

**CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT**

Salt Hollow

Report Revised April 14, 2006

Report Completed 2005

Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Salt Hollow. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish and other aquatic species with an emphasis on anadromous salmonids in Salt Hollow. The objective of the biological inventory was to document the presence and distribution of salmonids and other aquatic species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, 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

Salt Hollow Creek, located in Mendocino County, California, is a tributary to the west branch of the Russian River (see Salt Hollow Creek map, page 2). The legal description at the confluence with the Russian River is T16N, R12W, Yokaya Rancho. Its location is 39.253244630935 N. latitude and 123.203169823674 W. longitude, LLID: 1232031392532. Year round vehicle access exists from Salt Hollow Road, via East Road, via highway 20 via Highway 101 near Calpella.

Salt Hollow Creek and its tributaries drain a basin of approximately 3.89 square miles. Salt Hollow Creek is a second order stream and has approximately 3.54 miles of intermittent stream, according to the USGS Redwood Valley 7.5 minute quadrangles. Major tributaries include the "north fork" Salt Hollow Creek (un-named on the topographic map) which is included in this report. There are eight ponds in the watershed which have a total surface area of 8.4 acres, including four on-stream reservoirs with a total area of 5.6 acres. Summer flow was not measured due to low-flow conditions. Elevations range from about 679 feet at the mouth of the creek to 2254 feet in the headwaters. The majority of the watershed is oak woodland and oak grassland, although there are significant patches of vineyards and grasslands. Common species in the riparian zone include willow, blackberry, and some cottonwood. The watershed is entirely privately owned, mostly in small parcels, and is managed for rural/residential development and vineyard development. The California Natural Diversity Data Database lists no occurrences of sensitive plants or animals in the Salt Hollow watershed.

METHODS

The habitat inventory conducted in Sample Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers that conducted the inventory were trained in standardized habitat inventory methods by

the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team and was supervised by Bob Coey, Russian River Basin Planner (DFG).

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 (1998). This form was used in Salt Hollow to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

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. Flows are also measured or estimated at major tributary confluences.

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 (1998). 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:

Water and air temperatures, and time, are measured by crew members with hand-held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

Temperatures are also recorded using remote temperature recorders which log temperature at set intervals, 24 hours/day.

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". Salt Hollow 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. All unit lengths were measured. The first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (Length, Mean Width, Mean Depth, Maximum Depth and pool Tail Crest Depth). All measurements are 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 Salt Hollow, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). "Not suitable" (value 5) is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, absence of particulate substrate (e.g. bedrock), 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Salt Hollow, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

In all fully measured habitat units, dominant and sub-dominant substrate elements are visually estimated using a list of seven size classes: Silt/Clay, Sand, Gravel, Small Cobble, Large Cobble, Boulder, and Bedrock. Mechanical substrate sampling is also conducted to quantify the percentage of fine sediment within spawning gravels.

8. Canopy:

Stream canopy density is estimated using modified handheld spherical densimeters as described in the California Salmonid Stream Habitat Restoration Manual (1998). Canopy density relates to the amount of stream shaded from the sun. In Salt Hollow, 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. Finally, the total canopy over each habitat unit is visually divided into evergreen and deciduous, and the estimated percentages are recorded.

9. Bank Composition and Vegetation:

Banks may be composed primarily of (1) Bedrock, (2) Boulders, (3) Cobble/Gravel, or (4) Silt/Clay/Sand, and may be covered predominantly with (5) Grass, (6) Brush, (7) Deciduous Trees, (8) Coniferous Trees, or (9) No Vegetation at all. These factors influence the ability of stream banks to withstand winter flows. For each fully measured habitat unit in Salt Hollow, the dominant Bank Composition Type and Vegetation Type of both the right and left banks were chosen from the options above. Additionally, the percentage of vegetal coverage was estimated and recorded for each bank.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species present and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, and 3) electro-fishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual (1998).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed by CDFG. This program processes and summarizes the data, and produces the following tables and appendices:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Salt Hollow Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HISTORICAL STREAM SURVEYS:

There is no record of stream surveys conducted by the Department of Fish and Game on Salt Hollow

Creek prior to this year.

HABITAT INVENTORY RESULTS FOR SALT HOLLOW CREEK

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of Salt Hollow Creek, 7/18/2001 - 7/24/2001, was conducted by Mike Shugars and Jake Newell with supervision and analysis by California Department of Fish and Game (CDFG). The survey began at the confluence with the Russian River and extended up Salt Hollow Creek to the end of survey a 20 foot high dam. The total length of stream surveyed was 12,509 feet, with an additional 21 feet of side channel.

A flow of .075 cfs was measured on August 9, 2001 approximately one mile above the survey start with a Marsh-McBirney Model 2000 flow meter.

This section of Salt Hollow Creek has two reaches with one distinct channel type: from the mouth to 12,341 feet an F4 and 168 feet an F4.

F4 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly gravel substrate.

Water temperatures ranged from 58°F to 70°F. Air temperatures ranged from 60°F to 80°F.

Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs at end of report). A recorder in Reach 1, in a scour pool approximately 60 feet upstream of East Road Bridge, logged temperatures every two hours from July 18 through September 25, 2001. The highest temperature recorded was 68.4°F in August and the lowest was 46.8°F in October. The mean of the daily highs was 65.3°F for the month of July, 64.5°F for August, 60.6°F for September and 56.0°F for October.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of *occurrence* there were 58% Flatwater units, 31% Pool units and 11% Dry units (Graph 1). Based on total *length* there were 52.4% Dry units, 37.9% Flatwater units and 9.7% Pool units (Graph 2).

There were 101 habitat units measured and 22% were completely sampled. There were ten Level IV habitat types identified. The data is summarized in Table 2. The most frequent habitat types by percent *occurrence* were Glides at 33%, Runs at 25%, Dry units at 11% and Lateral Scour Pools - Bedrock Formed at 10% (Graph 3). By percent total *length*, Dry units at 52%, Glides at 27%, Runs at 11% and Lateral Scour Pools - Bedrock Formed at 4%.

There were 31 pools identified (Table 3). Lateral Scour - Bedrock Formed pools were the pool type most often encountered at 32% (Table 4), and comprised 37% of the total length of pools (Table 2).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Of the 31 pools sampled, 27 (87%) had a depth of two feet or greater (Graph 5). These deeper pools comprised 90% of the total length of stream habitat.

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. Pools rated 23 and Flatwater units rated 12 (Table 1). Of the pool types, Lateral Scour Pools - Root Wad Enhanced rated 40, Corner Pools rated 33 and Mid-Channel Pools rated 23 (Table 2).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were Small Wood at 27%, Root Mass at 19%, Terrestrial Vegetation at 12%, and Aquatic Vegetation at 9%. Graph 7 describes the pool shelter in Salt Hollow Creek.

Table 6 summarizes the dominant substrate by habitat type.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 31 pool tail-outs measured, ten had a value of 2 (32%), 14 had a value of 3 (45%) and one had a value of 4 (3%). There were six (19%) riffles with a rating of 5 (unsuitable substrate type for spawning). On this scale, a value of 1 is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs. Graph 6 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 73%. The mean percentages of deciduous and evergreen trees were 34% and 66%, respectively. Graph 9 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 68% and the mean percent left bank vegetated was 42%. For the habitat units measured, the dominant vegetation types for the stream banks were: 36% Deciduous Trees, 34% Brush and 23% Evergreen Trees (Graph 11). The dominant substrate for the stream banks were: 52% Silt, Clay & Sand, 25% Bedrock and 23% Cobble & Gravel (Graph 10).

HABITAT INVENTORY RESULTS FOR NORTH FORK SALT HOLLOW CREEK

The habitat inventory of the North Fork Salt Hollow Creek was conducted August 9, 2001 by M. Terry (DFG) and J. Newell (DFG) with supervision and analysis by California Department of Fish and Game (CDFG). The survey began at the confluence with Salt Hollow Creek and extended up North Fork Salt Hollow Creek to the end of survey at a dam. The total length of stream surveyed was 4294 feet.

On August 9, 2001, a flow of 0.11 cfs was measured at habitat unit 8, approximately 330' above survey start with a Marsh-McBirney Model 2000 flow meter.

This section of North Fork Salt Hollow Creek has one reach with one distinct channel type: from the mouth to 4294 feet upstream is a B6 channel type.

B6 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly silt/clay substrate.

Water temperatures ranged from 63°F to 67°F. Air temperatures ranged from 73°F to 83°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 76.0% Flatwater units, 20.0% Pool units and 4.0% Dry units. Based on total length there were 94.7% Flatwater units, 3.3% Pool units and 1.9% Dry units (Graph 1).

Twenty-nine habitat units were measured and 28% were completely sampled. Eight Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent occurrence were Run at 41%, Glide at 24%, Mid-Channel Pool at 10%, and Culvert at 10% (Graph 2). By percent total length, Not Surveyed at 37%, Run at 32%, Glide at 26%, and Culvert at 2%.

Five pools were identified (Table 3). Mid-Channel Pool pools were most often encountered at 10%, and comprised 68% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth.

Three of the five pools (60%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 68% of the total length of stream habitat.

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. Flatwater units rated 23 and Pools rated 16 (Table 1). Of the pool types, Lateral Scour Pool - Root Wad Enhanced rated 30, Plunge Pool rated 15 and Mid-Channel Pool rated 12 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were Aquatic Vegetation at 30%, Small Wood at 25%, Boulders at 21%, Root Mass at 13%, Terrestrial Vegetation at 7%, and White Water at 4%. Graph 5 describes the pool shelter in North Fork Salt Hollow Creek.

Table 6 summarizes the dominant substrate by habitat type. No low-gradient riffles were surveyed (Graph 6).

No mechanical gravel sampling was conducted in 2001 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the five pool tail-outs measured, three had a value of 3 (60%) and two had a value of 4 (40%). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs. Graph 7 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 77%. The mean percentages of deciduous and evergreen trees were 45% and 55%, respectively. Graph 8 describes the canopy for

the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 50% and the mean percent left bank vegetated was 42%. For the habitat units measured, the dominant vegetation types for the stream banks were: 44% Brush, 25% Evergreen Trees, 25% Deciduous Trees and 6% Grass (Graph 11). The dominant substrate for the stream banks was: 75% Silt, Clay & Sand (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS FOR SALT HOLLOW CREEK:

According to *Status of Coho Salmon in California* (L.R. Brown and P.B. Moyle, 1991), coho salmon existed in Salt Hollow Creek at an unspecified point in time. However, they have not been found in recent surveys and it is likely they no longer inhabit Salt Hollow Creek.

In September, 26, 2001, a biological inventory was conducted in Salt Hollow Creek to document the fish species composition and distribution at several locations. Each site was single-pass electro-fished using one Smith Root Model 12 electro-fisher. Fish from each site were counted by species and returned to the stream. A random sample of fish was selected from each reach and tissues were taken for genetic analysis. Air temperatures ranged from to 59° to 77°F and water temperatures ranged from 56° to 60°F.

The inventory of Site 1 started at habitat unit #21. In pool, riffle and run habitats, ten steelhead (ranging from 76-115 mm) were observed along with 26 stickleback, 24 roach, 19 sculpin and one crayfish. Amphibians observed included two bull frog larvae and one small toad.

The inventory of Site 2 started at habitat unit #60. In pool, riffle and run habitats, there were no steelhead observed. However there were 71 roach, 55 stickle back, 31 sculpins, six lamprey and two suckers observed. Amphibians observed included two bull frog larvae.

