 3.3       |                 | 306.0             | 45.0             | 1.20             | 2.5             | 0.0                         | 0                | 2             | 25             | 0                |
| B-2          | 6     | 164.00 | 1.1       |                 | 104.0             | 59.0             | 1.20             | 1.7             | 0.0                         | 0                | 1             | 40             | 0                |
| B-2          | 6     | 165.00 | 5.5       |                 | 121.0             | 30.0             | 3.90             | 6.0             | 0.9                         | 1                | 2             | 20             | 0                |
| B-2          | 6     | 166.00 | 1.1       |                 | 333.0             | 54.0             | 1.20             | 2.7             | 0.0                         | 0                | 2             | 30             | 0                |
| B-2          | 6     | 167.00 | 6.5       |                 | 46.0              | 18.0             | 1.40             | 2.1             | 0.0                         | 1                | 2             | 30             | 0                |
| B-2          | 6     | 168.00 | 3.3       |                 | 761.0             | 33.0             | 1.10             | 3.0             | 0.0                         | 0                | 2             | 25             | 0                |
| B-2          | 6     | 169.00 | 1.1       |                 | 46.0              | 25.0             | 0.70             | 0.9             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 6     | 170.00 | 3.3       |                 | 165.0             | 33.0             | 1.50             | 2.1             | 0.0                         | 0                | 2             | 40             | 0                |
| B-2          | 6     | 171.00 | 1.1       |                 | 98.0              | 63.0             | 0.60             | 0.9             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 6     | 172.00 | 3.3       |                 | 166.0             | 35.0             | 1.60             | 2.9             | 0.0                         | 0                | 1             | 25             | 0                |
| B-2          | 6     | 173.00 | 3.3       |                 | 65.0              | 33.0             | 0.60             | 1.3             | 0.0                         | 0                | 1             | 15             | 0                |
| B-2          | 6     | 173.10 | 1.1       |                 | 290.0             | 16.0             | 0.40             | 1.4             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 6     | 173.10 | 3.1       |                 | 67.0              | 18.0             | 0.40             | 0.6             | 0.0                         | 0                | 1             | 15             | 0                |
| B-2          | 6     | 173.10 | 4.2       |                 | 59.0              | 14.0             | 0.60             | 1.1             | 0.5                         | 1                | 1             | 15             | 0                |
| B-2          | 6     | 173.10 | 1.1       |                 | 108.0             | 18.0             | 0.40             | 0.8             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 6     | 173.10 | 3.3       |                 | 53.0              | 14.0             | 0.60             | 1.1             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 6     | 173.10 | 1.1       |                 | 132.0             | 17.0             | 0.30             | 0.7             | 0.0                         | 0                | 1             | 15             | 0                |
| B-2          | 6     | 173.10 | 4.2       |                 | 27.0              | 13.0             | 0.60             | 1.0             | 0.5                         | 1                | 1             | 15             | 0                |
| B-2          | 6     | 173.10 | 3.3       |                 | 36.5              | 9.8              | 0.40             | 0.5             | 0.0                         | 0                | 1             | 20             | 0                |
| B-2          | 6     | 173.10 | 1.2       |                 | 82.3              | 21.0             | 0.30             | 0.8             | 0.0                         | 0                | 1             | 25             | 0                |
| B-2          | 6     | 174.00 | 3.3       |                 | 169.0             | 21.0             | 1.10             | 2.2             | 0.0                         | 0                | 1             | 35             | 0                |
| B-2          | 6     | 175.00 | 6.3       |                 | 15.0              | 11.0             | 1.50             | 1.9             | 1.8                         | 4                | 2             | 40             | 5                |
| B-2          | 6     | 176.00 | 3.3       |                 | 48.0              | 18.0             | 1.60             | 2.3             | 0.0                         | 0                | 2             | 30             | 0                |
| C-3          | 6     | 177.00 | 1.1       |                 | 124.0             | 36.0             | 0.60             | 1.8             | 0.0                         | 0                | 1             | 25             | 0                |
| C-3          | 6     | 178.00 | 3.3       |                 | 70.0              | 35.0             | 1.00             | 1.6             | 0.0                         | 0                | 1             | 25             | 5                |
| C-3          | 6     | 179.00 | 1.1       |                 | 31.0              | 31.4             | 0.90             | 1.3             | 0.0                         | 0                | 1             | 20             | 5                |
| C-3          | 6     | 180.00 | 3.3       |                 | 74.0              | 19.6             | 1.50             | 2.6             | 0.0                         | 0                | 1             | 20             | 5                |
| C-3          | 6     | 181.00 | 1.2       |                 | 51.0              | 44.0             | 0.70             | 1.1             | 0.0                         | 0                | 1             | 15             | 5                |
| C-3          | 6     | 182.00 | 3.3       |                 | 82.0              | 32.0             | 1.50             | 2.9             | 0.0                         | 0                | 1             | 10             | 0                |
| C-3          | 6     | 183.00 | 1.1       |                 | 127.0             | 44.5             | 0.60             | 1.5             | 0.0                         | 0                | 1             | 20             | 0                |
| C-3          | 6     | 184.00 | 3.3       |                 | 118.0             | 26.5             | 1.40             | 1.9             | 0.0                         | 0                | 1             | 10             | 0                |
| C-3          | 6     | 185.00 | 1.2       |                 | 88.0              | 30.0             | 0.50             | 1.8             | 0.0                         | 0                | 1             | 20             | 0                |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | % swd<br>(d<12") | % lwd<br>(d>12") | % Root<br>Mass | % Terr.<br>Veg. | % Aquat.<br>Veg. | % White-<br>water | % Boulder<br>(d>10") | % Bedrock<br>Ledge | Silt/Clay | Sand<br>(<0.08") | Gravel<br>(0.08-2.5") | Sm. Cobble<br>(2.5-5") | Lg. Cobble<br>(5-10") |
|--------|------------------|------------------|----------------|-----------------|------------------|-------------------|----------------------|--------------------|-----------|------------------|-----------------------|------------------------|-----------------------|
