CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
North Fork Mill Creek
Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on the North Fork Mill Creek. 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 the North Fork Mill Creek. 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

The North Fork Mill Creek, located in Mendocino County, California, is a tributary to Mill Creek, a tributary of the Russian River (see North Fork Mill Creek map, page 2). The legal description at the confluence with the Mill Creek is T15N, R12W, Rancho Yokayo. Its location is 39°07'53.5" N. latitude and 123°09'18.5" W. longitude. Year round vehicle access exists from Highway 101 near Ukiah, by heading east at the Talmage exit, turning south on River Road, heading east on Mill Creek Road then heading north Guidiville Reservation Road.

North Fork Mill Creek and its tributaries drain a basin of approximately 9.42 square miles. North Fork Mill Creek is a third order stream and has approximately 5.02 miles of blue line stream and 0.8 miles of intermittent stream, according to the USGS Ukiah and Cow Mountain 7.5 minute quadrangles. The one major tributary, Willow Creek, is 0.2 miles above a 50' fish barrier on North Fork Mill Creek. Willow Creek is included in *italics* throughout this stream report. Summer flow on North Fork Mill Creek was measured as approximately 0.3 cfs at an unknown location. Elevations range from about 660 feet at the mouth of the creek to 3140 feet in the headwaters. The upper watershed is mostly chaparral, with oak woodland on north-facing slopes and in canyon bottoms and large numbers of tiger lilies, especially in the Willow Creek basin. In the lower watershed, there is rural-residential development and vineyards, as well as some open grassy areas with a towering riparian canopy**.** With the exception of approximately 530 acres of private land, which constitutes 36% of the watershed, the BLM owns almost the entire watershed. Land uses include rural residential development and vineyard development in the lowest part of the

watershed, and recreational activities such as hiking, hunting, and off-road vehicles in the rest of the watershed. The California Natural Diversity Data Database lists Bolander's horkela (*Horkelia bolanderi*) and Raiches manzanita (*Arctostaphylos stanfordiana ssp. Raichei*) in the North Fork Mill watershed. There is no historical record of salmonids on the North Fork Mill Creek.

METHODS

The habitat inventory conducted in North Fork Mill 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 Derek Acomb, 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 the North Fork Mill Creek 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.

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. De-watered units are labeled "DRY". Mill 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. 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 Mill Creek, 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 Mill Creek, 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.

8. Canopy:
Stream canopy density is estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual (1998). Canopy density relates to the amount of stream shaded from the sun. In Mill 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. 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 Mill Creek, 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 Stream Habitat 2.0.16, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- 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 North Fork Mill 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 North Fork Mill Creek prior to this year.

HABITAT INVENTORY RESULTS

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

The habitat inventory of Mill Creek, North Fork, July 25, 2001 - August 2, 2001, was conducted by L.MacTague. J.Facendini and M.Shugars(DFG) with supervision and analysis by California Department of Fish and Game (DFG). The survey began at the confluence with Mill Creek and extended up the North Fork Mill Creek to a 50 foot high barrier. The total length of stream surveyed was 15199 feet, with no length of side channel.

A flow of 0.26 cfs was measured on August 8, 2001 at habitat unit with a Marsh-McBirney Model 2000 flow meter.

This section of the North Fork Mill Creek has 3 reaches with 3 distinct channel types: from the mouth to 5913 feet a F3, 5260 feet a B2 and 4026 feet a A2.

F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate.

B2 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 bedrock substrate.

A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate.

Water temperatures ranged from 60ºF to 68ºF. Air temperatures ranged from 69ºF to 90ºF.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on total *length* there were 42.6% Dry units, 36.3% Flatwater units, 12.0% Pool units and 9.1% Riffle units (Graph 2). Based on frequency of *occurrence* there were 37.8% Flatwater units, 34.9% Pool units, 17.4% Riffle units and 9.9% Dry units. (Graph 1).

One hundered and seventy-two habitat units were measured and 28% were completely sampled. Sixteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent *occurrence* were Step Run at 20%, Mid-Channel Pool at 11%, Dry at 10%, Glide at 10% and Low Gradient Riffle at 9%. By percent total *length*, Dry at 43%, Flatwater at 36% and Riffles at 9%.

Sixty pools were identified (Table 3). Mid-Channel Pool pools were most often encountered at 11%, (Graph 3), and comprised 24% of the total length of pools.

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

Eight of the 58 pools (14%) had a depth of three feet or greater (Graph 5).

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. Riffles rated 5, Pools rated 26 and Flatwater units rated 10 (Table 1). Of the pool types, Lateral Scour Pool - Root Wad Enhanced rated 53, Mid-Channel Pool rated 36, Lateral Scour Pool - Bedrock Formed rated 32, Step Pool rated 23, Plunge Pool rated 23, Lateral Scour Pool - Boulder Formed rated 13, Corner Pool rated 13 and Dammed Pool rated 10 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were Boulders at 50%, Small Wood at 14%, Bedrock at 13%, and White Water at 13%. Graph 7 describes the pool shelter in the North Fork of Mill Creek.

Table 6 summarizes the dominant substrate by habitat type. In the 15 Low-Gradient Riffles surveyed, the dominant substrate was Small Cobble in two riffles and Boulders in one riffle.
The depth of cobble embeddedness was estimated at pool tail-outs. Of the 58 pool tail-outs measured, eleven had a value of 1 (19%), fourteen had a value of 2 (24%), eleven had a value of 3 (19%) and four had a value of 4 (7%). Eighteen (31%) riffles rated a 5 (Graph 6). Level 5 is unsuitable for spawning. On this scale, a value of 1 is best for fisheries. Boulders and Small Cobble were the dominant substrate observed at pool tail-outs, at 31.6 and 26.3%, respectively (Graph 8).

The mean percent canopy density for the stream reach surveyed was 75%. The mean percentages of deciduous and evergreen trees were 84% and 16%, respectively. Graph 9 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 80% and the mean percent left bank vegetated was 75%. For the habitat units measured, the dominant vegetation types for the stream banks were: 46% Brush, 30% Deciduous Trees, 16% Bare Soil and7% Evergreen Trees (Graph 11). The dominant substrate for the stream banks were: 50% Silt, Clay & Sand, 31% Bedrock, 18% Boulder and 1% Cobble & Gravel (Graph 10).