JUVENILE SURVEYS FOR NORTH FORK SALT HOLLOW CREEK:

In September, 26, 2001, a biological inventory was conducted in North Fork Salt Hollow Creek to document the fish species composition and distribution at one location. The site was single-pass electro-fished using one Smith Root Model 12 electro-fisher. Fish were counted by species and returned to the stream. A random sample of salmonids was selected and tissues were taken for genetic analysis. Air temperatures ranged from to 77° to 78°F and water temperatures ranged from 60° to 61 °F.

The inventory started at near the confluence of Salt Hollow Creek and North Fork Salt Hollow (180 feet downstream of the Road B bridge) and extended upstream for approximately 1200 feet. In pool, riffle and run habitats, one steelhead (230 mm) was observed. Amphibians observed included four bullfrog larvae and 12 bullfrog adults. An additional ten adult frogs were seen, but due to thick aquatic vegetation they escaped before they could be identified. Given that bullfrogs were the only

frog species identified in North Fork Salt Hollow, it is likely that these ten unknown frogs were bullfrogs.

A summary of historical and recent data collected appears in the table below.

Table 1. Species Observed in Historical and Recent Surveys			
YEARS	SPECIES	SOURCE	Native/Introduced
2001	Steelhead	DFG	N
?	Coho	Brown & Moyle	N
2001	Sculpin	DFG	N
2001	Roach	DFG	N
2001	Three-spine Stickleback	DFG	N
2001	Crayfish	DFG	N
2001	Bull frog	DFG	I
2001	Lamprey	DFG	N

Historical records reflect that steelhead fingerlings were rescued/transferred from Salt Hollow Creek in 1958, 1959 and 1964.

Table 2. Summary of fish rescues/transfers from Salt Hollow Creek				
YEAR	RELEASE LOCATION	SPECIES	#	SIZE
1958	Reeves Canyon Creek	SH	8,360	FING
1958	Russian River	SH	708	FING
1959	Russian River	SH	2,150	FING
1964	Russian River	SH	720	FING

SH = Steelhead
 FING = fingerling

ADULT SURVEYS:

There is no record of carcass surveys conducted on this creek.

DISCUSSION

Salt Hollow Creek has two reaches: 12341 feet a F4 and 168 feet a F4. According to the DFG Salmonid Stream Habitat Restoration Manual, F4 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days 7/18/2001 - 7/24/2001 ranged from 58°F to 70°F. Air temperatures ranged from 60°F to 80°F. The warmest water temperatures were recorded in Reach 1.

These temperatures, if sustained, are above the threshold stress level (65°F) for salmonids.

Summer temperatures measured using remote temperature recorders placed in pools ranged from 46.8°F to 68.4°F for Reach 1.

The Temperature Summary graph shows that for much of the summer (July through most of August) the lower watershed exhibited temperatures above the optimal for salmonids.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the lower, cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and/or more extensive biological sampling conducted.

Pools comprised 10% of the total **length** of this survey. 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. In Salt Hollow Creek, the pools are relatively deep with 87% having a maximum depth of at least two feet. These pools comprised 90% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 23. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by Small Wood at 27%, Root Masses at 19%, Terrestrial Vegetation at 12%, and Aquatic Vegetation at 9%. Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

No low gradient riffles were measured. This is generally considered poor for spawning salmonids.

Of the pool tail-outs measured 48% had embeddedness ratings of either 3 or 4. None had a rating of 1. Cobble embeddedness measured to be 25% or less (a rating of 1) is considered best for the needs of salmon and steelhead.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence.

The mean percent canopy for the survey was 66%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Cooler water temperatures are desirable in Salt Hollow Creek. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

DISCUSSION FOR NORTH FORK SALT HOLLOW CREEK

North Fork Salt Hollow Creek has only one reach: 4294 feet of B6.

According to the DFG Salmonid Stream Habitat Restoration Manual, B6 channel types are excellent for bank-placed boulders and log cover. They are also good for low-stage weirs, single and opposing wing-deflectors and channel constrictors. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

The water temperatures recorded on the survey days 8/9/2001 - 8/9/2001 ranged from 63°F to 67°F. Air temperatures ranged from 73°F to 83°F. These temperatures are tolerable for salmonids, although ideal temperatures for salmonids are much lower. However, it is difficult to draw strong conclusions from such limited temperature data (one day). If more definitive results are desired, a remote temperature sensor could be used to track water temperatures over an entire summer.

*Pools comprised 2% of the total **length** of this survey. 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. In North Fork Salt Hollow Creek, the pools are relatively deep with 60% having a maximum depth of at least two feet. These pools comprised 1.4% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.*

The mean shelter rating for pools was 16. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by Aquatic Vegetation at 30%, Small Wood at 25%, Boulders at 21%, and Root Mass at 13%. Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

No low gradient riffles were measured for substrate. Either gravel or small cobble as the dominant substrate in low-gradient riffles are generally considered good for spawning salmonids.

One hundred percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. None had a rating of 1. Cobble embeddedness measured to be 25% or less (a rating of 1) is considered best for the needs of salmon and steelhead. Therefore, the North Fork Salt Hollow appears to provide poor spawning habitat for salmonids.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In North Fork Salt Hollow Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 77%. This is fair, since 80% is generally considered desirable. However, the canopy is quite poor in the some sections of the stream (for instance the upstream end of the electrofishing site). Due to a thin or absent canopy, an excessive amount of sunlight was striking the water's surface in these sections and elevating water temperatures and caused extensive growth of aquatic plants. The aquatic plant's which carpet the water's surface provide excellent habitat for non-native bullfrogs. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

GENERAL MANAGEMENT RECOMMENDATIONS

Salt Hollow and its tributaries should be managed as an anadromous, natural production streams.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

- 1) In Salt Hollow, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 2) Map sources of upslope and in-channel 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. Near-stream riparian planting along any portion of the stream

should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.

- 3) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing >shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.
- 4) Where feasible, design and engineer pool enhancement structures to increase the number of pools in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 5) Increase the canopy on Salt Hollow by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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.

Salt Hollow Creek

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	WP#1 (F1) WB Russian= 64 degrees. LB Himalayan blackberry. Photo
35	0002.00	Dense blackberry, sweet and ripe
74	0003.00	Run/glide. 1" irrigation hose in creek, sprinklers, LB.
385	0004.00	Concrete blocks forming scour
413	0005.00	Vineyard both banks,>40 ft' from creek
426	0006.00	4' foot undercut root wad

459	0007.00	1" irrigation hose
544	0008.00	Willow, wild grape, sedges, non-native grasses, cat-tails
605	0009.00	Lower reach is bog-like
650	0010.00	RB <i>Arundo</i> LB reservoir, 1 acre. Roach, tadpoles. (2) Fords, bridge (see form, no passage problem). WP#05 (F1): N39°15'18.2", W123°12'3.7"
1004	0011.00	Sheer 10' erosive RB, stabilized by alder, <i>Arundo</i> , willow
1047	0012.00	LB: old shed amidst black oak/live oak grove, concrete banks in creek
1264	0013.00	2+ roach. RB: old cars/concrete scour, shelter, bank stability
1295	0014.00	LB old wood fence
1387	0017.00	LB gravel/silt conglomerate 12' sheer cliff
1428	0018.00	Gravel/silt deposition from pits on left bank. GPS WP#6 (F1).
1514	0020.00	WP #07 (F1): N39°15'21.6", W123°12'0.4"
1531	0021.00	Roach, tadpoles
1776	0023.00	East Road bridge (see form)
1889	0025.00	HOBO temp, roach
2006	0028.00	LB: old car, >100 ft riparian zone. RB: East Road
2220	0030.00	Bridge: see form. WP#11(F11):N39°15'27.9", W123°11'59.2"
2340	0031.00	LB: old wooden fence. Unidentified fish, bullfrog, wire fence
2728	0035.00	Wet Trib, RB North Fork Salt Hollow Ck., All flow is coming from this trib- main fork is dry not flowing, but there is still stagnant water. 62° trib temp, 64° @confluence.
2816	0038.00	Erosive LB; Spring RB

2896	0039.00	RB brush placed by landowner for bank stability
2941	0040.00	WP#12;N39`15'29" W123`11'51"
2982	0041.00	Narrow trench was once channelized (1970s);intermittent flow
3127	0042.00	Banks:Gravel/silt; Hardened conglomerate
3159	0043.00	Rough fish; erosive LB
3222	0045.00	LB very erosive 20' vertical cliff 80' long
3404	0046.00	RB: 20' wide floodplain HU#46-48
3426	0047.00	Erosive vertical bank
3490	0048.00	Newt. Dead mouse ;3 cut alder stumps; AL 1.0;3
3529	0049.00	LB dead brush for stability. RB steep erosive cliff
3674	0050.00	Sand and algae; several dead alder perched across creek; AL 1.0; 25; WP#13; N39`15'27.2"/W123`11'42.8"
3732	0053.00	Includes several dry sections 5-10' long
3941	0056.00	Many roach
4148	0060.00	Madrones; WP#14 N39`15'24.5"/W123`11'40.4"
4487	0065.00	Roach;newts
4621	0067.00	Large wet/dry trib WP# 15
4647	0068.00	Stream turns north heading upstream
4731	0069.00	Roach;newt
4751	0070.00	WP#16 (F1) N39`15'24.3"/W123`11'34.5"

4817	0071.00	Nice riparian all throughout reach since East Rd.
4899	0072.00	Cattails; very erosive LB
4953	0074.00	Steelhead?
5056	0076.00	LB steep silty cliff-SEE PHOTO
5395	0079.00	WP#17 N39° 15'24"/W123° 11'2705"
5456	0079.01	Old car in stream
5456	0080.00	RB old cars
5542	0081.00	LB old metal gas tanks for stabilization 40' long
5582	0082.00	1.5" irrigation hose RB
5637	0083.00	Per landowner, fish usually spawn here, but not this year
5720	0084.00	Foot bridge-SEE FORM; drainage pipes; no erosion; some kind of bank stabilization
5778	0086.00	Rip rap RB
5801	0087.00	LB culvert-SEE FORM
5836	0088.00	HW 1.0 <3 cut stump
5851	0089.00	WP#018;N39° 15'26.9"/W123° 11'23.5"
6073	0092.00	Many imported boulders; Culvert LB
6130	0094.00	Dry bridge box culvert-SEE FORM
6162	0095.00	Bridge; garbage in creek
6692	0096.00	Wire mesh in creek; Gradient increases

6726	0097.00	Bridge form; 4' jump
7366	0098.00	LB erosion; L 40' x W 40' x D 15'
7377	0099.00	Irrigation tube across creek; RB barbed wire; WP #20; N39`15'31.8"/W123`11'9"
7509	0100.00	Bridges, debris accumulation, old cars. Quite grown over, 2000' upstream Dam 20'. WP# 33; BLACK BART RD-END OF SURVEY.