| 148.00 | 5                | 5                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 149.00 | 0                | 0                | 0              | 0               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 150.00 | 20               | 25               | 10             | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 151.00 | 0                | 5                | 0              | 0               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 152.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 153.00 | 0                | 0                | 0              | 10              | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 154.00 | 0                | 0                | 0              | 10              | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 155.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 156.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 157.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 0                      | 2                     |
| 158.00 | 10               | 10               | 5              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 159.00 | 0                | 0                | 0              | 0               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 160.00 | 0                | 0                | 0              | 0               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 161.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 162.00 | 5                | 0                | 0              | 5               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 163.00 | 10               | 0                | 0              | 5               | 0                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 164.00 | 5                | 0                | 0              | 5               | 0                | 10                | 20                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 165.00 | 5                | 0                | 0              | 0               | 0                | 0                 | 15                   | 0                  | 0         | 0                | 0                     | 0                      | 1                     |
| 166.00 | 5                | 5                | 0              | 5               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 167.00 | 5                | 10               | 5              | 5               | 0                | 0                 | 5                    | 0                  | 0         | 1                | 2                     | 0                      | 0                     |
| 168.00 | 5                | 0                | 0              | 5               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 169.00 | 5                | 0                | 0              | 0               | 0                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 170.00 | 5                | 5                | 5              | 5               | 5                | 5                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 171.00 | 5                | 0                | 0              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 172.00 | 0                | 0                | 0              | 5               | 5                | 10                | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 173.00 | 0                | 0                | 0              | 0               | 5                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 173.10 | 0                | 0                | 0              | 5               | 10               | 0                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 173.10 | 0                | 5                | 0              | 5               | 5                | 0                 | 0                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 173.10 | 5                | 0                | 0              | 5               | 5                | 0                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 173.10 | 0                | 0                | 0              | 5               | 5                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 173.10 | 0                | 0                | 5              | 5               | 5                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 173.10 | 0                | 0                | 0              | 5               | 5                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 173.10 | 0                | 0                | 0              | 10              | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 173.10 | 5                | 0                | 0              | 5               | 5                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 173.10 | 5                | 0                | 0              | 5               | 5                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 174.00 | 0                | 0                | 0              | 5               | 5                | 10                | 15                   | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 175.00 | 0                | 0                | 10             | 10              | 5                | 0                 | 10                   | 0                  | 0         | 0                | 0                     | 0                      | 0                     |
| 176.00 | 10               | 0                | 5              | 5               | 5                | 5                 | 0                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 177.00 | 5                | 0                | 0              | 5               | 5                | 5                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 178.00 | 5                | 0                | 0              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 179.00 | 0                | 0                | 0              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 180.00 | 0                | 0                | 0              | 5               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 1                     | 2                      | 0                     |
| 181.00 | 0                | 0                | 0              | 0               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 182.00 | 0                | 0                | 0              | 5               | 0                | 0                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 183.00 | 0                | 0                | 0              | 5               | 5                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 184.00 | 0                | 0                | 0              | 0               | 0                | 5                 | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |
| 185.00 | 5                | 0                | 0              | 0               | 5                | 10                | 5                    | 0                  | 0         | 0                | 0                     | 1                      | 2                     |

Appendix B (continued). Habitat Inventory Data: Middle Fork San Joaquin River

| Unit # | Boulder<br>(>10") | Bedrock | % Exposed<br>Substrate | % Canopy | % Decid.<br>Trees | % Conif.<br>Trees | RtBk Dom.<br>Type | % RtBk<br>Cover | LtBk Dom.<br>Type | % RtBk<br>Cover |
|--------|-------------------|---------|------------------------|----------|-------------------|-------------------|-------------------|-----------------|-------------------|-----------------|
| 148.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 80              | 7                 | 90              |
| 149.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 6                 | 65              | 3                 | 10              |
| 150.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 3                 | 5               | 5                 | 95              |
| 151.00 | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 4                 | 15              | 5                 | 70              |
| 152.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 4                 | 5               | 7                 | 95              |
| 153.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 5                 | 85              | 7                 | 90              |
| 154.00 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 95              | 7                 | 95              |
| 155.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 7                 | 90              | 7                 | 100             |
| 156.00 | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 3                 | 5               | 6                 | 85              |