HABITAT INVENTORY RESULTS: Willow Creek

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

The habitat inventory of 7/19/2001 to 7/19/2001, was conducted by Laine MacTague and Jeff Facendini, (DFG). The total length of the stream surveyed was 1,727 feet.

Stream flow was not measured on Willow Creek.

Willow Creek is an A2 channel type for 1,727.3 feet of the stream surveyed (Reach 1). A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel dominant substrates.

Water temperatures taken during the survey period ranged were54 degrees Fahrenheit. Air temperatures ranged from 72 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 29% pool units, 57% riffle units, 7% dry units, 7% flatwater units, (Graph 1). Based on total length of Level II habitat types there were 5% pool units, 28% riffle units, 62% dry units, and 4% flatwater units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 36% Cascade units, 21% High Gradient Riffle units, and 14% Step Pool units (Graph 3). Based on percent total length, 62% Dry units, 15% Cascade units, and 13% High Gradient Riffle units were found.

A total of four pools were identified (Graph 4). Main Channel pools were the most frequently encountered, at 75%, and comprised 81% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Two of the four pools (50%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the four pool tail-outs measured, one had a value of 1 (25%); three had a value of 2 (75%), (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

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. Riffle habitat types had a mean shelter rating of 5, flatwater habitat types had a mean shelter rating of 45 , and pool habitats had a mean shelter rating of 11 (Table 1). Of the pool types, the Main Channel pools had a mean shelter

rating of 12, Scour pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Willow Creek. Graph 7 describes the pool cover in Willow Creek. Boulders are the dominant pool cover type followed by bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 50% of pool tail-outs, and small Cobble observed in 50% of pool tail-outs.

The mean percent canopy density for the surveyed length of Willow Creek was 80%. The mean percentages of hardwood and coniferous trees were 36% and 64%, respectively. Twenty percent of the canopy was open. Graph 9 describes the mean percent canopy in Willow Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 66%. The mean percent left bank vegetated was 83.3%. The dominant elements composing the structure of the stream banks consisted of 42.5% sand/silt/clay, and 25% bedrock (Graph 10). Brush was the dominant vegetation type observed in 58.3% of the units surveyed. Additionally, 8.3% of the units surveyed had hardwood trees as the dominant vegetation type, and 8.3% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

In October 16, 2001, a biological inventory was conducted in the North Fork Mill Creek to document the fish species composition and distribution. The one site surveyed was single-pass electro-fished using one Smith Root Model 12 electro-fisher. Fish from the 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 64° to 65°F and water temperatures ranged from 57° to 60° F.

The inventory of Site 1 started approximately 1.6 miles from the mouth and ended approximately 391 feet upstream. In riffle, step-run and pool habitats, at least 20 steelhead (ranging from 1 plus year to 2 plus years old) were observed along with at least 17 newts, at least 5 pacific giant salamanders and at least 4 yellow-legged frogs.

During the habitat inventory, no salmonids were observed upstream of unit 150, 13,752 feet above the confluence with Mill Creek, which appears to impede further passage.

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
2001	Sculpin	DFG	N
2001	Rough Skin Newt	DFG	N
2001	Pacific Giant Salamander	DFG	N
2001	California Newt	DFG	N
2001	Yellow-legged Frog	DFG	N
2001	Garter Snake	DFG	N

ADULT SURVEYS:

There is no record of any carcass or spawning survey having been performed by DFG in the North Fork Mill Creek

DISCUSSION

The North Fork Mill Creek has three reaches: 5913 feet a F3, 5260 feet a B2 and 4026 feet a A2. According to the DFG Salmonid Stream Habitat Restoration Manual, F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, 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.

B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover. 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 high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

The water temperatures recorded on the survey days July 25, 2001 - August 2, 2001 ranged from 60ºF to 68ºF. Air temperatures ranged from 69ºF to 90ºF. The warmest water temperatures were recorded in Reach 3. These temperatures, if sustained, are above the threshold stress level (65ºF) for salmonids.

It is unknown if this thermal regime is typical. 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 12% of the total length of this survey. In third order streams a primary pool is defined to have a maximum depth of at least three 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 Mill Creek, the pools are relatively shallow with 12% having a maximum depth of at least three feet.

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 26. 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 Boulders at 61%, Small Wood at 8%, Bedrock at 9% and White Water at 4%. 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.

Two of the three low gradient riffles measured (67%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Twenty-six percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 19% 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. In North Fork Mill Creek, the amount of fine sediment in potential spawning habitat seems to be minimal.

The mean percent canopy for the survey was 75%. This is acceptable, since 80 percent is generally considered desirable, however cooler water temperatures are desirable in North Fork Mill 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: Willow Creek

Willow Creek is an A2 channel type for 1,727.30 feet of the stream surveyed (Reach 1). A2 Channel Types are generally not suitable for stream habitat structures.

The water temperatures recorded on the survey days 7/19/2001 to 7/19/2001, were 54 degrees Fahrenheit. Air temperatures ranged from 72 to 80 degrees Fahrenheit. 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 4% of the total length of this survey, riffles 28%, and pools 5%. The pools are relatively shallow, with only two of the four (50%) pools having a maximum residual 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 residual 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 for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Four of the four pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4, and none of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Willow Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Four of the four pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 11. The shelter rating in the flatwater habitats was 45. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Boulders in Willow Creek. Boulders are the dominant cover type in pools followed by bedrock ledge. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 80%. Reach 1 had a canopy density of 80%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 66% and 83.3%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

GENERAL MANAGEMENT RECOMMENDATIONS

Mill Creek should be managed as an anadromous, natural production stream.

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) Access for migrating salmonids is an ongoing potential problem in Reach 3, therefore, fish passage should be monitored, and improved where possible.

2) In Mill Creek, 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.

3) 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.

4) 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.

5) 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.

6) Increase the canopy on Mill Creek 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.