COMMENTS AND LANDMARKS: North Fork Salt Hallow

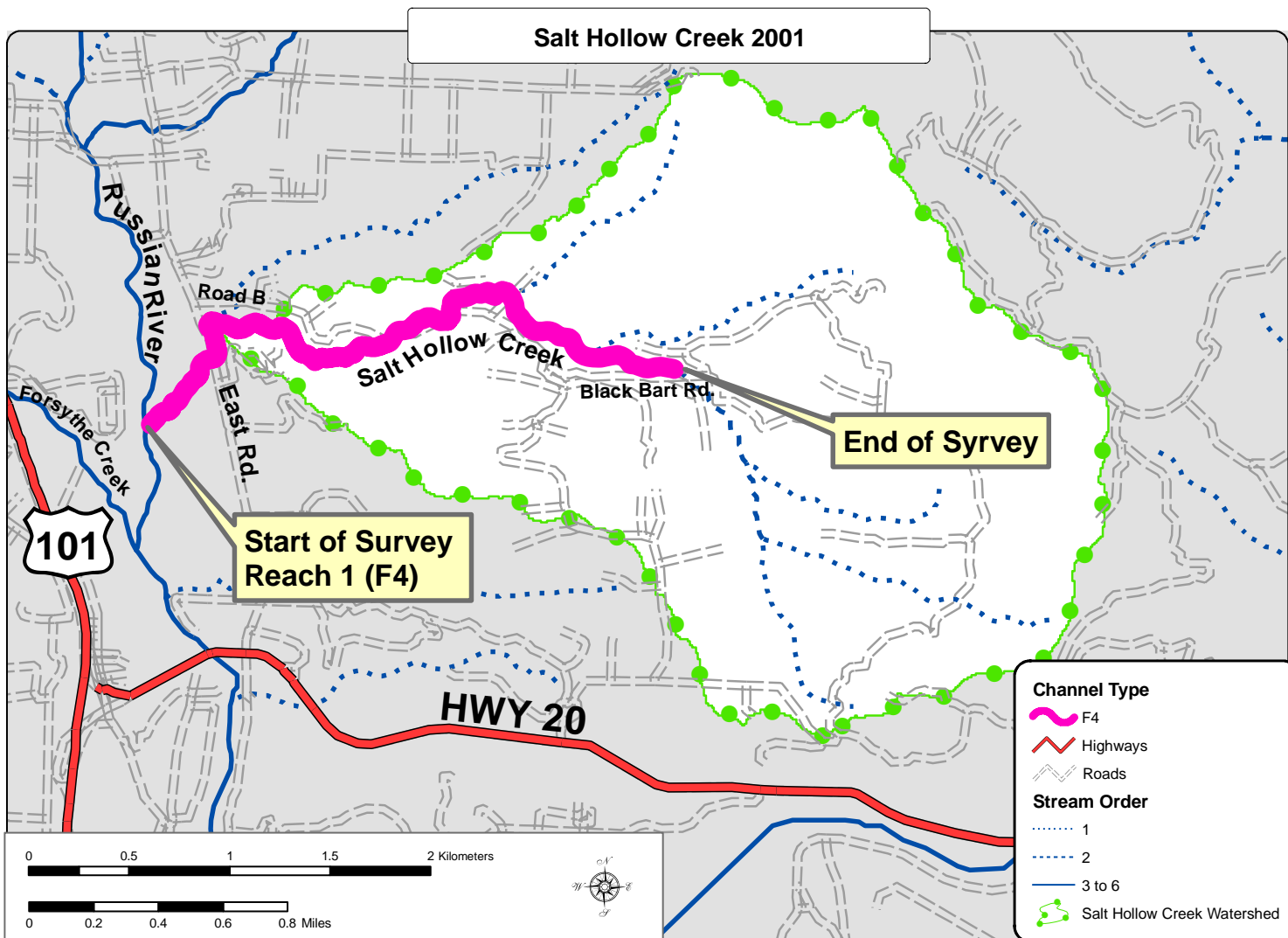
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Salt Hollow Creek, North Fork

<i>Position (ft.)</i>	<i>Habitat Unit #</i>	<i>Comments:</i>
0	0001.00	<i>WP #001 Dam/Debris Accumulation: See FORM/fence across stream</i>
194	0003.00	<i>Fence across stream</i>
215	0004.00	<i>Large sediment spill-SEE FORM; LB fence falling in SEE PHOTO #19</i>
265	0005.00	<i>LB Metal fence, rock stabilization method; walking bridge #1</i>
291	0006.00	<i>Unprotected electric wire across creek; geese access. 4' plunge from culvert. No I.D. on fish</i>
452	0010.00	<i>WP #005; N39`15'33.4"/W123`11'53.9"</i>
657	0011.00	<i>Overgrown blackberry bushes partially surveyed by adjacent road RB</i>
957	0012.00	<i>Tent LB</i>
1057	0013.00	<i>Fence across creek</i>

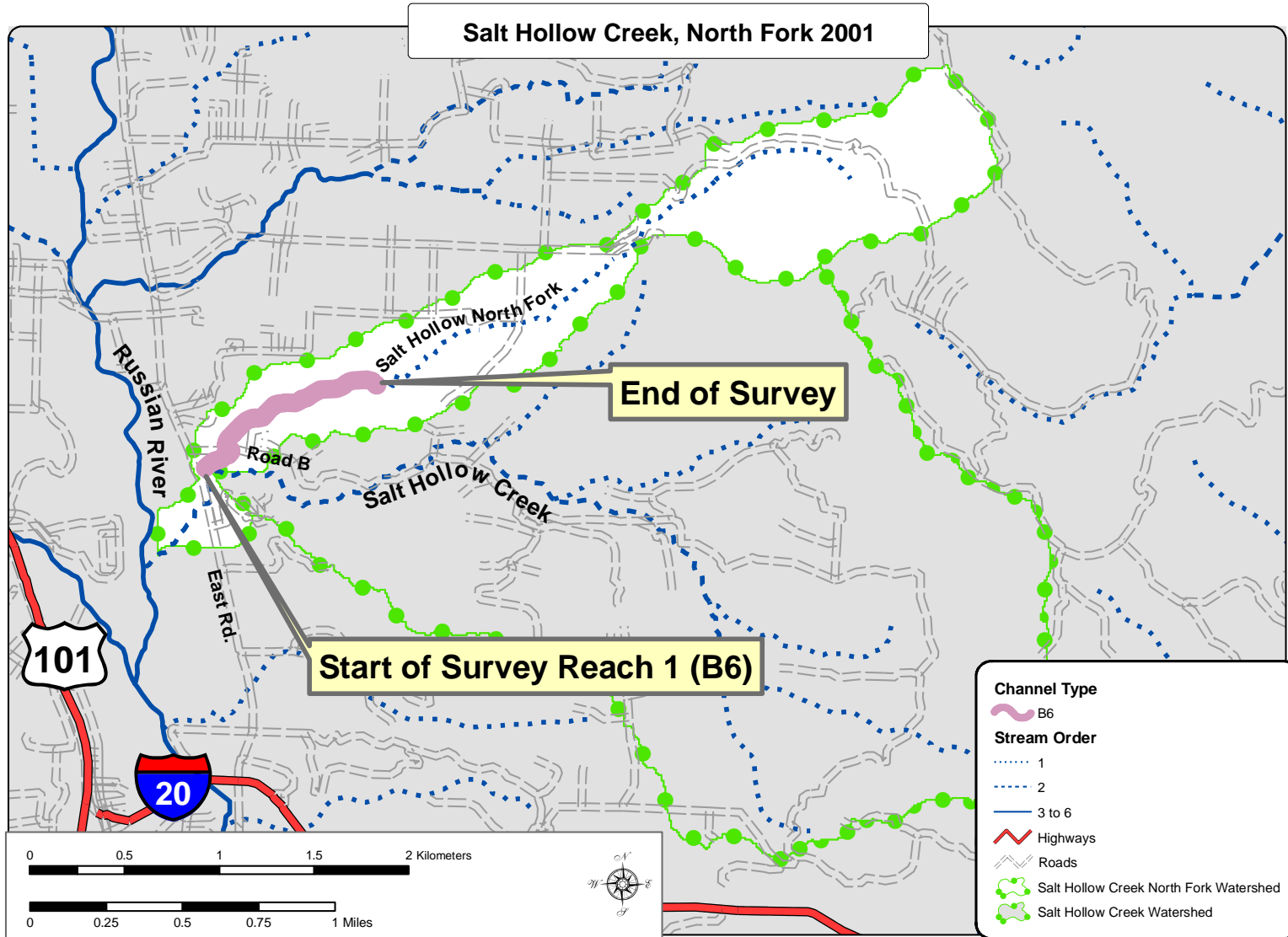
1153	0015.00	Old grapevine? Fence across stream
1438	0016.00	2 culverts side by side WP 006
1648	0020.00	WP 007; N39`15'39.3"/W123`11'46.2"
1720	0021.00	2' jump; several glides within unit BRIDGE #2
1970	0022.00	2' jump-small dam SEE FORM; concrete blocks-stabilization RB WP009
1979	0023.00	Bridge #3, dry trib LB; small drainage pipe into creek 2' jump; Pond 1800 sf
2659	0028.00	WP #010- Fence (deer)
2694	0029.00	Overgrown blackberries WP #011 WP #012 SEE DAM FORM. Dam at END OF SURVEY

APPENDIX A: MAP



L:\mondo3\data\stream-maps\SaltHollowCreek2001.mxd

Prepared by: Celeste Dodge and Colin Brooks, April 4, 2005



L:\mondo3\data\stream-maps\SaltHollowCreekNF2001.mxd

Prepared by: Celeste Dodge and Colin Brooks, April 6, 2005

APPENDIX B: SALT HOLLOW TABLES

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Salt Hollow Creek

LLID:

1232031392532

Drainage:

Russian River - Upper

Survey Dates: 7/18/2001 to 7/24/2001

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:12.0N

Longitude: 123:12:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
1	0	CULVERT	1.0	32	32	0.3									
11	0	DRY	10.9	595	6548	52.3									
58	10	FLATWATER	57.4	82	4742	37.8	3.7	0.4	0.8	182	10542	81	4687		12
31	30	POOL	30.7	39	1208	9.6	8.4	1.3	2.6	333	10331	485	15030	443	23
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
101	40				12530					20873			19717		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Salt Hollow Creek

LLID:

1232031392532

Drainage: Russian River - Upper

Survey Dates: 7/18/2001 to 7/24/2001

Confluence Location:

Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:12.0N

Longitude 123:12:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
33	5	GLD	32.7	104	3424	27.3	4	0.5	1.6	253	8362	130	4294		15	70
25	5	RUN	24.8	53	1318	10.5	3	0.2	0.9	110	2753	32	788		5	73
1	1	TRP	1.0	41	41	0.3	3	1.7	3.1	123	123	221	221	209		85
9	9	MCP	8.9	43	388	3.1	9	1.4	3.8	390	3511	624	5617	576	23	70
5	5	GRP	5.0	33	165	1.3	9	1.3	4.3	304	1520	486	2432	436	33	74
4	3	LSR	4.0	26	105	0.8	9	1.4	2.9	229	916	326	1302	313	40	83
10	10	LSBk	9.9	45	450	3.6	8	1.2	3.5	365	3651	470	4699	427	12	70
2	2	LSBo	2.0	30	59	0.5	8	1.0	2.2	253	506	300	599	249	15	85
11	0	DRY	10.9	595	6548	52.3										83
1	0	CUL	1.0	32	32	0.3										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
101	40	12530	21342	19952

Table 3 - Summary of Pool Types

Stream Name: Salt Hollow Creek

LLID:

1232031392532

Drainage:

Russian River - Upper

Survey Dates: 7/18/2001 to 7/24/2001

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:12.0N

Longitude: 123:12:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid. Vol. (cu.ft.)	Mean Shelter Rating
10	10	MAIN	32	43	429	36	8.1	1.4	363	3634	540	5396	23
21	20	SCOUR	68	37	779	64	8.5	1.2	318	6682	395	8285	23
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
31	30				1208					10316		13682	

Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Salt Hollow Creek

LLID:

1232031392532

Drainage: Russian River - Upper

Survey Dates: 7/18/2001 to 7/24/2001

Confluence Location:

Quad: REDWOOD VALLEY

Legal Description:

