STREAM INVENTORY REPORT

Coon Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Coon Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Coon Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Coon Creek is tributary to the North Fork Navarro River, tributary to the Navarro River, located in Mendocino County, California (Map 1). Coon Creek's legal description at the confluence with the North Fork Navarro River is T15N R16W S14. Its location is 39°09′39″ north latitude and 123°36′03″ west longitude. Coon Creek is a first order stream and has approximately 2.0 miles of blue line stream according to the USGS Navarro 7.5 minute quadrangle. Coon Creek drains a watershed of approximately 0.85 square miles. Elevations range from about 60 feet at the mouth of the creek to 800 feet in the headwater areas. Redwood/Douglas fir mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via State Route 128 near Boonville.

METHODS

The habitat inventory conducted in Coon Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors and the AmeriCorps Watershed Stewards Project (WSP/AmeriCorps) Members who conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Coon Creek personnel were trained in May, 1996, by Gary Flosi. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth.

Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Coon Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the end of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Coon Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form (Hopelain, 1995). Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Coon Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Coon Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Coon Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Coon Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Coon Creek fish presence was observed from the stream banks and three sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Coon Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of June 11 and 12, 1996, was conducted by Chris Coyle (CCC) and Amber Siglar (WSP/AmeriCorps). The total length of the stream surveyed was 2,249 feet with no side channels.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.03 cfs on June 11, 1996.

Coon Creek

Coon Creek is a B4 channel type for the entire 2,249 feet of stream reach surveyed. B4 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable stream banks, with a gravel dominant substrate.

Water temperatures taken during the survey period ranged from 51 to 58 degrees Fahrenheit. Air temperatures ranged from 58 to 76 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 37% riffle units, 31% pool units, 30% flatwater units, and 2% was a culvert (Graph 1). Based on total **length** of Level II habitat types there were 41% riffle units, 27% pool units, 24% flatwater units, and 7% was a culvert (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 35%; mid-channel pools, 18%; and runs, 16% (Graph 3). Based on percent total **length**, low gradient riffles made up 40%, mid-channel pools, 14%, and step runs, 12%.

A total of 33 pools were identified (Table 3). Main channel pools were most frequently encountered at 82% (Graph 4), and comprised 86% of the total length of all pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Four of the 33 pools (12%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 33 pool tail-outs measured, none had a value of 1; five had a value of 2 (15%); nineteen had a value of 3 (58%); nine had a value of 4 (27%); and none had a value of 5 (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool habitat types had a mean shelter rating of 23, riffle units had a mean shelter rating of 14, and flatwater habitats had a mean shelter rating of 6 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 24, while main channel pools had a mean shelter rating of 23 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris and is the dominant cover type in Coon Creek. Large woody debris is lacking in nearly all habitat types. Graph 7 describes the pool cover in Coon Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in the three the low gradient riffles measured (Graph 8).

The mean percent canopy density for the stream reach surveyed was 90%. The mean percentages of deciduous and coniferous trees were 8% and 92%, respectively (Table 8). Graph 9 describes the canopy in Coon Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 86.8%. The mean percent left bank vegetated was 83.3%. The dominant elements composing the structure of the stream banks consisted of 7.5% boulder, 30% cobble/gravel, and 62.5% sand/silt/clay (Graph 10). Grass was the dominant vegetation type observed in 52.5% of the units surveyed. Additionally, 5% of the units surveyed had deciduous trees as the dominant vegetation type, and 37.5% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on July 10, 1996. The sites were sampled by Andrew MacMillan (WSP/AmeriCorps) and David Jones (CCC).

The first site sampled was habitat units 11 through 27. It included riffles, runs, and pools starting approximately 310 feet from the confluence with the North Fork Navarro River. The site yielded five steelhead and two Pacific giant salamanders.

The second site included habitat units 70 through 90, consisting of riffles, runs, lateral scour pools and plunge pools. It is located approximately 1462 feet above the creek mouth. The site yielded thirteen steelhead and 20 Pacific giant salamanders. More steelhead were seen but not caught.