SURVEY COMMENTS – North Fork Mill Creek

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

North Fork Mill Creek

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	Concrete blocks and garbage intermittent throughout from here to Guidi Rd. culvert. Wet xing 34'-SEE FORM. Chest high pipe at 50'. RB Rip Rap 45'-78'. Fence over creek at334'; RB *Arundo* 340'
520	0002.00	Pacific tree frog(PTF), SH, Sculpin; LWD PROTOCOL(OL/2/10/B/6)
539.8	0003.00	Hose, Plastic, SH, PTF
752.8	0007.00	Culvert at 2685'-SEE FORM; LB Home at 2800'
2993.1	0009.00	LWD PROTOCOL(OG/2/20); RSNL. LB concrete. All 5'-28'
3088.1	0010.00	WP 022(F4)/N39°07'59.7"/W123°08'43.9"
3177.3	0011.00	Garter Snake, RSN, SH
3197.8	0012.00	RB IVY
3319.5	0014.00	SH, RSN
3347.1	0015.00	LB Home. Refuse on Bank, IVY, concrete
3727.9	0017.00	RB *Arundo*
3788.9	0019.00	LB House-non-natives and loud dogs
3823.7	0020.00	LB concrete and Rock wall; 6-7 3+ and 3+ SH; WP 023(F4)/N39°08'3.5"/W123°08'41.4"; RB *Arundo*; LB Gabions
3884.2	0022.00	Yellow-legged frog (YLF)

3947.9	0023.00	LB *vinca*
4024.9	0024.00	LB Rock wall in creek. LB Dry gully at top of unit
4091.9	0027.00	LB- well about 50' away; RSN
4116.1	0028.00	58' rotten pipe causing minor jam. Incredible grape vine tangle at 600'; 693'-big metal junk. Accumulation at 86'-SEE FORM; Accumulation-SEE FORM; 6' fence crossing at 281'
5067.3	0029.00	LWD PROTOCOL(AL/2.5/10/B/6); Accumulation - SEE FORM
5079	0030.00	WP 024(F4)/N39°08'9.1"/W123°08'25.8"; Alternative housing at 91'-SEE PHOTO; Accumulation at 68' - SEE FORM; PTF, SH(micro-pool)
5411.1	0031.00	Sulfur smell. YLF and RSN
5799.4	0036.00	PTF
5913.4	0037.00	Channel type change (F3----->B2)
5950.6	0038.00	Erosion between debris accumulations - SEE FORM; Accumulation at 260'-SEE FORM; Accumulation at 315'-SEE FORM; LWD PROTOCOL(MA/3/30/c/10); LWD PROTOCOL(AL/1.5/10/B/6)
6340.6	0039.00	About 40 RSN; about 6 2+ and 3+ SH
6356.7	0040.00	RB Dry gully at 20'; WP 025(F4)/N38°08'13.0"/W123°08'0.7"
7014.7	0041.00	Channel Type 'A' for about 250'
7537.6	0050.00	WP 026(F4)/N39°08'15.3"/W123°08'07.0"
7554.6	0051.00	RB dirt road 40' upslope
7649.6	0052.00	LB-8" pipes bent around alder at flood
7735.6	0053.00	RB road down to 8' upslope

7926.6	0054.00	RB rusty 8" pipe
7955.6	0055.00	LB road up DFG truck; Two 8' pipes- metal and PVC-crossing creek overhead
8099.6	0056.00	LWD PROTOCOL(PVC/AL/1.5/3/C/3)-Accumulation at top-SEE FORM
8114.6	0057.00	LB defunct dirt road cut. YLF. Much 8" metal in bed
8271.6	0059.00	WD PROTOCOL(BAL/2.0/30/C/10); ACCUMULATION-SEE FORM
8360.6	0060.00	RB-Large erosion from upslope appears to be stabilizing. LB 8-12" pipe 20' up; WP 027(F4)/N39°08'17.2"/W123°07'57.4"
8454.6	0062.00	RSN-many
8470.6	0063.00	Begin 8" diversion. PVC pipe in creek by LB
8485.6	0064.00	RSN-many
8656.9	0068.00	Many pipes supporting the diversion pipe. About 10 1+ and 2+ SH. Pool tail with much cementing (natural?) of substrate.These notes pertain to the next HU as well
8691.9	0069.00	See notes from HU #68; Those notes apply to both habitat units
8725.9	0070.00	WP 031(F4)/N39°08'17.7"/W123°07'53.1"; LB - Debris accumulation at top of unit-SEE FORM
8786.9	0072.00	RSN are fat again now
8872.9	0073.00	SH
8904.9	0074.00	Nice healthy habitat
9069.9	0077.00	Still many RSN in each HU
9256.9	0080.00	WP 028(F4)/N39°08'20.1"/W123°07'45.1"
9584.9	0083.00	Dipper.

9798.9	0087.00	LB much seepage this entire unit
9833.9	0088.00	LB spring 5' upslope
9872.9	0090.00	WP 030(F4) N39°08'23.7"/W123°07'43.2"
9894.9	0092.00	Water disappears underground on LB at top of unit-much mineral deposit stone in area
9914.9	0093.00	Debris accumulation at 250'-SEE FORM; LB Trickling cave at 35'; intermittent at 95'- SEE NOTEBOOK
10497.9	0098.00	SH
10597.9	0100.00	WP 032(F4)/N39°08'26.0"/W123°07'36.3"
10842.9	0102.00	RB dry trib at 50'
10881.9	0103.00	YOY
11096.9	0105.00	LB Erosion gully-basically stable source of LWD and minor gravel
11172.9	0106.00	Channel Type Change(B2----->A2)
11208.9	0107.00	Still RSN
11317.9	0110.00	WP 033(F4)/N39°08'32.7"/W123°07'33.3"
11462.9	0113.00	Pacific Giant Salamander (PGSL)
11604.9	0114.00	1+ SH and other salmonids
11802.9	0120.00	WP 034(F4)/N39°08'40.7"/W123°07'26.8"; Lots of Tan oak leaves
11831.9	0121.00	YOY. Shallow erosion gullies RB-gravel source
12133.9	0127.00	YOY

12195.9	0129.00	LWD PROTOCOL(AL/2.5/30/B/6); 2+ SH and 1+ SH; Many pools; Debris accumulation at 81'-SEE FORM
12301.9	0130.00	2+ SH; WP 035(F4)/N39°08'37.1"/W123°07'25.3"
12521.9	0133.00	1+ SH; YLF; RSN; Many Pools
12567.9	0134.00	DIPPER
12792.9	0136.00	1+ SH
12947.9	0139.00	Debris accumulation at top of unit-SEE FORM
12969.9	0140.00	WP 036(F4)/N39°08'33.5"/W123°07'18.4"
13123.9	0145.00	1+ and YOY SH
13154.9	0146.00	YOY and 1+ SH
13354.9	0147.00	YOY and 3+ SH (rainbow)
13371.9	0148.00	RB damp seep at 14'
13534.9	0149.00	RB- 50-60' overhanging mineral formation from seep. 1+ SH
13632.9	0150.00	YOY, 2+, 3+ SH; WP 037(F4)/N39°08'36.4"/W123°07'11.3"
13958.9	0153.00	PGSL, RSN
14155	0155.00	PGSL, RSN; Cementing is almost absent
14402	0160.00	WP 038(F4)/N39°08'31.1"/W123°07'0.7"
14551.6	0165.00	PGSL
14752.6	0167.00	Healthy sediment recruitment.