T000R000S00

Latitude: 39:15:12.0N

Longitude: 123:12:11.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
1	TRP	3	0	0	0	0	0	0	1	100	0	0
9	MCP	29	0	0	2	22	4	44	3	33	0	0
5	CRP	16	0	0	1	20	2	40	1	20	1	20
4	LSR	13	0	0	0	0	4	100	0	0	0	0
10	LSBk	32	0	0	5	50	2	20	3	30	0	0
2	LSBo	6	0	0	1	50	1	50	0	0	0	0
Total Units												
			Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1 < 2 Foot Max Resid. Depth	Total 1 < 2 Foot % Occurrence	Total 2 < 3 Foot Max Resid. Depth	Total 2 < 3 Foot % Occurrence	Total 3 < 4 Foot Max Resid. Depth	Total 3 < 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
		31	0	0	9	29	13	42	8	26	1	3

Mean Maximum Residual Pool Depth (ft.): 2.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Salt Hollow Creek LLID: 1232031392532 Drainage: Russian River - Upper
 Survey Dates: 7/18/2001 to 7/24/2001 Dry Units: 11
 Confluence Location: Quad: REDWOOD VALLEY Legal Description: T000R000S00 Latitude: 39:15:12.0N Longitude: 123:12:11.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
0	0	TOTAL RIFFLE									
33	4	GLD	18	55	0	8	15	5	0	0	0
25	2	RUN	0	10	0	0	3	40	0	0	48
58	6	TOTAL FLAT	12	40	0	5	11	17	0	0	16
1	0	TRP									
9	9	MCP	18	36	0	12	6	16	0	8	4
5	3	CRP	5	23	17	28	13	3	0	7	3
4	4	LSR	0	39	0	58	3	0	0	1	0
10	8	LSBk	9	6	9	21	23	3	0	16	13
2	2	LSBo	0	0	5	0	23	0	0	50	23
31	26	TOTAL POOL	10	23	5	23	13	7	0	13	8
1	0	CUL									
101	32	TOTAL	10	26	4	19	12	9	0	10	9

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Salt Hollow Creek

LLID:

1232031392532

Drainage: Russian River - Upper

Survey Dates: 7/18/2001 to 7/24/2001

Dry Units: 11

Confluence Location: Quad:

REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:12.0N

Longitude: 123:12:11.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
33	5	GLD	0	20	80	0	0	0	0
25	5	RUN	20	0	60	20	0	0	0
1	1	TRP	0	0	100	0	0	0	0
9	3	MCP	0	0	100	0	0	0	0
5	3	CRP	0	0	100	0	0	0	0
4	2	LSR	0	50	50	0	0	0	0
10	2	LSBk	0	50	50	0	0	0	0
2	1	LSBo	0	0	0	100	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Salt Hollow Creek
 LLID: 1232031392532
 Drainage: Russian River - Upper
 Survey Dates: 7/18/2001 to 7/24/2001
 Confluence Location: Quad: REDWOOD VALLEY
 Legal Description: T000R000S00
 Latitude: 39:15:12.0N
 Longitude: 123:12:11.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
73	65	35	0	68	41

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Salt Hollow Creek LLID: 1232031392532 Drainage: Russian River - Upper
 Survey Dates: 7/18/2001 to 7/24/2001
 Confluence Location: Quad: REDWOOD VALLEY Legal Description: T000R000S00 Latitude: 39:15:12.0N Longitude: 123:12:11.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	2	9	25.0
Boulder	0	0	0.0
Cobble / Gravel	4	6	22.7
Sand / Silt / Clay	16	7	52.3

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	1	0	2.3
Brush	7	8	34.1
Hardwood Trees	8	8	36.4
Coniferous Trees	6	4	22.7
No Vegetation	0	1	2.3

Total Stream Cobble Embeddedness Values: 3

Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: Salt Hollow Creek LLID: 1232031392532 Drainage: Russian River - Upper
 Survey Dates: 7/18/2001 to 7/24/2001
 Confluence Location: Quad: REDWOOD VALLEY Legal Description: T000R000S00 Latitude: 39:15:12.0N Longitude: 123:12:11.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)		12	10
SMALL WOODY DEBRIS (%)		40	23
LARGE WOODY DEBRIS (%)		0	5
ROOT MASS (%)		5	23
TERRESTRIAL VEGETATION (%)		11	13
AQUATIC VEGETATION (%)		17	7
WHITEWATER (%)		0	0
BOULDERS (%)		0	13
BEDROCK LEDGES (%)		16	8

NORTH FORK SALT HOLLOW TABLES

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Salt Hollow Creek, North Fork

LLID:

1231996392581

Drainage:

Russian River - Upper

Survey Dates: 8/9/2001 to 8/9/2001

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:29.0N

Longitude: 123:11:59.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
3	0	CULVERT	10.3	22	67	1.6									
1	0	DRY	3.4	50	50	1.2									
19	6	FLATWATER	65.5	131	2489	58.0	4.3	0.5	1.2	785	14912	438	5542		23
1	0	NOSURVEY	3.4	1600	1600	37.3									
5	5	POOL	17.2	18	88	2.0	8.2	1.3	2.3	169	845	285	1426	256	16

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
29	11	4294	15757	6968

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Salt Hollow Creek, North Fork

LLID:

1231996392581

Drainage: Russian River - Upper

Survey Dates: 8/9/2001 to 8/9/2001

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:29.0N

Longitude 123:11:59.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
7	3	GLD	24.1	158	1103	25.7	5	0.5	1.4	964	6750	444	3109		23	80
12	3	RUN	41.4	116	1386	32.3	4	0.6	1.1	605	7264	418	1670			75
3	3	MCP	10.3	20	60	1.4	9	1.4	4.3	223	668	405	1214	366	12	83
1	1	LSR	3.4	19	19	0.4	6	1.0	1.4	114	114	137	137	114	30	75
1	1	PLP	3.4	9	9	0.2	7	1.1	1.5	63	63	76	76	69	15	40
1	0	DRY	3.4	50	50	1.2										90
3	0	CUL	10.3	22	67	1.6										100
1	0	NS	3.4	1600	1600	37.3										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
29	11	4294	14859	6206

Table 3 - Summary of Pool Types

Stream Name: Salt Hollow Creek, North Fork

LLID:

1231996392581

Drainage:

Russian River - Upper

Survey Dates: 8/9/2001 to 8/9/2001

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:29.0N

Longitude:

123:11:59.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid. Vol. (cu.ft.)	Mean Shelter Rating
3	3	MAIN	60	20	60	68	9.3	1.4	223	668	366	1099	12
2	2	SCOUR	40	14	28	32	6.5	1.1	89	177	92	183	23
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
5	5				88					845		1282	

Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Salt Hollow Creek, North Fork

LLID:

1231996392581

Drainage: Russian River - Upper

Survey Dates: 8/9/2001 to 8/9/2001

Confluence Location:

Quad: REDWOOD VALLEY

Legal Description:

T000R000S00

Latitude: 39:15:29.0N

Longitude: 123:11:59.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
3	MCP	60	0	0	0	0	2	67	0	0	1	33
1	LSR	20	0	0	1	100	0	0	0	0	0	0
1	PLP	20	0	0	1	100	0	0	0	0	0	0

Total Units

	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1 < 2 Foot Max Resid. Depth	Total 1 < 2 Foot % Occurrence	Total 2 < 3 Foot Max Resid. Depth	Total 2 < 3 Foot % Occurrence	Total 3 < 4 Foot Max Resid. Depth	Total 3 < 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
5	0	0	2	40	2	40	0	0	1	20

Mean Maximum Residual Pool Depth (ft.): 2.3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Salt Hollow Creek, North Fork LLID: 1231996392581 Drainage: Russian River - Upper
 Survey Dates: 8/9/2001 to 8/9/2001 Dry Units: 1
 Confluence Location: Quad: REDWOOD VALLEY Legal Description: T000R000S00 Latitude: 39:15:29.0N Longitude: 123:11:59.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
0	0	TOTAL RIFFLE									
7	3	GLD	0	67	0	0	0	33	0	0	0
12	0	RUN									
19	3	TOTAL FLAT	0	67	0	0	0	33	0	0	0
3	3	MCP	0	67	0	10	0	0	3	20	0
1	1	LSR	0	0	0	10	10	80	0	0	0
1	1	PLP	0	0	0	0	30	70	0	0	0
5	5	TOTAL POOL	0	40	0	8	8	30	2	12	0
3	0	CUL									
1	0	NS									
29	8	TOTAL	0	50	0	5	5	31	1	8	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Salt Hollow Creek, North Fork

LLID:

1231996392581

Drainage: Russian River - Upper

Survey Dates: 8/9/2001 to 8/9/2001

Dry Units: 1

Confluence Location: Quad:

REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:29.0N

Longitude: 123:11:59.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
7	3	GLD	67	33	0	0	0	0	0
12	2	RUN	100	0	0	0	0	0	0
3	2	MCP	50	50	0	0	0	0	0
1	1	LSR	0	100	0	0	0	0	0
1	1	PLP	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Salt Hollow Creek, North Fork

LLID:

1231996392581

Drainage: Russian River - Upper

Survey Dates: 8/9/2001 to 8/9/2001

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:29.0N

Longitude: 123:11:59.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
79	56	44	0	39	39

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Salt Hollow Creek, North Fork

LLID:

1231996392581

Drainage: Russian River - Upper

Survey Dates: 8/9/2001 to 8/9/2001

Confluence Location: Quad: REDWOOD VALLEY

Legal Description: T000R000S00

Latitude: 39:15:29.0N

Longitude: 123:11:59.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	1	2	18.8
Boulder	0	0	0.0
Cobble / Gravel	0	1	6.3
Sand / Silt / Clay	7	5	75.0

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	1	0	6.3
Brush	4	3	43.8
Hardwood Trees	1	3	25.0
Coniferous Trees	2	2	25.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values:

3

Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: Salt Hollow Creek, North Fork LLID: 1231996392581 Drainage: Russian River - Upper
 Survey Dates: 8/9/2001 to 8/9/2001
 Confluence Location: Quad: REDWOOD VALLEY Legal Description: T000R000S00 Latitude: 39:15:29.0N Longitude: 123:11:59.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)		0	0
SMALL WOODY DEBRIS (%)		67	40
LARGE WOODY DEBRIS (%)		0	0
ROOT MASS (%)		0	8
TERRESTRIAL VEGETATION (%)		0	8
AQUATIC VEGETATION (%)		33	30
WHITEWATER (%)		0	2
BOULDERS (%)		0	12
BEDROCK LEDGES (%)		0	0

APPENDIX C: SALT HOLLOW CREEK

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Salt Hollow Creek Russian River -	LLID: 1232031392532	Drainage:
Survey Dates: 7/18/2001 to 7/24/2001	Survey Length (ft.): 12530	Main Channel (ft.): 12509 Side Channel (ft.): 21
Confluence Location: Quad: REDWOOD 123:12:11.0W	Legal Description: T000R000S00	Latitude: 39:15:12.0N Longitude:

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1									
Channel Type: F4 9.8	Canopy Density (%): 72.3					Pools by Stream Length (%):			
Reach Length (ft.): 12341	Coniferous Component (%): 63.9					Pool Frequency (%): 31.3			
Riffle/Flatwater Mean Width (ft.): 3.7	Hardwood Component (%): 36.1					Residual Pool Depth (%):			
BFW:	Dominant Bank Vegetation: Hardwood Trees			< 2 Feet Deep: 29.0					
Range (ft.): to	Vegetative Cover (%): 54.5			2 to 2.9 Feet Deep: 41.9					
Mean (ft.):	Dominant Shelter: Small Woody Debris			3 to 3.9 Feet Deep: 25.8					
Std. Dev.:	Dominant Bank Substrate Type: Sand/Silt/Clay			>= 4 Feet Deep: 3.2					
Base Flow (cfs): 0 (ft.): 2.56	Occurrence of LWD (%): 3.2					Mean Max Residual Pool Depth			
Water (F): 58 - 70	Air (F): 60 - 80	LWD per 100 ft.:		Mean Pool Shelter Rating: 23					
Dry Channel (ft.): 6548		Riffles:							
		Pools:							
		Flat:							
Pool Tail Substrate (%): Silt/Clay: 0.0	Sand: 0.0	Gravel: 83.3	Sm Cobble: 0.0	Lg Cobble: 8.3	Boulder: 8.3				
Bedrock: 0.0									
Embeddedness Values (%): 1. 0.0	2. 32.3	3. 45.2	4. 3.2	5. 19.4					
 STREAM REACH: 2									
Channel Type: F4 0.0	Canopy Density (%): 95.0					Pools by Stream Length (%):			
Reach Length (ft.): 168	Coniferous Component (%): 80.0					Pool Frequency (%): 0.0			
Riffle/Flatwater Mean Width (ft.):	Hardwood Component (%): 20.0					Residual Pool Depth (%):			
BFW:	Dominant Bank Vegetation:			< 2 Feet Deep:					
Range (ft.): to	Vegetative Cover (%): 0.0			2 to 2.9 Feet Deep:					
Mean (ft.):	Dominant Shelter:			3 to 3.9 Feet Deep:					
Std. Dev.:	Dominant Bank Substrate Type:			>= 4 Feet Deep:					
Base Flow (cfs): 0 (ft.):	Occurrence of LWD (%):					Mean Max Residual Pool Depth			
Water (F): 63 - 63	Air (F): 70 - 70	LWD per 100 ft.:		Mean Pool Shelter Rating:					
Dry Channel (ft.): 0		Riffles:							
		Pools:							
		Flat:							
Pool Tail Substrate (%): Silt/Clay:	Sand:	Gravel:	Sm Cobble:	Lg Cobble:	Boulder:				
Bedrock:									
Embeddedness Values (%): 1.	2.	3.	4.	5. 0.0					

NORTH FORK SALT HOLLOW CREEK

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Salt Hollow Creek, North Fork Russian River -	LLID: 1231996392581	Drainage:
Survey Dates: 8/9/2001 to 8/9/2001	Survey Length (ft.): 4294	Main Channel (ft.): 4294 Side Channel (ft.): 0
Confluence Location: Quad: REDWOOD 123:11:59.0W	Legal Description: T000R000S00	Latitude: 39:15:29.0N Longitude:

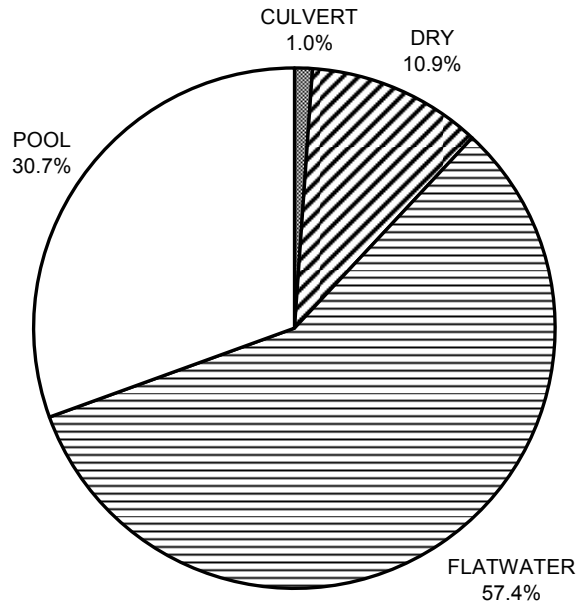
Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B6 2.0	Canopy Density (%): 79.2	Pools by Stream Length (%):
Reach Length (ft.): 4294	Coniferous Component (%): 55.6	Pool Frequency (%): 17.2
Riffle/Flatwater Mean Width (ft.): 4.3	Hardwood Component (%): 44.4	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 40.0
Range (ft.): to	Vegetative Cover (%): 38.8	2 to 2.9 Feet Deep: 40.0
Mean (ft.):	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0.0
Std. Dev.:	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 20.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth
(ft.): 2.34	LWD per 100 ft.:	Mean Pool Shelter Rating: 16
Water (F): 63 - 67	Riffles:	
Air (F): 73 - 83	Pools:	
Dry Channel (ft.): 50	Flat:	
Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder:		
Bedrock:		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 60.0 4. 40.0 5. 0.0		

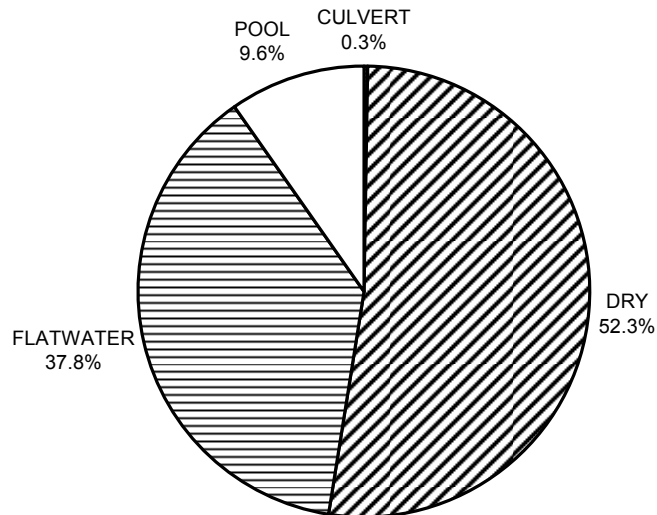
APPENDIX D: SALT HOLLOW CREEK GRAPHS

**SALT HOLLOW CREEK 2001
HABITAT TYPES BY PERCENT OCCURRENCE**



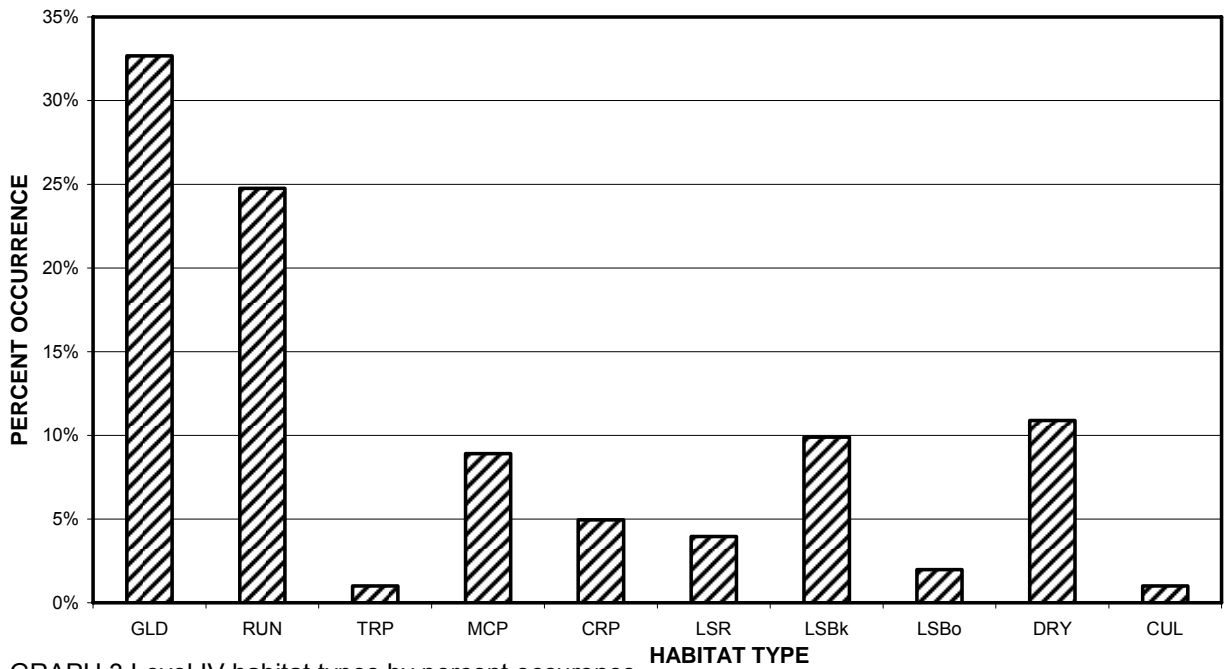
GRAPH 1 Level II habitat types by percent occurrence

**SALT HOLLOW CREEK 2001
HABITAT TYPES BY PERCENT TOTAL LENGTH**



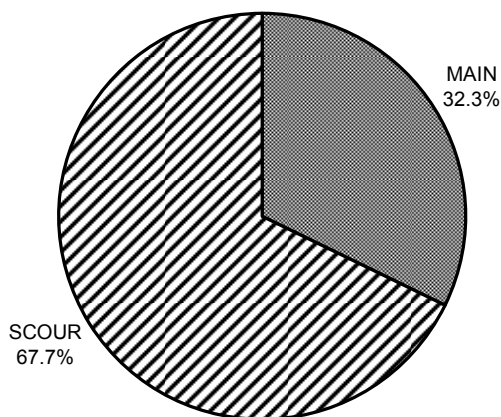
GRAPH 2 Level II habitat types by percent total length

**SALT HOLLOW CREEK 2001
HABITAT TYPES BY PERCENT OCCURRENCE**



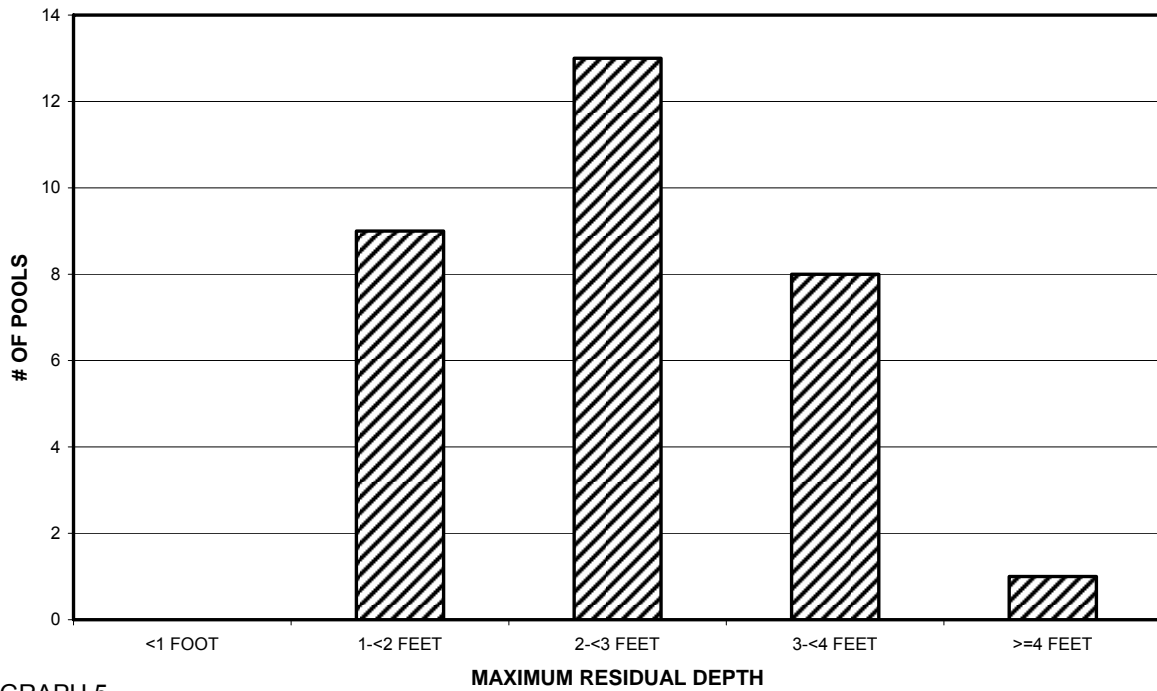
GRAPH 3 Level IV habitat types by percent occurrence