| 157.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 3                 | 5               | 6                 | 85              |
| 158.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 7                 | 90              | 3                 | 25              |
| 159.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 100             | 7                 | 95              |
| 160.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 100             | 7                 | 100             |
| 161.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 90              | 7                 | 100             |
| 162.00 | 0                 | 0       | 0                      | 2        | 2                 | 0                 | 5                 | 90              | 7                 | 95              |
| 163.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 80              | 7                 | 95              |
| 164.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 2                 | 75              | 1                 | 50              |
| 165.00 | 2                 | 0       | 0                      | 0        | 0                 | 0                 | 4                 | 25              | 1                 | 30              |
| 166.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 2                 | 70              | 7                 | 80              |
| 167.00 | 0                 | 0       | 0                      | 10       | 5                 | 5                 | 4                 | 85              | 4                 | 15              |
| 168.00 | 0                 | 0       | 0                      | 5        | 0                 | 5                 | 7                 | 90              | 7                 | 90              |
| 169.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 75              | 1                 | 5               |
| 170.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 95              | 7                 | 90              |
| 171.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 100             | 7                 | 100             |
| 172.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 1                 | 40              | 7                 | 70              |
| 173.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 7                 | 90              | 7                 | 100             |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 100             | 7                 | 100             |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 40              |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 100             | 7                 | 90              |
| 173.10 | 0                 | 0       | 0                      | 10       | 10                | 0                 | 7                 | 100             | 5                 | 100             |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 173.10 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 174.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 1                 | 15              | 7                 | 100             |
| 175.00 | 2                 | 1       | 0                      | 10       | 10                | 0                 | 7                 | 85              | 3                 | 5               |
| 176.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 7                 | 100             | 3                 | 20              |
| 177.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 100             | 7                 | 95              |
| 178.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 179.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 7                 | 100             |
| 180.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 80              | 7                 | 100             |
| 181.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 100             | 5                 | 100             |
| 182.00 | 0                 | 0       | 0                      | 5        | 5                 | 0                 | 5                 | 100             | 5                 | 100             |
| 183.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 100             | 7                 | 100             |
| 184.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 100             | 3                 | 70              |
| 185.00 | 0                 | 0       | 0                      | 0        | 0                 | 0                 | 5                 | 65              | 7                 | 100             |

| Appendix C. Habitat Inventory Form        |              |               |               |      |            |      |       |       |       |              |      |     |      |      |       |        |
|-------------------------------------------|--------------|---------------|---------------|------|------------|------|-------|-------|-------|--------------|------|-----|------|------|-------|--------|
| Date                                      | 7/3/94       | Stream Name   | Alligator Ck. |      | Twsp.      | 4S   | Range | 26E   | Sec.  | 10SE1/4NW1/4 |      |     |      |      |       |        |
| Surveyors                                 | Rowan, D. E. |               |               |      | Flow (cfs) | 2    | Time  | 1000  |       |              |      |     |      |      |       |        |
| Water Temp. (F)                           | 50           | Air Temp. (F) | 62            |      |            |      |       |       |       |              |      |     |      |      |       |        |
| Habitat Unit #                            | 1            | 2             | 3             | 4    | 5          | 6    | 7     | 8     | 9     | 10           | 11   | 12  | 13   | 14   | 15    | 16     |
| Habitat Unit Type                         | LSL          | LGR           | LSL           | RUN  | DPL        | LSBo | LSL   | RUN   | MDW.  | LSL          | RUN  | CRP | MDW. | LSR  | MDW.  | HGR    |
| Channel Type                              | B4           | B4            | B4            | B4   | B4         | B4   | B4    | B4    | B4    | B4           | B4   | B4  | B4   | B4   | B4    | STP    |
| Reach #                                   | 1            | 1             | 1             | 1    | 1          | 1    | 1     | 1     | 1     | 1            | 1    | 1   | 1    | 1    | 1     | 2      |
| Mean Length (ft.)                         | 78.0         | 26.0          | 12.0          | 62.0 | 38.0       | 40.0 | 370.0 | 170.0 | 210.0 | 14.0         | 13.0 | 8.0 | 40.0 | 40.0 | 400.0 | 3249.0 |
| Mean Width (ft.)                          | 17.0         | 8.0           | 6.5           | 3.6  | 18.0       | 6.0  | 5.0   | 2.5   | 8.0   | 4.0          | 1.5  | 5.0 | 8.0  | 6.0  | 8.0   | 3.0    |
| Mean depth (ft.)                          | 0.5          | 0.2           | 0.6           | 0.6  | 1.0        | 0.8  | 0.4   | 0.5   | 0.4   | 1.8          | 0.5  | 2.0 | 0.4  | 0.7  | 0.4   | 0.2    |
| Max. Depth (ft.)                          | 2.7          |               | 0.7           |      | 2.6        | 1.3  | 1.5   |       | 1.5   | 3.0          |      | 2.8 | 0.2  | 1.1  | 0.2   | 0.9    |
| Depth Pool Tail Crest (ft.)               | 1.3          |               | 0.4           |      | 0.4        | 0.3  | 0.0   |       |       | 0.4          |      | 0.4 |      | 0.0  |       | 0.2    |
| Pool Tail Embeddedness (%)                | 0.0          |               | 10.0          |      | 0.0        | 10.0 | 0.0   |       |       | 0.0          |      | 0.0 |      | 0.0  |       | 0.0    |
| SHELTER RATING                            |              |               |               |      |            |      |       |       |       |              |      |     |      |      |       |        |
| Shelter Value                             | 3            | 2             | 3             | 3    | 3          | 3    | 3     | 3     | 1     | 3            | 1    | 3   | 1    | 3    | 1     | 3      |
| % Unit Covered                            | 15           | 40            | 40            | 85   | 25         | 65   | 80    | 100   | 30    | 40           | 30   | 30  | 30   | 85   | 30    | 35     |
| % Undercut Banks                          | 5            | 0             | 0             | 10   | 5          | 5    | 5     | 20    | 0     | 20           | 0    | 20  | 0    | 10   | 0     | 5      |