The third site sampled was habitat units 93 through 101, including riffles, runs, plunge pools and corner pools located approximately 2040 feet above the creek mouth. The site yielded only Pacific giant salamanders.

DISCUSSION

Coon Creek is a B4 channel type for the entire 2,249 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as follows: excellent for low staged weirs, boulder clusters, banks placed boulders, single and opposing wing deflectors and log cover, and good for medium staged weirs.

The water temperatures recorded on the survey days June 11 and 12, 1996, ranged from 51 to 58 degrees Fahrenheit. Air temperatures ranged from 58 to 76 degrees Fahrenheit. This is a good temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 24% of the total **length** of this survey, riffles 41%, and pools 27%. The pools are relatively shallow, with only 4 of the 33 pools (12%) having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least

half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Eighty-five percent of the 33 pool tail-outs measured had embeddedness ratings of 3 or 4. None had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Coon Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 23. The shelter rating in the flatwater habitats was 6. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, large woody debris contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and divides territorial units to reduce density related competition.

All of the low gradient riffles measured had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 90%. This is a relatively high percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

RECOMMENDATIONS

1) Coon Creek should be managed as an anadromous, natural production stream.

2) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from small woody debris. Adding high quality complexity with large woody cover is desirable and in some areas the material is locally available.

4) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

6) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and

meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Comments:
0'	Begin survey at the confluence with the North Fork Navarro River. Channel type is B4.
264'	State Route 128 crossing; concrete box culvert, 3'W x 46'L x 3'H at grade with no baffles. Upstream end is impacted with fines and debris.
732'	End of the North Fork Navarro River flood plain.
780'	Corrugated metal pipe (CMP) culvert, 1.5' diameter, on the left bank. No outfall.
880'	Constriction made up of loose debris and boulders with a 4' jump.
963'	Log debris accumulation (LDA) 5'H x 10'W x 6'L. Retaining 5' of sediment for 140' upstream.
1,043'	Right bank erosion, 10'H X 20'L contributing fines.
1,273'	Channel type taken, B4.
1,347'	Small woody debris jam, 3'L X 7'W X 4'H. Retaining 4' of sediment for 100' upstream.
1,356'	Left bank tributary. Accessible to fish, but the flow is only 1 to 2 gallons per minute.
1,516'	LDA, 4'H x 15'W x 3'L. Retaining 3' of sediment 75' upstream.
1,738'	Downed logs lying parallel in steep channel section. Possible barrier.
1,829'	LDA, 7'H x 30'W x 15'L; retaining sediment 7' deep and 50' upstream.
1,899'	CMP culvert with a 1.5' plunge, no baffles and the bottom is rusted through. Possible velocity barrier.
2,115'	LDA, 5'H x 20'W x 10'L, retaining 5' of sediment at base.

2,249' End of survey at an LDA that is 7' high. Above this debris causes a series of step pools approximately 70 feet long leading to a bedrock cascade. The gradient through this section is approximately 20%. No fish observed since the log accumulation at 1738'.