**SALT HOLLOW CREEK 2001
POOL TYPES BY PERCENT OCCURRENCE**



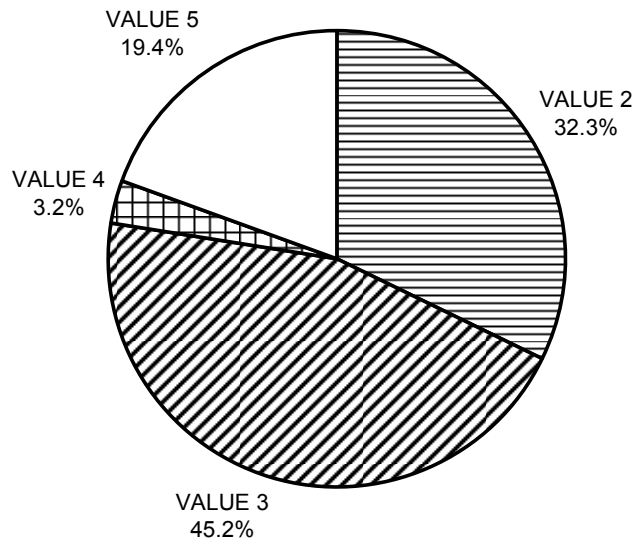
GRAPH 4 Level I pool types by percent occurrence

**SALT HOLLOW CREEK 2001
MAXIMUM DEPTH IN POOLS**



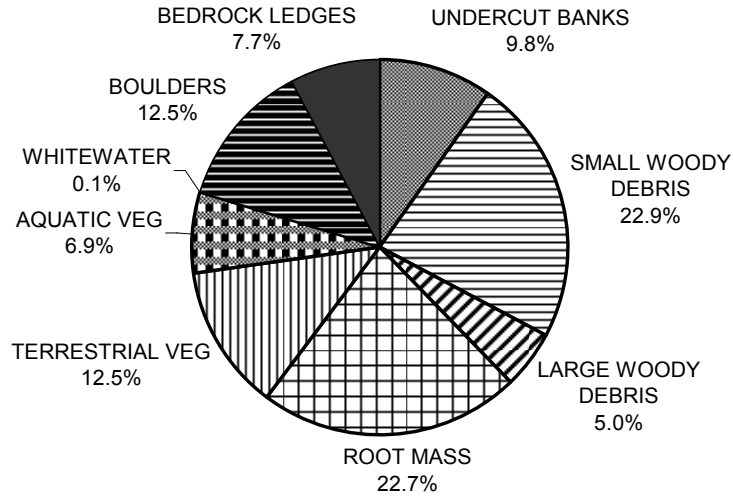
GRAPH 5

**SALT HOLLOW CREEK 2001
PERCENT EMBEDDEDNESS**



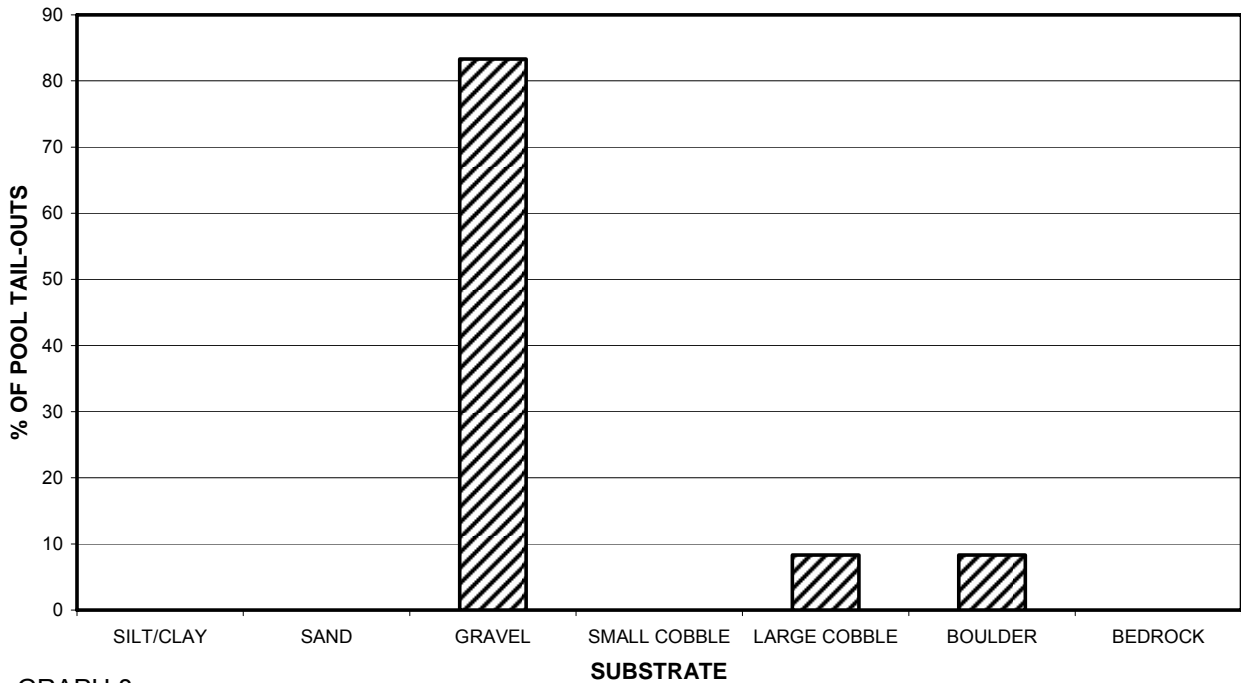
GRAPH 6

**SALT HOLLOW CREEK 2001
MEAN PERCENT COVER TYPES IN POOLS**



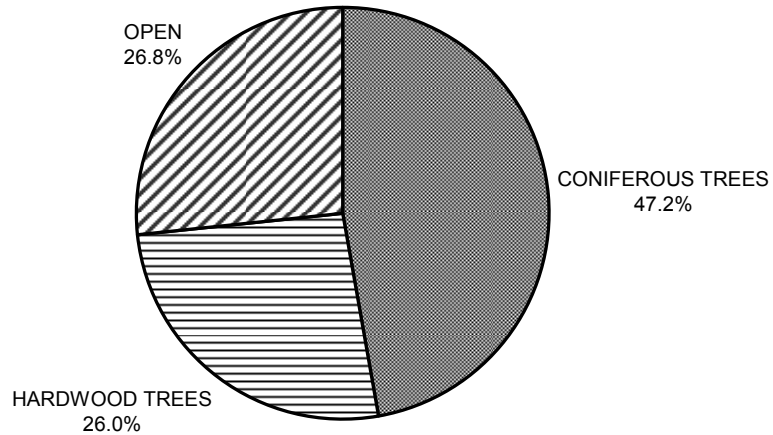
GRAPH 7

**SALT HOLLOW CREEK 2001
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



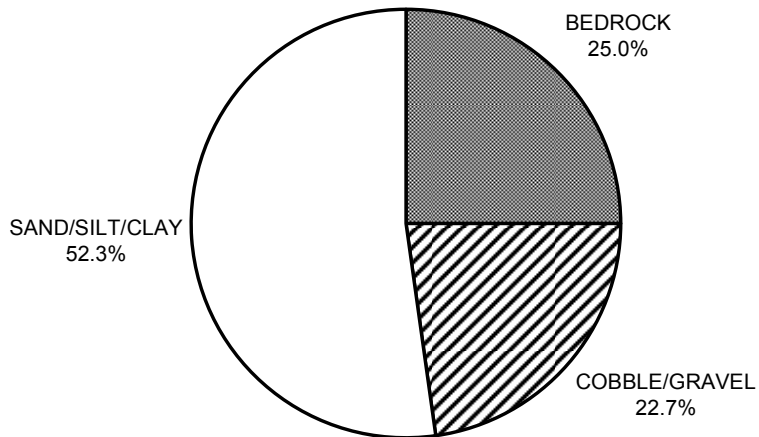
GRAPH 8

**SALT HOLLOW CREEK 2001
MEAN PERCENT CANOPY**



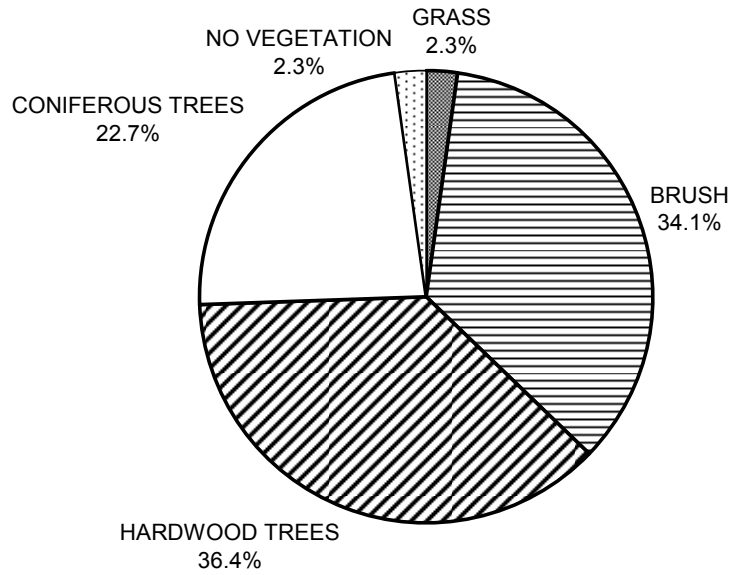
GRAPH 9

**SALT HOLLOW CREEK 2001
DOMINANT BANK COMPOSITION**



GRAPH 10

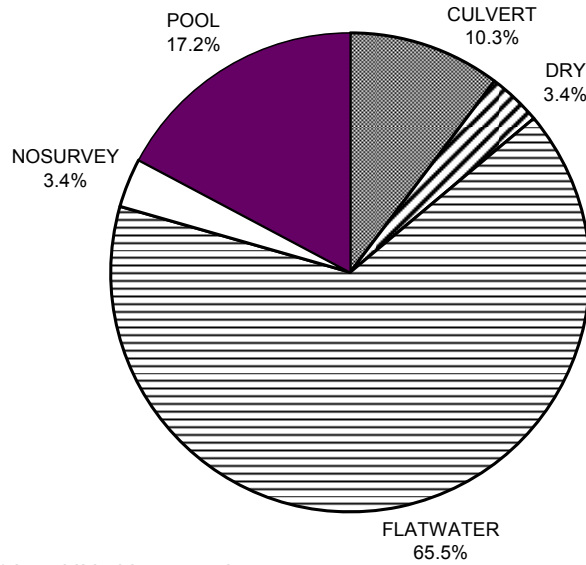
**SALT HOLLOW CREEK 2001
DOMINANT BANK VEGETATION**