| % swd (d<12")                             | 0            | 5             | 30            | 50   | 5          | 10   | 10    | 20    | 0     | 0            | 0    | 0   | 0    | 0    | 0     | 10     |
| % lwd (d>12")                             | 5            | 0             | 10            | 20   | 10         | 0    | 5     | 10    | 0     | 10           | 0    | 0   | 0    | 0    | 0     | 5      |
| % root mass                               | 0            | 0             | 0             | 0    | 0          | 0    | 0     | 0     | 0     | 0            | 0    | 0   | 0    | 60   | 0     | 0      |
| % terr. veg.                              | 5            | 35            | 0             | 5    | 5          | 40   | 55    | 50    | 0     | 0            | 0    | 0   | 0    | 10   | 0     | 5      |
| % aqua. veg.                              | 0            | 0             | 0             | 0    | 0          | 5    | 5     | 0     | 30    | 10           | 30   | 10  | 30   | 5    | 30    | 0      |
| % white water                             | 0            | 0             | 0             | 0    | 0          | 0    | 0     | 0     | 0     | 0            | 0    | 0   | 0    | 0    | 0     | 10     |
| % boulders (d>10")                        | 0            | 0             | 0             | 0    | 0          | 5    | 0     | 0     | 0     | 0            | 0    | 0   | 0    | 0    | 0     | 0      |
| % bedrock ledges                          | 0            | 0             | 0             | 0    | 0          | 0    | 0     | 0     | 0     | 0            | 0    | 0   | 0    | 0    | 0     | 0      |
| SUBSTRATE COMPOSITION (two most dominant) |              |               |               |      |            |      |       |       |       |              |      |     |      |      |       |        |
| Silt/Clay                                 | x            |               | x             |      | x          |      | x     | x     |       | x            | x    | x   |      |      |       |        |
| Sand (<0.08")                             | x            |               |               |      |            | x    | x     | x     | x     | x            | x    | x   | x    | x    | x     | x      |
| Gravel (0.08-2.5")                        |              | x             |               | x    |            |      |       |       | x     |              |      |     | x    | x    | x     | x      |
| Sm. Cobble (2.5-5")                       |              | x             |               | x    |            | x    |       |       |       |              |      |     | x    | x    | x     | x      |
| Lg. Cobble (5-10")                        |              |               | x             |      | x          |      |       |       |       |              |      |     |      |      |       | x      |
| Boulder (>10")                            |              |               |               |      |            |      |       |       |       |              |      |     |      |      |       |        |
| Bedrock                                   |              |               |               |      |            |      |       |       |       |              |      |     |      |      |       |        |
| % Exposed Substrate                       |              |               |               |      |            |      |       |       |       |              |      |     |      |      |       |        |
| PERCENT TOTAL CANOPY                      | 0            | 50            | 0             | 20   | 5          | 40   | 30    | 100   | 0     | 0            | 0    | 0   | 0    | 40   | 0     | 90     |
| % Deciduous Trees                         | 0            | 50            | 0             | 20   | 5          | 40   | 30    | 100   | 0     | 0            | 0    | 0   | 0    | 40   | 0     | 90     |
| % Coniferous Trees                        | 0            | 0             | 0             | 0    | 0          | 0    | 0     | 0     | 0     | 0            | 0    | 0   | 0    | 0    | 0     | 0      |
| BANK COMPOSITION                          |              |               |               |      |            |      |       |       |       |              |      |     |      |      |       |        |
| Rt Bk Dominant Type                       | 5            | 7             | 5             | 5    | 5          | 5    | 5     | 7     | 5     | 5            | 5    | 5   | 5    | 7    | 5     | 6      |
| % Rt Bk Vegetated                         | 95           | 95            | 80            | 100  | 100        | 85   | 100   | 100   | 100   | 100          | 100  | 100 | 100  | 60   | 100   | 80     |
| Lft Bk Dominant Type                      | 5            | 5             | 5             | 5    | 5          | 5    | 5     | 7     | 5     | 5            | 5    | 5   | 5    | 5    | 5     | 6      |
| % Lft Bk Vegetated                        | 95           | 95            | 90            | 100  | 100        | 70   | 100   | 100   | 100   | 100          | 100  | 100 | 100  | 70   | 100   | 80     |

| Appendix C. Habitat Inventory Form        |              |               |              |            |       |       |        |      |              |
|-------------------------------------------|--------------|---------------|--------------|------------|-------|-------|--------|------|--------------|
| Date                                      | 6/15/94      | Stream Name   | Boundary Ck. | Twsp.      | 4S    | Range | 26E    | Sec. | 10NE1/4NE1/4 |
| Surveyors                                 | Rowan, D. E. |               |              | Flow (cfs) | 2     | Time  | 900    |      |              |
| Water Temp. (F)                           | 50           | Air Temp. (F) | 56           |            |       |       |        |      |              |
| Habitat Unit #                            | 1            | 2             | 3            | 4          | 5     | 6     | 7      |      |              |
| Habitat Unit Type                         | HGR          | STP           | RUN          | PLP        | LGR   | HGR   | CAS    |      |              |
| Channel Type                              | A3           | A3            | A3           | B4         | B4    | A3    | A3     |      |              |
| Reach #                                   | 1            | 1             | 1            | 2          | 2     | 3     | 3      |      |              |
| Mean Length (ft.)                         | 60.0         | 50.0          | 481.0        | 15.0       | 833.0 | 400.0 | 1576.0 |      |              |
| Mean Width (ft.)                          | 5.0          | 6.5           | 4.5          | 30.0       | 4.0   | 7.0   | 3.0    |      |              |
| Mean Depth (ft.)                          | 0.5          | 0.4           | 0.4          | 0.4        | 0.2   | 0.4   |        |      |              |
| Max. Depth (ft.)                          | 0.9          | 0.6           | 0.4          | 0.7        | 0.4   | 0.7   |        |      |              |
| Depth Pool Tail Crest (ft.)               |              | 0.4           |              | 0.1        |       |       |        |      |              |
| Pool Tail Embeddedness (%)                |              | 5.0           |              | 0.0        |       |       |        |      |              |
| SHELTER RATING                            |              |               |              |            |       |       |        |      |              |
| Shelter Value                             | 3            | 3             | 3            | 2          | 3     | 3     |        |      |              |
| % Unit Covered                            | 95           | 50            | 90           | 20         | 85    | 85    |        |      |              |
| % Undercut Banks                          | 5            | 0             | 5            | 0          | 0     | 0     |        |      |              |
| % swd (d<12")                             | 5            | 10            | 20           | 10         | 10    | 25    |        |      |              |
| % lwd (d>12")                             | 10           | 5             | 5            | 10         | 10    | 15    |        |      |              |
| % root mass                               | 5            | 5             | 0            | 0          | 0     | 5     |        |      |              |