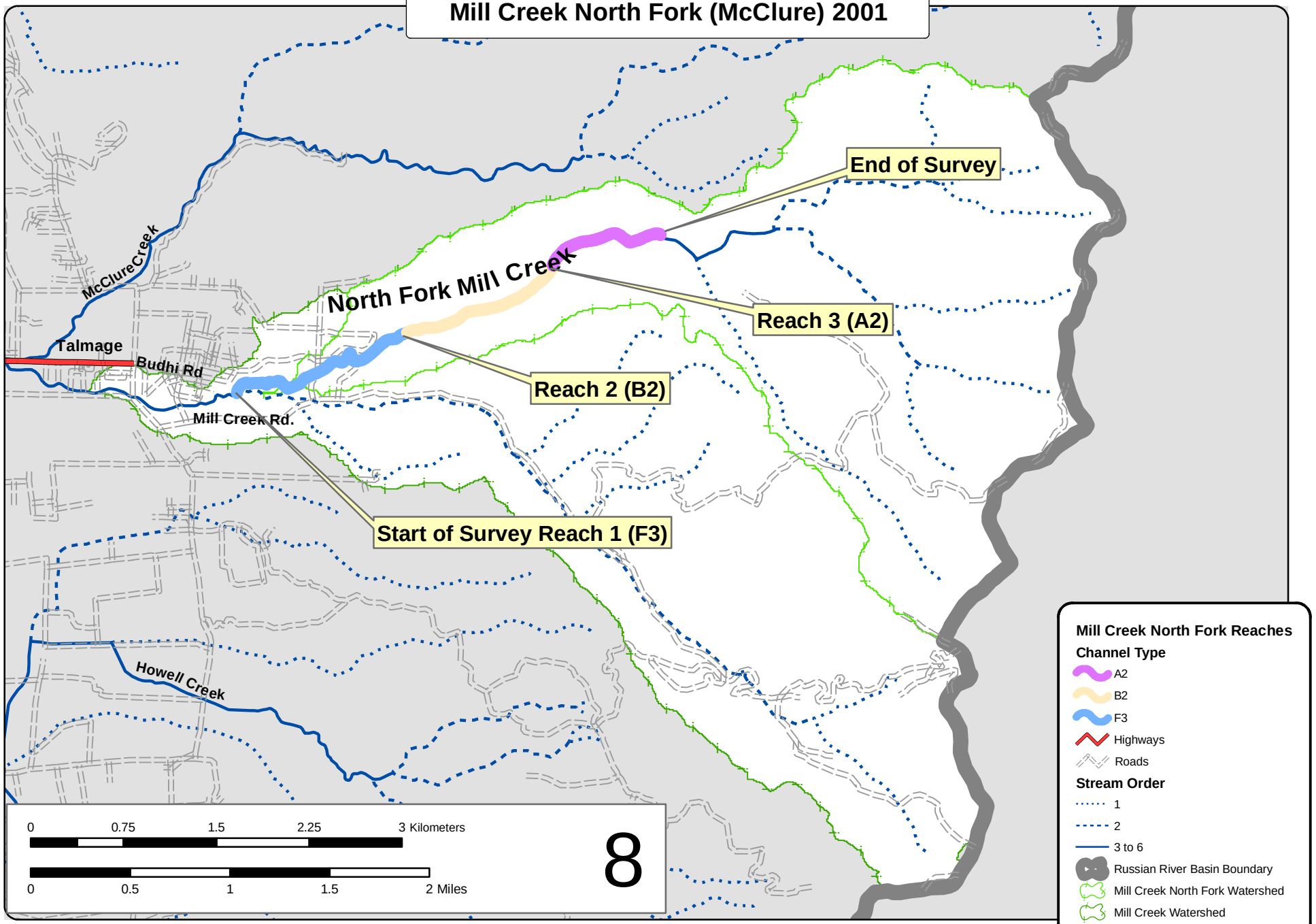
14994.6	0168.00	PGSL
15077.6	0170.00	WP(F4)/N39°08'38.2"/W123°06'58.8"
15163.6	0172.00	PGSL; WP 041(F4)/N39°08'38.4"/W123°06'57.9"; END OF SURVEY: END

SURVEY COMMENTS – Willow Creek

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

Position (ft.)	*Habitat Unit #*	*Comments:*
0	*0001.00*	*N 39°08'32.4" W 123°06'46.1"*
24.9	*0002.00*	*Garter snake*
108.9	*0003.00*	*Rough-Skinned Newt, dark and especially pale color variety, common throughout creek.*
126.3	*0004.00*	*LOG ACCUMULATION: BLM H:5', W:16', L:28' ; in-stream Retaining gravel: 2.5': No fish seen upstream, no scour pool beneath, no maintenance required. Notes: recent fall, will clear well LWD protocol: BA/1/30/E/3*
224.3	*0005.00*	*LB shallow dry gully, primarily cobble recruitment 1".*
371.9	*0010.00*	*N 39°08"27.0" W 123°06'41.9"*
452.3	*0011.00*	*RB - heavy seep/spring@110', almost entire flow, see photo. N 39°08'27.2" W123°06'41.9"*
581.3	*0013.00*	*RB- beach at 600' garter snakes @1070'*
1651.3	*0014.00*	*LOG ACCUMULATION@ 33' Land owner: BLM Instream, H:6', W:18', L:11.1' Retaining gravel: 3'; No fish seen upstream, no scour pool, no maintenance advised. LWD protocol: BA/1/15/F/6 End OF SURVEY - bedrock cascade at top of habitat unit 014. Approximately 200'+; N 39°08'18.0" W123°06'36.7"*