GRAPH 11

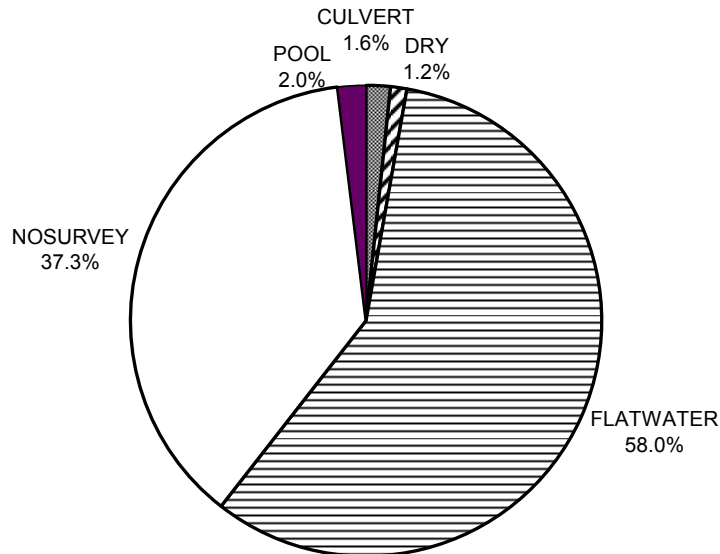
NORTH FORK SALT HOLLOW CREEK GRAPHS

**SALT HOLLOW CREEK, NORTH FORK 2001
HABITAT TYPES BY PERCENT OCCURRENCE**



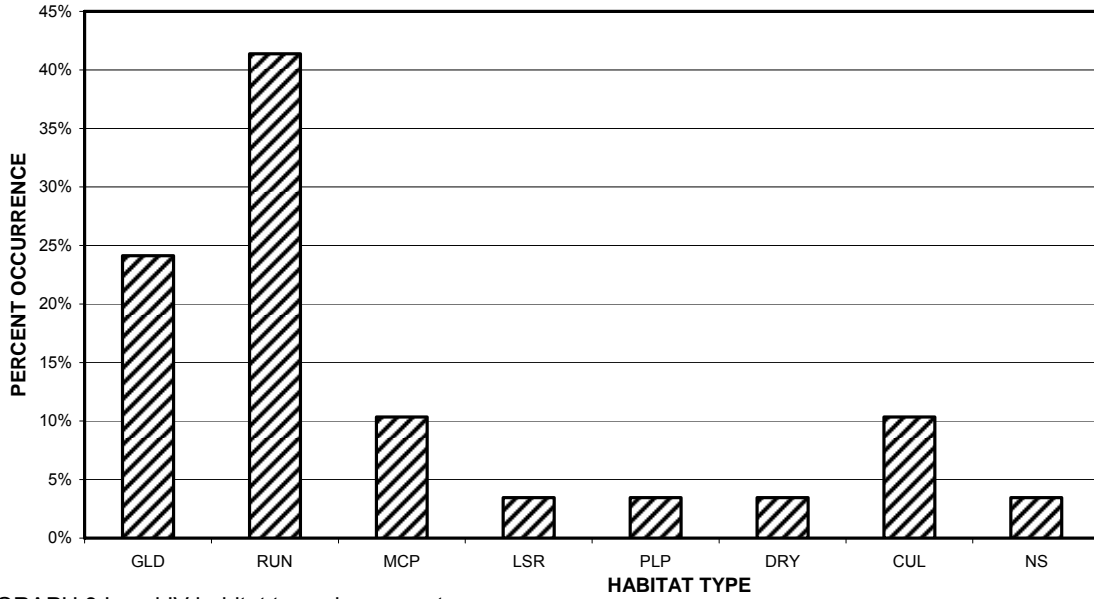
GRAPH 1 Level II habitat types by percent occurrence

**SALT HOLLOW CREEK, NORTH FORK 2001
HABITAT TYPES BY PERCENT TOTAL LENGTH**



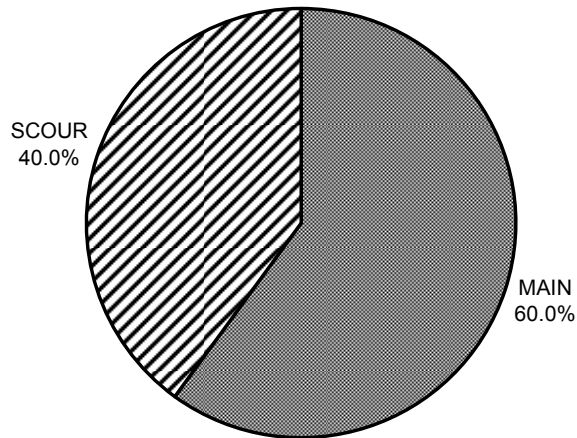
GRAPH 2 Level II habitat types by percent total length

**SALT HOLLOW CREEK, NORTH FORK 2001
HABITAT TYPES BY PERCENT OCCURRENCE**



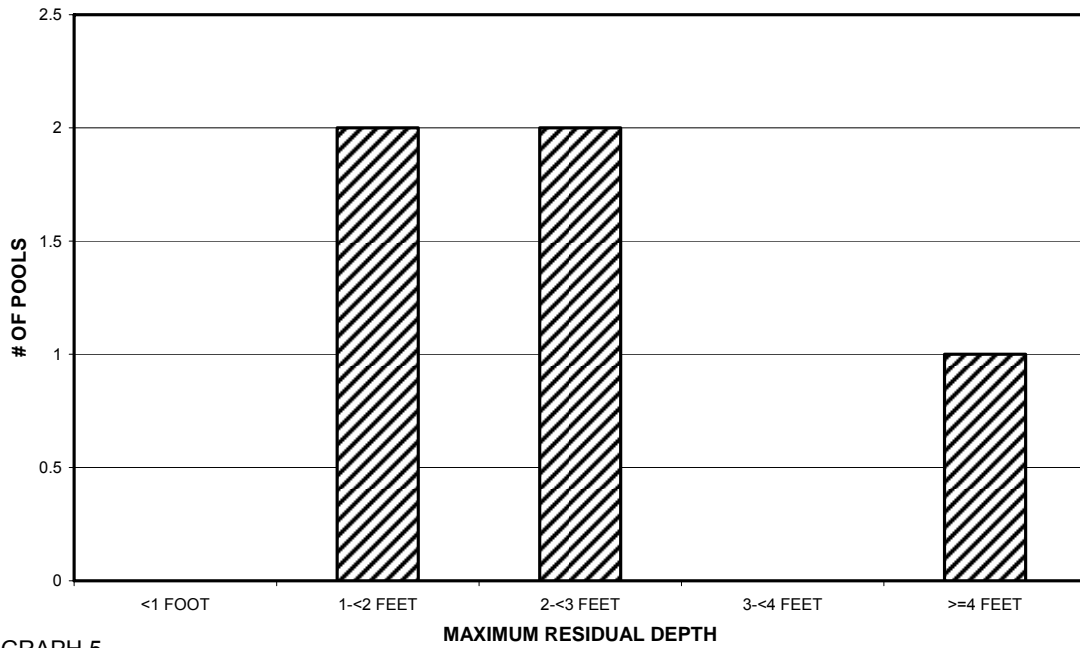
GRAPH 3 Level IV habitat types by percent occurrence

**SALT HOLLOW CREEK, NORTH FORK 2001
POOL TYPES BY PERCENT OCCURRENCE**



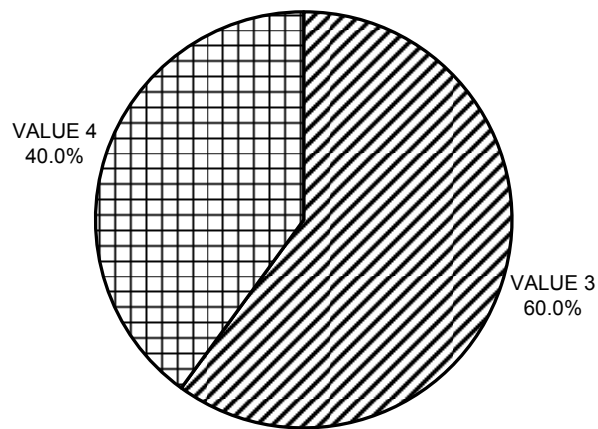
GRAPH 4 Level I pool types by percent occurrence