REFERENCES

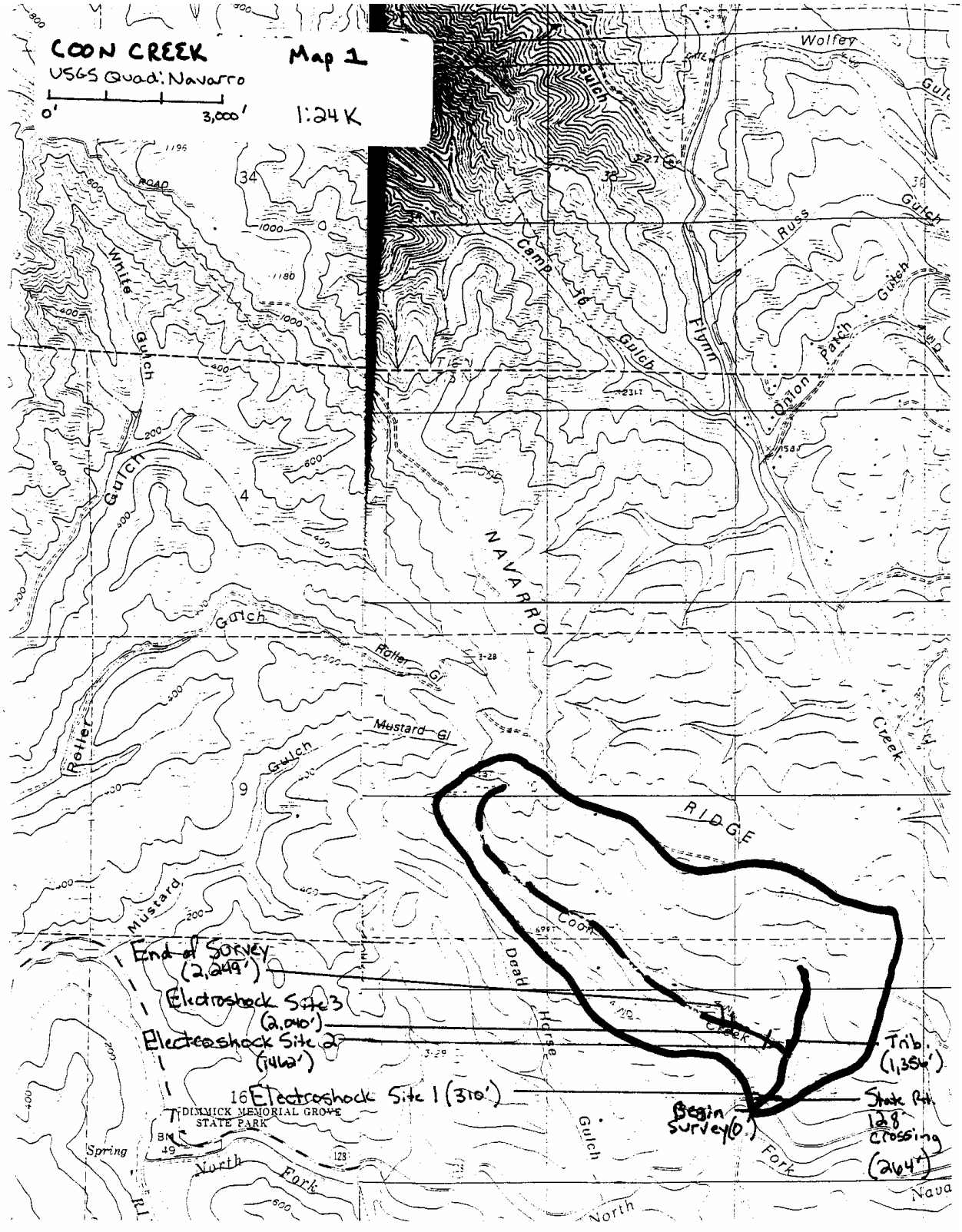
Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPE KEY

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5

Coon Creek


COON CREEK
Map 1
USGS Quad: Navarro
0'
3,000'
1:24K
Wolfey
Gulch
Russ
Gulch
Camp
16
Gulch
Flynn
Onion Patch
Gulch
White
Gulch
Gulch
NAVARRO
Gulch
Rotter Gl
Mustard Gl
Rotter
Gulch
Creek
RIDGE
Mustard
Gulch
End of Survey
(2,249')
Electroshock Site 3
(2,040')
Electroshock Site 2
(1462')
16 Electroshock Site 1 (310')
DIMMICK MEMORIAL GROVE
STATE PARK
Spring
North
Fork
Dead
Horse
Gulch
Trib.
(1,354')
Begin
Survey (0')
State Rt.
128
Crossing
(264')
Fork
North
Nava