Mill Creek North Fork (McClure) 2001



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Prepared by: Celeste Dodge and Colin Brooks, March 28, 2005

Appendix B: Tables

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

Stream Name: North Fork Mill Creek

LLID: 1231551391315

Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

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
17	1	DRY	9.9	381	6480.9	42.6	20.0								
65	11	FLATWATER	37.8	85	5518.1	36.3	5.9	0.6	1.2	380	24724	213	12580		10
60	59	POOL	34.9	30	1820.7	12.0	9.0	1.0	2.2	273	16403	343	20209	286	26
30	11	RIFFLE	17.4	46	1378.9	9.1	4.8	0.3	0.6	166	4982	58	1747		5

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
172	82	15198.6	46110	34535

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: North Fork Mill Creek

LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

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 (%)
15	3	LGR	8.7	46	688	4.5	4	0.3	0.8	59	890	15	228			92
8	4	HGR	4.7	51	407	2.7	8	0.4	1	215	1719	82	657		5	97
3	2	CAS	1.7	8	24	0.2	0	0.1	0.3	2	5	0	0			93
4	2	BRS	2.3	65	260	1.7	4	0.5	1.1	393	1572	133	533		5	75
17	7	GLD	9.9	53	909	6.0	6	0.7	1.7	335	5697	216	3151		13	90
13	1	RUN	7.6	64	827	5.4	7	0.4	0.8	482	6261	193	2504		5	84
35	3	SRN	20.3	108	3782	24.9	6	0.5	1.7	452	15829	213	7451		5	89
19	19	MCP	11.0	23	437	2.9	8	1.0	3.2	188	3570	244	4634	206	36	88
10	10	STP	5.8	66	655	4.3	8	1.0	3.7	539	5391	668	6683	547	23	98
2	2	CRP	1.2	31	62	0.4	9	1.0	2.8	265	529	309	619	270	13	98
4	4	LSR	2.3	20	80	0.5	5	0.7	1.8	99	397	72	289	66	53	92
3	3	LSBk	1.7	28	85	0.6	8	0.7	2.2	232	697	232	697	177	32	95
7	7	LSBo	4.1	23	164	1.1	9	0.9	3.1	197	1379	227	1590	176	13	97
14	13	PLP	8.1	22	309	2.0	12	1.4	3.9	293	4102	393	5079	337	23	78
1	1	DPL	0.6	29	29	0.2	13	1.6	2	358	358	645	645	573	10	70
17	1	DRY	9.9	381	6481	42.6	20			0	0					73

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
172	82	15198.6	48395	34759

Table 3 - Summary of Pool Types

Stream Name: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

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
29	29	MAIN	48	38	1092	60	8.2	1.0	309	8960	324	9382	31
30	29	SCOUR	50	23	700	38	9.6	1.1	235	7046	236	6842	23
1	1	BACKWATER	2	29	29	2	13.0	1.6	358	358	573	573	10

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
60	59	1820.7	16365	16797

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

Stream Name: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

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
19	MCP	33	0	0	7	37	11	58	1	5	0	0
10	STP	17	0	0	3	30	4	40	3	30	0	0
2	CRP	3	0	0	1	50	1	50	0	0	0	0
4	LSR	7	0	0	4	100	0	0	0	0	0	0
3	LSBk	5	0	0	2	67	1	33	0	0	0	0
7	LSBo	12	0	0	4	57	2	29	1	14	0	0
12	PLP	21	0	0	4	33	5	42	3	25	0	0
1	DPL	2	0	0	0	0	1	100	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
58	0	0	25	43	25	43	8	14	0	0

Mean Maximum Residual Pool Depth (ft.): 2.2

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001 Dry Units: 17

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

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
15	0	LGR									
8	4	HGR	0	3	0	0	0	0	0	98	0
3	0	CAS									
4	1	BRS	0	0	0	0	0	0	0	100	0
30	5	TOTAL RIFFLE	0	2	0	0	0	0	0	98	0
17	7	GLD	9	14	4	0	7	0	0	66	0
13	1	RUN	0	20	0	0	0	0	0	80	0
35	3	SRN	0	7	0	0	7	13	0	73	0
65	11	TOTAL FLAT	5	13	3	0	6	4	0	69	0
19	15	MCP	13	11	7	9	12	0	0	40	9
10	9	STP	0	0	1	0	0	0	6	87	7
2	2	CRP	20	53	0	0	3	0	0	0	25
4	2	LSR	10	0	0	90	0	0	0	0	0
3	3	LSBk	0	27	0	0	0	0	0	47	27
7	7	LSBo	1	0	0	1	1	0	1	96	0
14	13	PLP	0	5	3	0	0	0	10	69	12
1	1	DPL	0	0	0	0	0	0	0	90	10
60	52	TOTAL POOL	5	8	3	6	4	0	4	61	9
172	68	TOTAL	5	8	3	5	4	1	3	65	7

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001 Dry Units: 17

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

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
15	3	LGR	0	0	0	67	0	33	0
8	4	HGR	0	0	25	25	0	50	0
3	2	CAS	0	0	0	0	0	50	50
4	2	BRS	0	0	0	0	0	0	100
17	7	GLD	0	29	57	14	0	0	0
13	1	RUN	0	0	100	0	0	0	0
35	3	SRN	0	0	33	0	67	0	0
19	7	MCP	0	57	14	0	0	14	14
10	2	STP	0	50	0	0	0	50	0
2	1	CRP	0	0	100	0	0	0	0
4	3	LSR	0	67	0	33	0	0	0
3	2	LSBk	0	100	0	0	0	0	0
7	6	LSBo	0	0	33	0	0	50	17
14	4	PLP	0	25	25	0	25	25	0
1	1	DPL	0	0	0	0	0	0	100

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
88	20	80	0	48	46

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: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

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	12	18	31.3
Boulder	8	9	17.7
Cobble / Gravel	0	1	1.0
Sand / Silt / Clay	28	20	50.0

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	1.0
Brush	21	23	45.8
Hardwood Trees	14	15	30.2
Coniferous Trees	5	2	7.3
No Vegetation	7	8	15.6