**SALT HOLLOW CREEK, NORTH FORK 2001
MAXIMUM DEPTH IN POOLS**



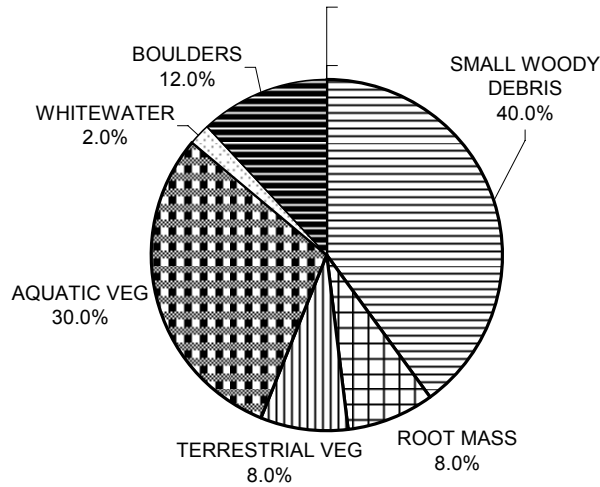
GRAPH 5

**SALT HOLLOW CREEK, NORTH FORK 2001
PERCENT EMBEDDEDNESS**



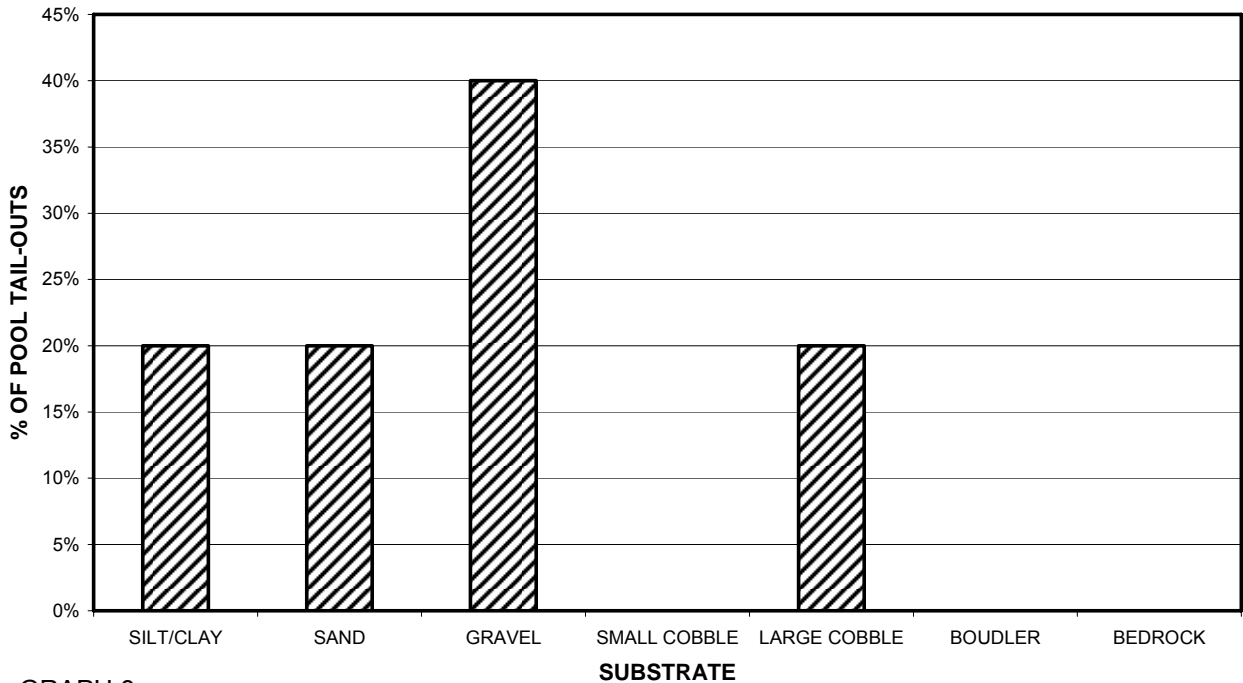
GRAPH 6

**SALT HOLLOW CREEK, NORTH FORK 2001
MEAN PERCENT COVER TYPES IN POOLS**



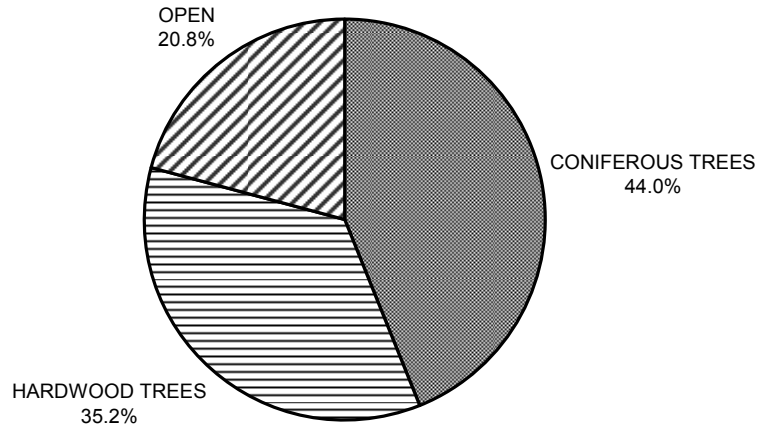
GRAPH 7

**SALT HOLLOW CREEK, NORTH FORK 2001
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



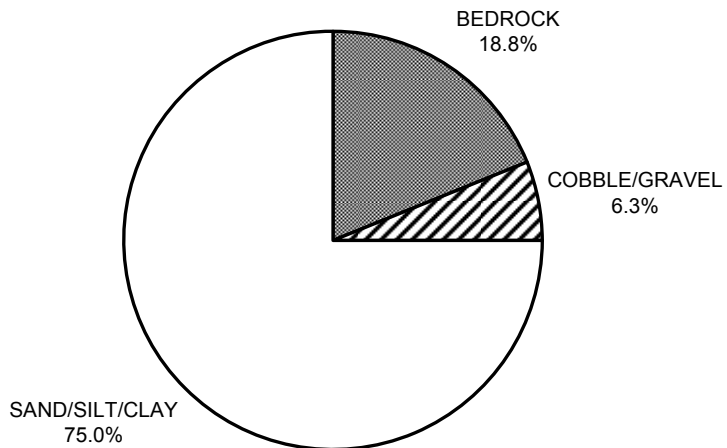
GRAPH 8

**SALT HOLLOW CREEK, NORTH FORK 2001
MEAN PERCENT CANOPY**



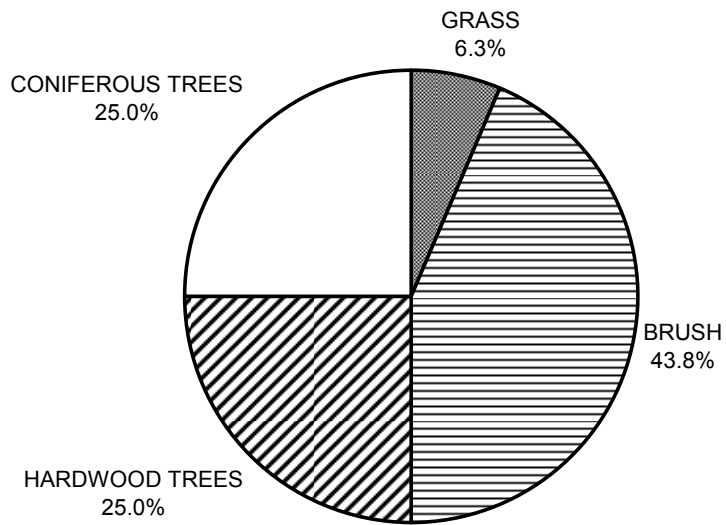
GRAPH 9

**SALT HOLLOW CREEK, NORTH FORK 2001
DOMINANT BANK COMPOSITION**



GRAPH 10

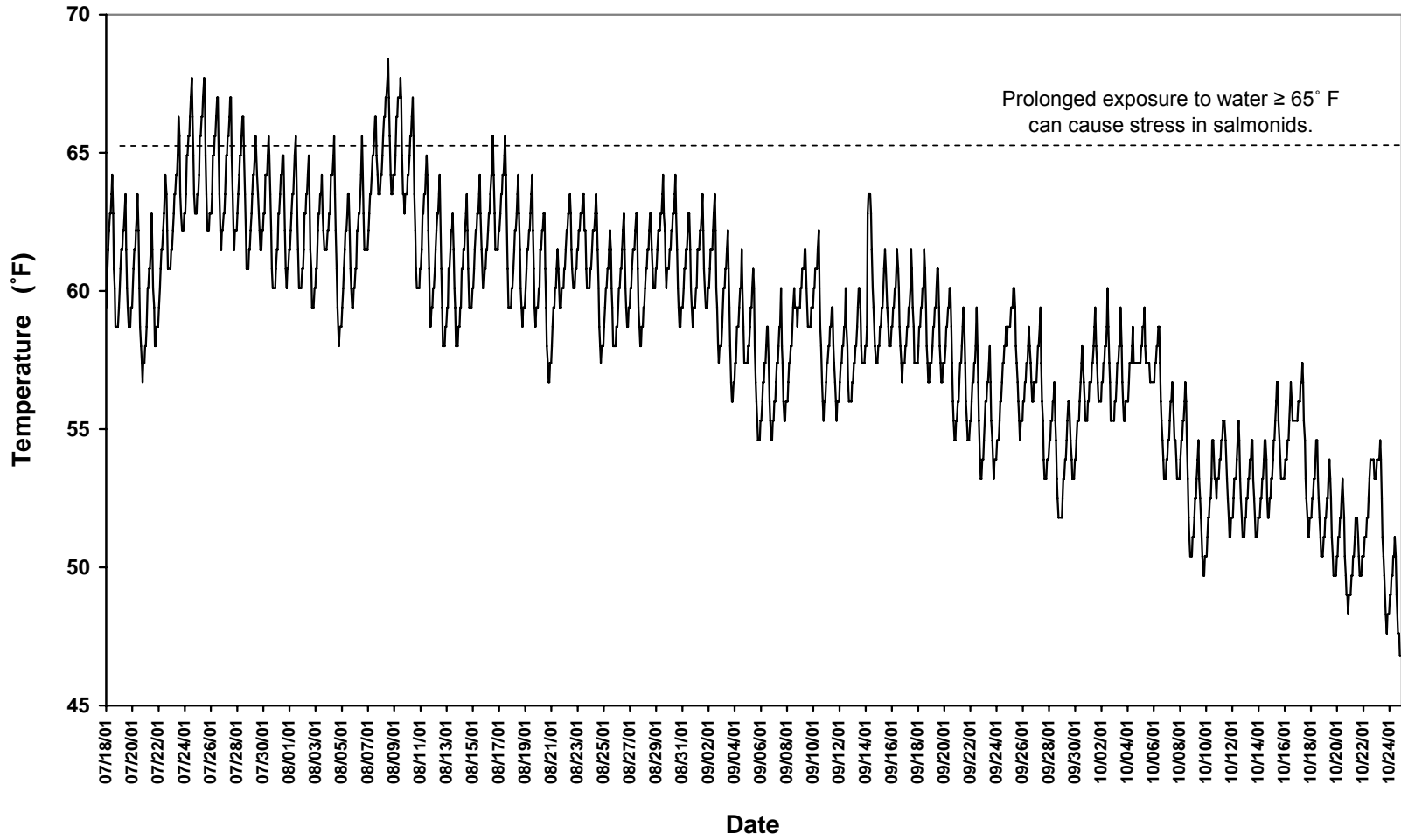
**SALT HOLLOW CREEK, NORTH FORK 2001
DOMINANT BANK VEGETATION**



GRAPH 11

APPENDIX E

Salt Hollow Creek Water Temperatures



Hydrologic Sub-Areas covered by the watershed:

Tributary to Russian River
 Tributary to
 Tributary to

Name: Salt Hollow Creek **LLId: (1:24k)** 1232031392532 **County:** Mendocino
Location: **T:** 16N **R:** 12W **S:** 9 **Latitude:** 39.2532446309357 **Longitude** 123.203169823674

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

Stream Order: <u>2</u>	Total Length: 3.54 Miles	Note: Length is for the USGS blue-line 1:24,000 stream.
Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nhydro1" 1:24k streams layer.	5.70 Km	

Drainage Area:	1010 Hectares
	2495 Acres
	3.89 sq. mi.

Elevations:	Mouth: <u>679</u> feet
	Headwaters: <u>2254</u> feet
	Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.
 Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): Steelhead

Ownership, for the watershed, in acres (and % of total watershed):

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	2494.6
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for ownership data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

Major Land Uses in the Watershed, in acres (and % of total watershed)

Mixed hardwood/conifer:	Hardwood:	Conifer:	Agriculture:	Urban:
0.00 acres	1444.94	0.00	391.04	14.98
0.0 %	57.9 %	0.0 %	15.7 %	0.6 %
Shrub:	Herbaceous:	Barren/rock:	Water:	
54.67	545.32	0.00	42.31	
2.2 %	21.9 %	0.0 %	1.7 %	

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.

USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
UKIAH	39123B2
REDWOOD VALLEY	39123C2

Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version)

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Forsythe Creek	111433	Upper Russian River	99.59
Coyote Valley	111432	Upper Russian River	0.41

Hydrologic Sub-Areas covered by the watershed:

Tributary to Salt Hollow Creek
Tributary to Russian River
Tributary to

Name: Salt Hollow Creek, North Fork **LLId: (1:24k)** 1231996392581 **County:** Mendocino
Location: **T:** 16N **R:** 12W **S:** 9 **Latitude:** 39.2581511428284 **Longitude** 123.199593484264

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

Stream Order: 1	Total Length: 2.67 Miles	Note: Length is for the USGS blue-line 1:24,000 stream.
Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nhydro1" 1:24k streams layer.	4.30 Km	

Drainage Area:	1010 Hectares
	2495 Acres
	3.89 sq. mi.

Elevations:	Mouth: 679 feet
	Headwaters: 2254 feet
	Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 0 Surface area: 0 sq. mi.
 Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): None

Ownership, for the watershed, in acres (and % of total watershed):

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	2494.6
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for ownership data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

Major Land Uses in the Watershed, in acres (and % of total watershed)

Mixed hardwood/conifer:	Hardwood:	Conifer:	Agriculture:	Urban:
0.00 acres	1444.94	0.00	391.04	14.98
0.0 %	57.9 %	0.0 %	15.7 %	0.6 %
Shrub:	Herbaceous:	Barren/rock:	Water:	
54.67	545.32	0.00	42.31	
2.2 %	21.9 %	0.0 %	1.7 %	

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.

USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
UKIAH	39123B2
REDWOOD VALLEY	39123C2

Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version)

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Forsythe Creek	111433	Upper Russian River	99.59
Coyote Valley	111432	Upper Russian River	0.41