| % terr. veg.                              | 60           | 20            | 60           | 0          | 65    | 30    |        |      |              |
| % aqua. veg.                              | 0            | 0             | 0            | 0          | 0     | 0     |        |      |              |
| % white water                             | 0            | 5             | 0            | 0          | 0     | 5     |        |      |              |
| % boulders (d>10")                        | 10           | 5             | 0            | 0          | 0     | 5     |        |      |              |
| % bedrock ledges                          | 0            | 0             | 0            | 0          | 0     | 0     |        |      |              |
| SUBSTRATE COMPOSITION (two most dominant) |              |               |              |            |       |       |        |      |              |
| Silt/Clay                                 |              |               |              | x          |       |       |        |      |              |
| Sand (<0.08")                             |              | x             | x            | x          | x     |       |        |      |              |
| Gravel (0.08-2.5")                        | x            | x             | x            |            | x     |       |        |      |              |
| Sm. Cobble (2.5-5")                       | x            |               |              |            |       | x     | x      |      |              |
| Lg. Cobble (5-10")                        |              |               |              |            |       | x     | x      |      |              |
| Boulder (>10")                            |              |               |              |            |       |       |        |      |              |
| Bedrock                                   |              |               |              |            |       |       |        |      |              |
| % Exposed Substrate                       |              |               |              |            |       |       |        |      |              |
| PERCENT TOTAL CANOPY                      |              |               |              |            |       |       |        |      |              |
| % Deciduous Trees                         | 65           | 15            | 80           | 20         | 35    | 25    | 15     |      |              |
| % Coniferous Trees                        | 0            | 5             | 20           | 0          | 10    | 5     | 10     |      |              |
| BANK COMPOSITION                          |              |               |              |            |       |       |        |      |              |
| Rt Bk Dominant Type                       | 7            | 5             | 7            | 4          | 5     | 6.5   | 6.5    |      |              |
| % Rt Bk Vegetated                         | 90           | 80            | 85           | 30         | 100   | 80    | 80     |      |              |
| Lft Bk Dominant Type                      | 7            | 5             | 7            | 4          | 7     | 6.5   | 6.5    |      |              |
| % Lft Bk Vegetated                        | 65           | 90            | 80           | 0          | 100   | 80    | 80     |      |              |

| Appendix C. Habitat Inventory Form        |              |               |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
|-------------------------------------------|--------------|---------------|-----------|-------|-------|-------|------|--------|-------------|-------|------|-------|------|-------|------|-------|-------|------|
| Date                                      | 6/13/94      | Stream Name   | Creek Ck. | Twsp. | 4S    | Range | 26E  | Sec.   | 3NE1/4SE1/4 |       |      |       |      |       |      |       |       |      |
| Surveyors                                 | Rowan, D. E. | Flow (cfs)    |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| Water Temp. (F)                           | 56           | Air Temp. (F) | 61        |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| Habitat Unit # -                          | 1            | 2             | 3         | 4     | 5     | 6     | 7    | 8      | 9           | 10    | 11   | 12    | 13   | 14    | 15   | 16    | 17    | 18   |
| Habitat Unit Type                         | HGR          | CAS           | RUN       | CAS   | PLP   | RUN   | CRP  | RUN    | CRP         | RUN   | LSL  | RUN   | CRP  | RUN   | LGR  | RUN   | HGR   | CAS  |
| Channel Type                              | A1           | A1            | A1        | A1    | B4    | B4    | B4   | B4     | B4          | C6    | B4   | B4    | B4   | B4    | B4   | B1    | B1    | A2   |
| Reach #                                   | 1            | 1             | 1         | 1     | 2     | 2     | 2    | 2      | 2           | 3     | 4    | 4     | 4    | 4     | 4    | 4     | 5     | 5    |
| Mean Length (ft.)                         | 40.0         | 15.0          | 60.0      | 25.0  | 20.0  | 900.0 | 10.0 | 1000.0 | 15.0        | 840.0 | 12.0 | 190.0 | 12.0 | 668.0 | 20.0 | 100.0 | 800.0 | 40.0 |
| Mean Width (ft.)                          | 20.0         | 10.0          | 8.0       | 25.0  | 8.0   | 10.0  | 6.0  | 10.0   | 10.0        | 5.0   | 8.0  | 6.0   | 5.0  | 6.0   | 3.0  | 4.0   | 5.0   | 3.0  |
| Mean Depth (ft.)                          | 0.6          | 0.1           | 0.7       | 0.2   | 1.0   | 1.0   | 1.4  | 1.0    | 1.9         | 1.0   | 2.0  | 1.0   | 1.8  | 0.5   | 0.3  | 0.4   | 0.4   | 0.4  |
| Max. Depth (ft.)                          | 1.1          | 0.2           | 1.5       | 0.5   | 2.8   | 2.0   | 2.3  | 2.0    | 2.3         | 2.0   | 2.6  | 2.3   | 2.3  | 1.0   |      | 0.8   | 0.8   | 1.0  |
| Depth Pool Tail Crest (ft.)               |              |               |           |       | 0.4   |       | 0.5  |        | 0.6         |       | 0.8  |       | 1.3  |       |      |       |       |      |
| Pool Tail Embeddedness (%)                |              |               |           |       | 100.0 |       | 0.0  |        | 0.0         |       | 0.0  |       | 0.0  |       |      |       |       |      |
| SHELTER RATING                            |              |               |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| Shelter Value                             | 3            | 0             | 3         | 1     | 3     | 3     | 3    | 3      | 3           | 3     | 3    | 3     | 3    | 3     | 1    | 1     | 1     | 1    |
| % Unit Covered                            | 20           | 0             | 95        | 40    | 75    | 95    | 20   | 90     | 60          | 75    | 40   | 75    | 50   | 80    | 10   | 75    | 60    | 20   |
| % Undercut Banks                          | 0            |               | 30        | 0     | 10    | 15    | 5    | 10     | 10          | 15    | 10   | 15    | 15   | 10    | 0    | 5     | 0     | 10   |
| % swd (d<12")                             | 5            |               | 8         | 20    | 10    | 3     | 0    | 15     | 0           | 5     | 0    | 5     | 0    | 5     | 0    | 15    | 5     | 0    |
| % lwd (d>12")                             | 0            |               | 2         | 0     | 0     | 2     | 0    | 5      | 0           | 0     | 5    | 0     | 0    | 0     | 0    | 10    | 5     | 5    |
| % root mass                               | 0            |               | 0         | 0     | 0     | 0     | 5    | 5      | 0           | 10    | 0    | 10    | 5    | 0     | 0    | 0     | 5     | 0    |
| % terr. veg.                              | 0            |               | 50        | 5     | 50    | 70    | 5    | 50     | 10          | 15    | 5    | 15    | 0    | 60    | 10   | 35    | 25    | 0    |
| % aqua. veg.                              | 0            |               | 0         | 5     | 5     | 5     | 5    | 5      | 40          | 30    | 20   | 30    | 30   | 5     | 0    | 10    | 20    | 0    |
| % white water                             | 10           |               | 2         | 10    | 0     | 0     | 0    | 0      | 0           | 0     | 0    | 0     | 0    | 0     | 0    | 0     | 0     | 5    |