Total Stream Cobble Embeddedness Values: 3

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

StreamName: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River - Upper

Survey Dates: 7/25/2001 to 8/2/2001

Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	5	5
SMALL WOODY DEBRIS (%)	2	13	8
LARGE WOODY DEBRIS (%)	0	3	3
ROOT MASS (%)	0	0	6
TERRESTRIAL VEGETATION (%)	0	6	4
AQUATIC VEGETATION (%)	0	4	0
WHITEWATER (%)	0	0	4
BOULDERS (%)	98	69	61
BEDROCK LEDGES (%)	0	0	9

Appendix B: Tables

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

Stream Name: Willow Creek

LLID: 1231127391423

Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

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	DRY	7.1	1070	1070	61.9									
1	1	FLATWATER	7.1	76	76	4.4	3.3	0.5	0.8	163	163	82	82		45
4	4	POOL	28.6	23	91.8	5.3	6.5	0.9	2.0	147	589	147	589	129	11
8	2	RIFFLE	57.1	61	489.5	28.3	5.5	0.5	1.3	272	2177	149	1193		5

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
14	7	1727.3	2929	1864

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Willow Creek

LLID: 1231127391423

Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

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 (%)
3	1	HGR	21.4	75	226	13.1	5	0.4	0.7	141	423	56	169		5	70
5	1	CAS	35.7	53	264	15.3	6	0.6	1.8	403	2016	242	1210			78
1	1	RUN	7.1	76	76	4.4	3	0.5	0.8	163	163	82	82		45	65
1	1	MCP	7.1	18	18	1.1	5	0.6	1.2	92	92	64	64	55	5	95
2	2	STP	14.3	28	56	3.2	7	0.9	2.8	188	375	189	379	163	15	95
1	1	PLP	7.1	17	17	1.0	7	1.1	2.4	122	122	146	146	134	10	
1	0	DRY	7.1	1070	1070	61.9										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
14	7	1727.3	3191	2049

Table 3 - Summary of Pool Types

Stream Name: Willow Creek LLID: 1231127391423 Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

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	75	25	74	81	6.3	0.8	156	467	127	380	12
1	1	SCOUR	25	17	17	19	7.0	1.1	122	122	134	134	10

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
4	4	91.8	589	514

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

Stream Name: Willow Creek

LLID: 1231127391423

Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

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	MCP	25	0	0	1	100	0	0	0	0	0	0
2	STP	50	0	0	1	50	1	50	0	0	0	0
1	PLP	25	0	0	0	0	1	100	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
4	0	0	2	50	2	50	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Willow Creek

LLID: 1231127391423

Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Dry Units: 1

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

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
3	1	HGR	0	0	0	0	10	0	0	90	0
5	0	CAS									
8	1	TOTAL RIFFLE	0	0	0	0	10	0	0	90	0
1	1	RUN	0	30	20	0	0	0	0	50	0
1	1	TOTAL FLAT	0	30	20	0	0	0	0	50	0
1	1	MCP	0	0	0	0	0	0	0	100	0
2	2	STP	0	0	0	0	0	0	0	95	5
1	1	PLP	0	0	0	0	0	0	0	100	0
4	4	TOTAL POOL	0	0	0	0	0	0	0	98	3
14	6	TOTAL	0	5	3	0	2	0	0	88	2

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Willow Creek

LLID: 1231127391423

Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Dry Units: 1

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

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
3	1	HGR	0	0	0	100	0	0	0
5	1	CAS	0	0	0	0	0	100	0
1	1	RUN	0	0	0	0	0	100	0
1	1	MCP	0	0	0	0	0	0	100
2	1	STP	0	0	0	100	0	0	0
1	0	PLP	0	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Willow Creek LLID: 1231127391423 Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
80	64	36	0	34	32

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: Willow Creek LLID: 1231127391423 Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

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	25.0
Boulder	0	2	16.7
Cobble / Gravel	2	0	16.7
Sand / Silt / Clay	3	2	41.7

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	0	0	0.0
Brush	4	3	58.3
Hardwood Trees	0	1	8.3
Coniferous Trees	0	1	8.3
No Vegetation	2	1	25.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Willow Creek LLID: 1231127391423 Drainage: Russian River - Upper

Survey Dates: 7/19/2001 to 7/19/2001

Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	0	30	0
LARGE WOODY DEBRIS (%)	0	20	0
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	10	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	90	50	98
BEDROCK LEDGES (%)	0	0	3

Appendix C: Fish Habitat Inventory Summary

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: North Fork Mill Creek LLID: 1231551391315 Drainage: Russian River -
Survey Dates: 7/25/2001 to 8/2/2001 Survey Length (ft.): 15198. Main Channel (ft.): 15198. Side Channel (ft.): 0
Confluence Location: Quad: UKIAH Legal Description: T000R000S00 Latitude: 39:07:53.0N Longitude: 123:09:18.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F3
Reach Length (ft.): 5913.4
Riffle/Flatwater Mean Width (ft.): 4.5
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs):
Water (F): 0 - 60 Air (F): 0 - 80
Dry Channel (ft.): 4840.6

Canopy Density (%): 90.6
Coniferous Component (%): 17.5
Hardwood Component (%): 82.5
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 76.9
Dominant Shelter: Undercut Banks
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 21.1
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 3.0
Pool Frequency (%): 22.2
Residual Pool Depth (%):
< 2 Feet Deep: 75.0
2 to 2.9 Feet Deep: 25.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.78
Mean Pool Shelter Rating: 47

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:
Embeddedness Values (%): 1. 25.0 2. 37.5 3. 37.5 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: B2
Reach Length (ft.): 5259.5
Riffle/Flatwater Mean Width (ft.): 5.7
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 60 - 64 Air (F): 72 - 90
Dry Channel (ft.): 1640.3

Canopy Density (%): 82.4
Coniferous Component (%): 22.1
Hardwood Component (%): 77.9
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 44.6
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 8.4
Pool Frequency (%): 27.5
Residual Pool Depth (%):
< 2 Feet Deep: 50.0
2 to 2.9 Feet Deep: 38.9
3 to 3.9 Feet Deep: 11.1
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 2.12
Mean Pool Shelter Rating: 16

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:
Embeddedness Values (%): 1. 27.8 2. 22.2 3. 11.1 4. 11.1 5. 27.8

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: A2
Reach Length (ft.): 4025.7
Riffle/Flatwater Mean Width (ft.): 4.7
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 60 - 68 Air (F): 69 - 81
Dry Channel (ft.): 0