| % boulders (d>10")                        | 5            |               | 3         | 0     | 0     | 0     | 0    | 0      | 0           | 0     | 0    | 0     | 0    | 0     | 0    | 0     | 0     | 0    |
| % bedrock ledges                          | 0            |               | 0         | 0     | 0     | 0     | 0    | 0      | 0           | 0     | 0    | 0     | 0    | 0     | 0    | 0     | 0     | 0    |
| SUBSTRATE COMPOSITION (two most dominant) |              |               |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| Silt/Clay                                 |              |               |           |       | x     |       |      |        |             |       | x    |       |      |       |      |       |       |      |
| Sand (<0.08")                             |              |               | x         | x     | x     | x     | x    | x      | x           | x     | x    | x     | x    | x     | x    | x     | x     | x    |
| Gravel (0.08-2.5")                        |              |               |           |       |       | x     | x    | x      | x           | x     |      | x     | x    | x     | x    | x     | x     | x    |
| Sm. Cobble (2.5-5")                       |              |               |           |       |       |       |      |        |             |       |      |       |      | x     | x    | x     | x     | x    |
| Lg. Cobble (5-10")                        | x            |               |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| Boulder (>10")                            | x            |               |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| Bedrock                                   |              | x             | x         | x     |       |       |      |        |             |       |      |       |      |       | 5    | 5     | 5     | 5    |
| % Exposed Substrate                       | 25           | 40            | 5         | 15    | 0     | 5     | 0    | 5      | 0           | 0     | 0    | 0     | 0    | 0     | 5    | 5     | 5     | 35   |
| PERCENT TOTAL CANOPY                      |              |               |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| % Deciduous Trees                         | 5            | 10            | 95        | 20    | 15    | 90    | 15   | 80     | 10          | 10    | 5    | 10    | 10   | 90    | 75   | 20    | 60    | 0    |
| % Coniferous Trees                        | 5            | 10            | 85        | 5     | 5     | 80    | 15   | 60     | 10          | 8     | 2.5  | 8     | 10   | 80    | 75   | 15    | 45    | 0    |
| % Lf Bk Dominant Type                     | 5            | 5             | 7         | 5     | 7     | 7     | 7    | 7      | 5           | 5     | 5    | 5     | 5    | 7     | 5    | 5     | 7     | 5    |
| % Lf Bk Vegetated                         | 100          | 25            | 100       | 90    | 100   | 100   | 100  | 100    | 100         | 100   | 20   | 100   | 100  | 100   | 100  | 100   | 65    | 90   |
| BANK COMPOSITION                          |              |               |           |       |       |       |      |        |             |       |      |       |      |       |      |       |       |      |
| Rt Bk Dominant Type                       | 5            | 7             | 7         | 5     | 7     | 7     | 5    | 7      | 5           | 5     | 5    | 5     | 5    | 7     | 7    | 7     | 7     | 5    |
| % Rt Bk Vegetated                         | 100          | 15            | 100       | 90    | 100   | 100   | 100  | 100    | 100         | 100   | 100  | 100   | 100  | 90    | 100  | 100   | 95    | 90   |
| Lf Bk Dominant Type                       | 5            | 5             | 7         | 5     | 7     | 7     | 7    | 7      | 5           | 5     | 5    | 5     | 5    | 7     | 5    | 5     | 7     | 5    |
| % Lf Bk Vegetated                         | 100          | 25            | 100       | 90    | 100   | 100   | 100  | 100    | 100         | 100   | 20   | 100   | 100  | 100   | 100  | 100   | 65    | 90   |

| Appendix C. Habitat Inventory Form        |              |               |             |       |            |       |       |      |       |              |
|-------------------------------------------|--------------|---------------|-------------|-------|------------|-------|-------|------|-------|--------------|
| Date                                      | 6/17/94      | Stream Name   | Minaret Ck. |       | Twsp.      | 2S    | Range | 26E  | Sec.  | 34NW1/4SE1/4 |
| Surveyors                                 | Rowan, D. E. |               |             |       | Flow (cfs) | 20    | Time  | 1000 |       |              |
| Water Temp. (F)                           | 42           | Air Temp. (F) | 54          |       |            |       |       |      |       |              |
| Habitat Unit #                            | 1            | 2             | 3           | 4     | 5          | 6     | 7     | 8    | 9     | 10           |
| Habitat Unit Type                         | PLP          | CRP           | LGR         | CRP   | GLD        | LGR   | HGR   | CAS  | LGR   | PLP          |
| Channel Type                              | A1           | B4            | B4          | B4    | B3         | B3    | A1    | A1   | B3    | B3           |
| Reach #                                   | 1            | 2             | 2           | 2     | 3          | 3     | 4     | 4    | 5     | 5            |
| Mean Length (ft.)                         | 792.0        | 400.0         | 85.0        | 200.0 | 340.0      | 310.0 | 160.0 | 20.0 | 135.0 | 2000.0       |
| Mean Width (ft.)                          | 15.0         | 25.0          | 40.0        | 40.0  | 40.0       | 35.0  | 25.0  | 25.0 | 40.0  | 30.0         |
| Mean Depth (ft.)                          | 2.5          | 1.5           | 0.7         | 1.5   | 0.9        | 0.6   | 1.1   |      |       | 2.6          |
| Max. Depth (ft.)                          |              | 4.5           |             |       |            |       |       |      |       | 12.0         |
| Depth Pool Tail Crest (ft.)               |              | 0.5           |             | 1.1   |            |       |       |      |       | 1.1          |
| Pool Tail Embeddedness (%)                |              | 20.0          |             | 10.0  |            |       |       |      |       | 25.0         |
| SHELTER RATING                            |              |               |             |       |            |       |       |      |       |              |
| Shelter Value                             | 3            | 3             | 1,2         | 3     | 3          | 1,2   | 3     | 0    | 1,2   | 3            |
| % Unit Covered                            | 80           | 25            | 15          | 50    | 40         | 20    | 85    |      | 20    | 60           |
| % Undercut Banks                          | 0            | 0             | 0           | 0     | 0          | 3     | 0     |      | 3     | 5            |
| % swd (d<12")                             | 5            | 5             | 0           | 15    | 5          | 2     | 0     |      | 2     | 25           |
| % lwd (d>12")                             | 5            | 5             | 0           | 20    | 5          | 0     | 5     |      | 0     | 30           |
| % root mass                               | 0            | 0             | 0           | 5     | 0          | 0     | 0     |      | 0     | 0            |
| % terr. veg.                              | 0            | 10            | 0           | 5     | 10         | 5     | 0     |      | 5     | 5            |
| % aqua. veg.                              | 0            | 0             | 0           | 0     | 0          | 0     | 0     |      | 0     | 0            |
| % white water                             | 15           | 0             | 10          | 0     | 0          | 0     | 35    |      | 0     | 0            |
| % boulders (d>10")                        | 40           | 5             | 5           | 0     | 20         | 10    | 40    |      | 10    | 0            |
| % bedrock ledges                          | 15           | 0             | 0           | 0     | 0          | 0     | 10    |      | 0     | 0            |
| SUBSTRATE COMPOSITION (two most dominant) |              |               |             |       |            |       |       |      |       |              |
| Silt/Clay                                 |              |               |             |       |            |       |       |      |       |              |
| Sand (<0.08")                             |              | x             |             | x     | x          |       |       |      |       | x            |
| Gravel (0.08-2.5")                        |              | x             | x           | x     |            |       |       |      |       | x            |
| Sm. Cobble (2.5-5")                       |              |               | x           |       | x          | x     |       |      | x     |              |
| Lg. Cobble (5-10")                        |              |               |             |       | x          |       |       |      | x     |              |
| Boulder (>10")                            | x            |               |             |       |            | x     | x     | x    |       |              |
| Bedrock                                   | x            |               |             |       |            |       | x     | x    |       |              |
| % Exposed Substrate                       |              |               |             |       |            |       |       |      |       |              |
| PERCENT TOTAL CANOPY                      | 5            | 25            | 10          | 35    | 35         | 15    | 40    | 5    | 40    | 15           |
| % Deciduous Trees                         | 0            | 15            | 0           | 5     | 5          | 5     | 0     | 5    | 5     | 0            |
| % Coniferous Trees                        | 5            | 10            | 10          | 30    | 30         | 10    | 40    | 0    | 35    | 15           |
| BANK COMPOSITION                          |              |               |             |       |            |       |       |      |       |              |
| Rt Bk Dominant Type                       | 1            | 7             | 8           | 7     | 7          | 7     | 8     | 1    | 7     | 7            |
| % Rt Bk Vegetated                         | 100          | 90            | 80          | 90    | 100        | 100   | 100   | 5    | 100   | 100          |
| Lft Bk Dominant Type                      | 1            | 7             | 7           | 5     | 5          | 7     | 8     | 1    | 7     | 7            |
| % Lft Bk Vegetated                        | 100          | 85            | 80          | 85    | 100        | 100   | 50    | 15   | 100   | 100          |

| Appendix C. Habitat Inventory Form        |              |               |                 |            |       |       |       |       |             |
|-------------------------------------------|--------------|---------------|-----------------|------------|-------|-------|-------|-------|-------------|
| Date                                      | 6/13/94      | Stream Name   | Reds Meadow Ck. | Twsp.      | 4S    | Range | 26E   | Sec.  | 2NE1/4SW1/4 |
| Surveyors                                 | Rowan, D. E. |               |                 | Flow (cfs) | 5     | Time  | 1300  |       |             |
| Water Temp. (F)                           | 66           | Air Temp. (F) | 67              |            |       |       |       |       |             |
| Habitat Unit #                            | 1            | 2             | 3               | 4          | 5     | 6     | 7     | 8     | 9           |
| Habitat Unit Type                         | RUN          | LSL           | LGR             | PLP        | HGR   | PLP   | RUN   | RUM   | DAM         |
| Channel Type                              | B4           | B4            | B4              | B4         | B4    | B1    | B1    | C6    | C6          |
| Reach #                                   | 1            | 1             | 1               | 1          | 1     | 2     | 2     | 3     | 3           |
| Mean Length (ft.)                         | 300.0        | 18.0          | 273.0           | 6.0        | 794.0 | 25.0  | 100.0 | 221.0 | 375.0       |
| Mean Width (ft.)                          | 5.0          | 5.0           | 7.0             | 15.0       | 6.0   | 15.0  | 6.0   | 4.5   | 80.0        |
| Mean Depth (ft.)                          | 0.7          | 1.1           | 0.4             | 0.6        | 0.6   | 1.0   | 0.6   | 0.9   | 1.3         |
| Max. Depth (ft.)                          | 1.2          | 1.5           | 0.7             | 1.7        | 1.0   | 2.5   | 1.0   | 1.7   | 3.0         |
| Depth Pool Tail Crest (ft.)               |              | 0.8           |                 | 0.4        |       | 0.5   |       |       |             |
| Pool Tail Embeddedness (%)                |              | 10.0          |                 | 20.0       |       | 0.0   |       |       |             |
| SHELTER RATING                            |              |               |                 |            |       |       |       |       |             |
| Shelter Value                             | 3            | 3             | 3               | 0          | 1     | 1     | 1     | 3     | 3           |
| % Unit Covered                            | 70           | 60            | 75              | 45         | 75    | 45    | 80    | 75    | 90          |
| % Undercut Banks                          | 10           | 5             | 10              | 5          | 10    | 5     | 10    | 15    | 10          |
| % swd (d<12")                             | 0            | 0             | 5               | 0          | 5     | 0     | 5     | 5     | 20          |
| % lwd (d>12")                             | 1            | 0             | 5               | 0          | 5     | 0     | 0     | 5     | 10          |
| % root mass                               | 0            | 0             | 15              | 0          | 15    | 0     | 5     | 5     | 15          |
| % terr. veg.                              | 50           | 40            | 45              | 0          | 45    | 0     | 50    | 15    | 5           |
| % aqua. veg.                              | 10           | 15            | 5               | 30         | 5     | 25    | 5     | 30    | 40          |
| % white water                             | 0            | 0             | 0               | 10         | 0     | 15    | 5     | 0     | 0           |
| % boulders (d>10")                        | 0            | 0             | 0               | 0          | 0     | 0     | 0     | 0     | 0           |
| % bedrock ledges                          | 0            | 0             | 0               | 0          | 0     | 0     | 0     | 0     | 0           |
| SUBSTRATE COMPOSITION (two most dominant) |              |               |                 |            |       |       |       |       |             |
| Silt/Clay                                 |              |               |                 |            |       |       |       |       |             |
| Sand (<0.08")                             |              | x             |                 | x          | x     |       |       | x     | x           |
| Gravel (0.08-2.5")                        | x            | x             | x               | x          | x     | x     |       | x     | x           |
| Sm. Cobble (2.5-5")                       | x            |               | x               |            |       |       |       |       |             |
| Lg. Cobble (5-10")                        |              |               |                 |            |       |       |       |       |             |
| Boulder (>10")                            |              |               |                 |            |       |       | x     |       |             |
| Bedrock                                   |              |               |                 |            |       | x     | x     |       |             |
| % Exposed Substrate                       | 0            |               | 5               | 0          |       |       |       |       |             |
| PERCENT TOTAL CANOPY                      |              |               |                 |            |       |       |       |       |             |
| % Deciduous Trees                         | 40           | 80            | 60              | 0          | 60    | 0     | 15    | 20    | 15          |