Canopy Density (%): 92.2
Coniferous Component (%): 19.5
Hardwood Component (%): 80.5
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 34.2
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Bedrock
Occurrence of LWD (%): 1.4
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 29.7
Pool Frequency (%): 49.3
Residual Pool Depth (%):
< 2 Feet Deep: 31.3
2 to 2.9 Feet Deep: 50.0
3 to 3.9 Feet Deep: 18.8
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 2.38
Mean Pool Shelter Rating: 27

Pool Tail Substrate (%):	Silt/Clay:	Sand:	Gravel:	Sm Cobble:	Lg Cobble:	Boulder:	Bedrock:

Embeddedness Values (%): 1. 12.5 2. 21.9 3. 18.8 4. 6.3 5. 40.6

Appendix C: Fish Habitat Inventory Data Summary

Stream Name: Willow Creek LLID: 1231127391423 Drainage: Russian River -
Survey Dates: 7/19/2001 to 7/19/2001 Survey Length (ft.): 1727.3 Main Channel (ft.): 1727.3 Side Channel (ft.): 0
Confluence Location: Quad: COW MOUNTAIN Legal Description: T15NR11WS19 Latitude: 39:08:32.0N Longitude: 123:06:46.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: A2
Reach Length (ft.): 1727.3
Riffle/Flatwater Mean Width (ft.): 4.8
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 0
Water (F): 54 - 54 Air (F): 72 - 80
Dry Channel (ft.): 1070

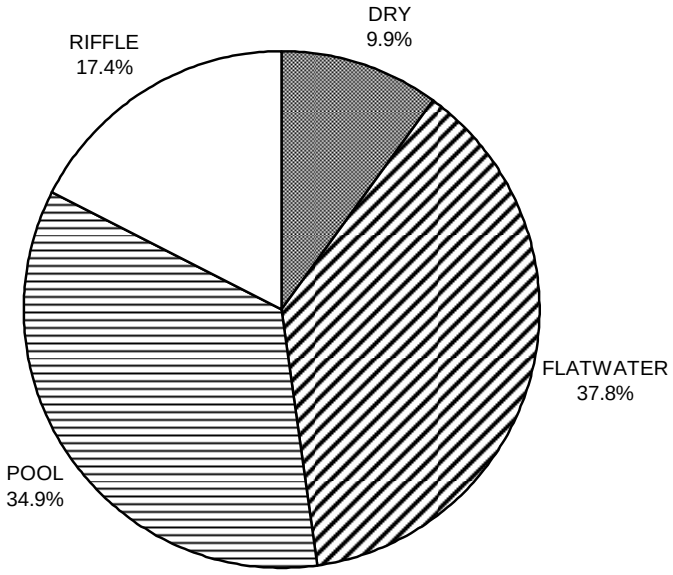
Canopy Density (%): 80.0
Coniferous Component (%): 64.3
Hardwood Component (%): 35.7
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 32.9
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 2.9
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 5.3
Pool Frequency (%): 28.6
Residual Pool Depth (%):
< 2 Feet Deep: 50.0
2 to 2.9 Feet Deep: 50.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.95
Mean Pool Shelter Rating: 11

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 50.0 Sm Cobble: 50.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 25.0 2. 75.0 3. 0.0 4. 0.0 5. 0.0