| % Coniferous Trees                        | 30           | 70            | 40              | 0          | 40    | 0     | 10    | 15    | 10          |
|                                           | 10           | 10            | 20              | 0          | 20    | 0     | 5     | 5     | 5           |
| BANK COMPOSITION                          |              |               |                 |            |       |       |       |       |             |
| Rt Bk Dominant Type                       | 5            | 5             | 7               | 4          | 7     | 5     | 5     | 5     | 5           |
| % Rt Bk Vegetated                         | 100          | 100           | 90              | 5          | 90    | 50    | 90    | 95    | 100         |
| Lft Bk Dominant Type                      | 7            | 7             | 7               | 4          | 7     | 1     | 7     | 5     | 5           |
| % Lft Bk Vegetated                        | 100          | 100           | 95              | 20         | 90    | 0     | 100   | 90    | 100         |

| Appendix C. Habitat Inventory Form        |                          |               |          |      |            |       |       |      |      |              |
|-------------------------------------------|--------------------------|---------------|----------|------|------------|-------|-------|------|------|--------------|
| Date                                      | 6/9/94                   | Stream Name   | Reds Ck. |      | Twsp.      | 3S    | Range | 26E  | Sec. | 35SW1/4NW1/4 |
| Surveyors                                 | Rowan, D. E., Godwin, T. |               |          |      | Flow (cfs) | 0.3   | Time  | 1315 |      |              |
| Water Temp. (F)                           | 65                       | Air Temp. (F) | 72       |      |            |       |       |      |      |              |
| Habitat Unit #                            | 1                        | 2             | 3        | 4    | 5          | 6     | 7     | 8    | 9    | 10           |
| Habitat Unit Type                         | LGR                      | PLP           | MDW      | STP  | CRP        | GLD   | LSL   | STP  | CAS  | STP          |
| Channel Type                              | A4                       | A4            | A4       | A4   | A4         | A4    | A4    | A4   | A4   | A3           |
| Reach #                                   | 1                        | 1             | 1        | 1    | 1          | 1     | 1     | 1    | 2    | 2            |
| Mean Length (ft.)                         | 82.0                     | 34.0          | 200.0    | 38.0 | 200.0      | 430.0 | 78.0  | 90.0 | 2.0  | 250.0        |
| Mean Width (ft.)                          | 1.5                      | 2.2           | 200      | 0.7  | 1          | 2.5   | 2.5   | 1.5  | 1    | 1.5          |
| Mean Depth (ft.)                          | 0.1                      | 0.3           | 0.3      | 0.25 | 0.4        | 0.3   | 0.25  | 0.25 | 0.3  | 0.3          |
| Max. Depth (ft.)                          | 0.2                      | 0.5           | 0.5      | 0.4  | 0.8        | 0.5   | 0.5   | 1.15 | 0.4  | 1            |
| Depth Pool Tail Crest (ft.)               |                          |               |          |      |            |       |       |      |      |              |
| Pool Tail Embeddedness (%)                | 30.0                     | 0.0           | 0.0      | 20.0 | 0.0        | 0.0   | 0.0   | 0.0  | 40.0 | 50.0         |
| SHELTER RATING                            |                          |               |          |      |            |       |       |      |      |              |
| Shelter Value                             |                          |               |          |      |            |       |       |      |      |              |
| % Unit Covered                            |                          |               |          |      |            |       |       |      |      |              |
| % Undercut Banks                          |                          |               |          |      |            |       |       |      |      |              |
| % swd (d<12")                             |                          |               |          |      |            |       |       |      |      |              |
| % lwd (d>12")                             |                          |               |          |      |            |       |       |      |      |              |
| % root mass                               |                          |               |          |      |            |       |       |      |      |              |
| % terr. veg.                              |                          |               |          |      |            |       |       |      |      |              |
| % aqua. veg.                              |                          |               |          |      |            |       |       |      |      |              |
| % white water                             |                          |               |          |      |            |       |       |      |      |              |
| % boulders (d>10")                        |                          |               |          |      |            |       |       |      |      |              |
| % bedrock ledges                          |                          |               |          |      |            |       |       |      |      |              |
| SUBSTRATE COMPOSITION (two most dominant) |                          |               |          |      |            |       |       |      |      |              |
| Silt/Clay                                 |                          |               |          |      |            |       |       |      |      |              |
| Sand (<0.08")                             |                          | x             | x        |      | x          | x     | x     | x    |      |              |
| Gravel (0.08-2.5")                        | x                        | x             | x        | x    | x          | x     | x     | x    |      | x            |
| Sm. Cobble (2.5-5")                       | x                        |               |          | x    |            |       |       |      | x    |              |
| Lg. Cobble (5-10")                        |                          |               |          |      |            |       |       |      | x    | x            |
| Boulder (>10")                            |                          |               |          |      |            |       |       |      |      |              |
| Bedrock                                   |                          |               |          |      |            |       |       |      |      |              |
| % Exposed Substrate                       | 35                       | 0             | 0        | 40   | 0          | 0     | 0     | 0    |      |              |
| PERCENT TOTAL CANOPY                      | 10                       | 0             | 0        | 70   | 40         | 100   | 25    | 85   | 100  | 90           |
| % Deciduous Trees                         | 10                       | 0             | 0        | 40   | 0          | 80    | 0     | 10   | 0    | 0            |
| % Coniferous Trees                        | 0                        | 0             | 0        | 30   | 40         | 20    | 25    | 75   | 100  | 90           |
| BANK COMPOSITION                          |                          |               |          |      |            |       |       |      |      |              |
| Rt Bk Dominant Type                       | 5                        | 5             | 5        | 5,7  | 5          | 5     | 5     | 5,7  | 5    | 5            |
| % Rt Bk Vegetated                         | 100                      | 100           | 100      | 100  | 100        | 100   | 100   | 95   | 5    | 80           |
| Lft Bk Dominant Type                      | 5                        | 5             | 5        | 5,7  | 5          | 5     | 5     | 5,7  | 5    | 5            |
| % Lft Bk Vegetated                        | 100                      | 100           | 100      | 100  | 100        | 100   | 100   | 95   | 75   | 80           |