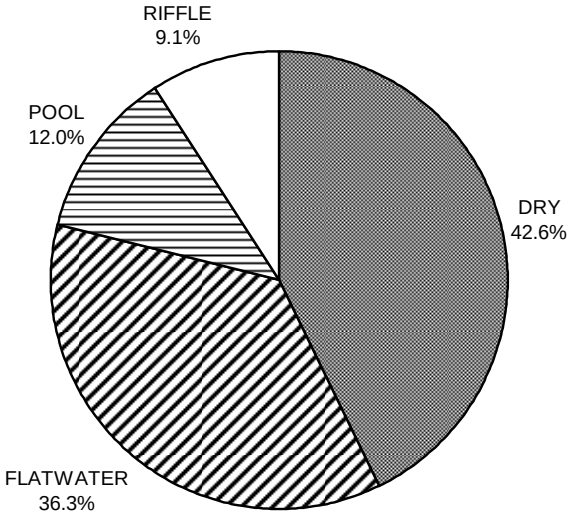
Appendix D: Graphs

NORTH FORK MILL CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE



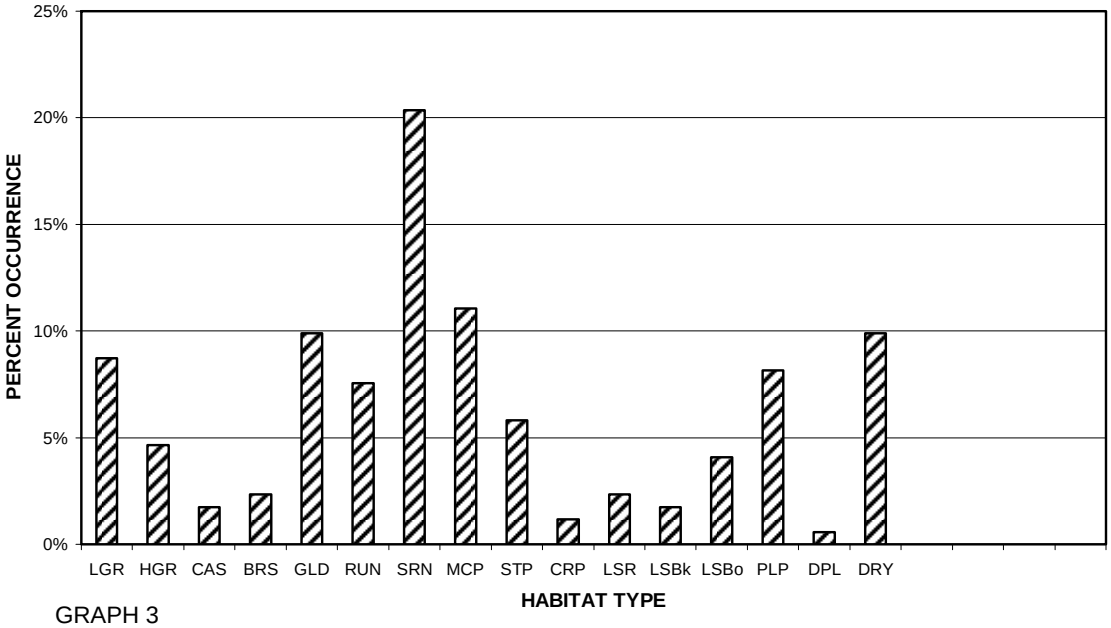
GRAPH 1

NORTH FORK MILL CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH



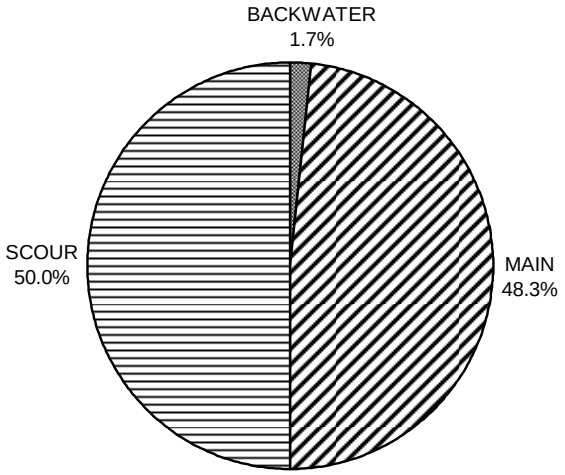
GRAPH 2

NORTH FORK MILL CREEK 2001
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE



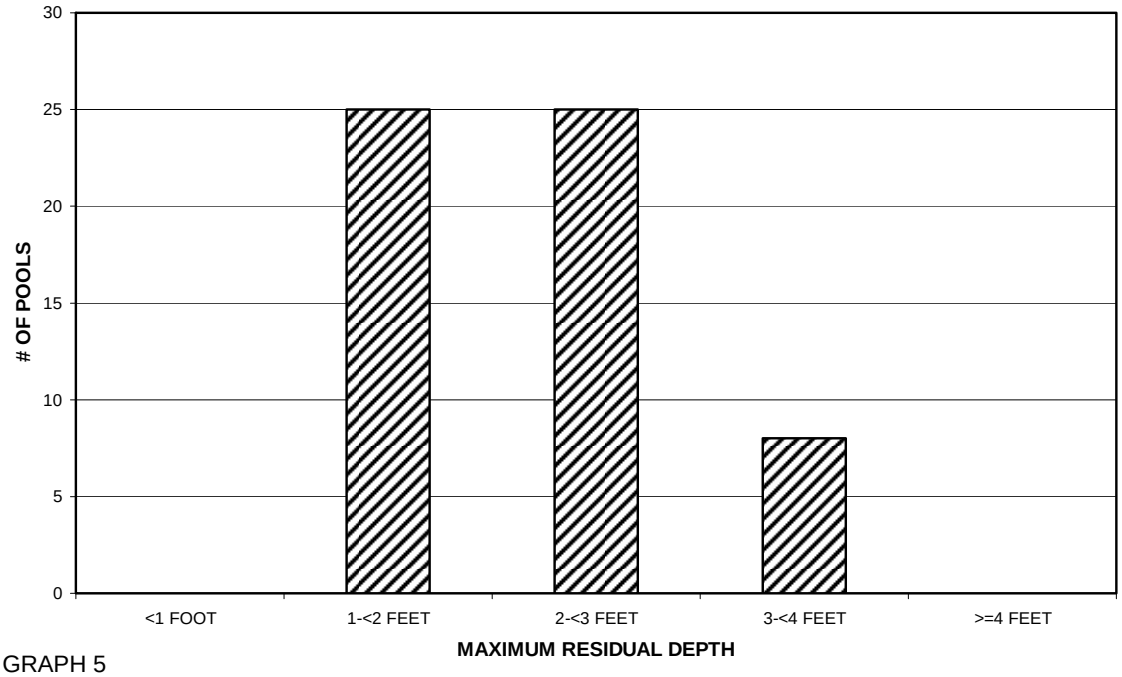
GRAPH 3

NORTH FORK MILL CREEK 2001
LEVEL I POOL TYPES BY PERCENT OCCURRENCE



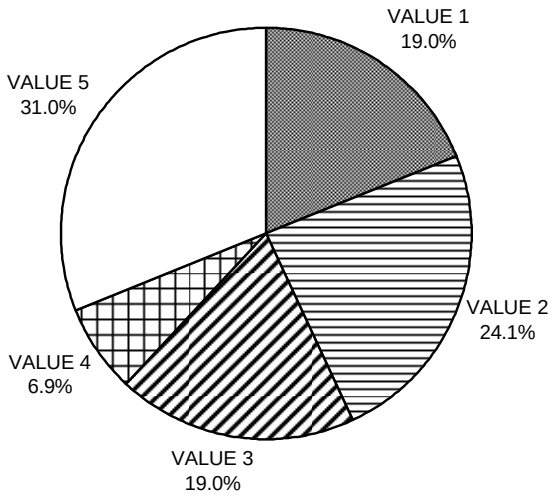
GRAPH 4

NORTH FORK MILL CREEK 2001
MAXIMUM DEPTH IN POOLS



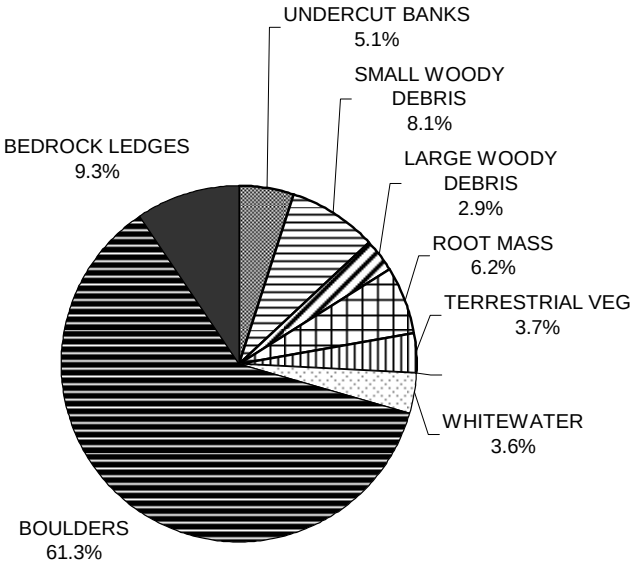
GRAPH 5

NORTH FORK MILL CREEK 2001
PERCENT EMBEDDEDNESS



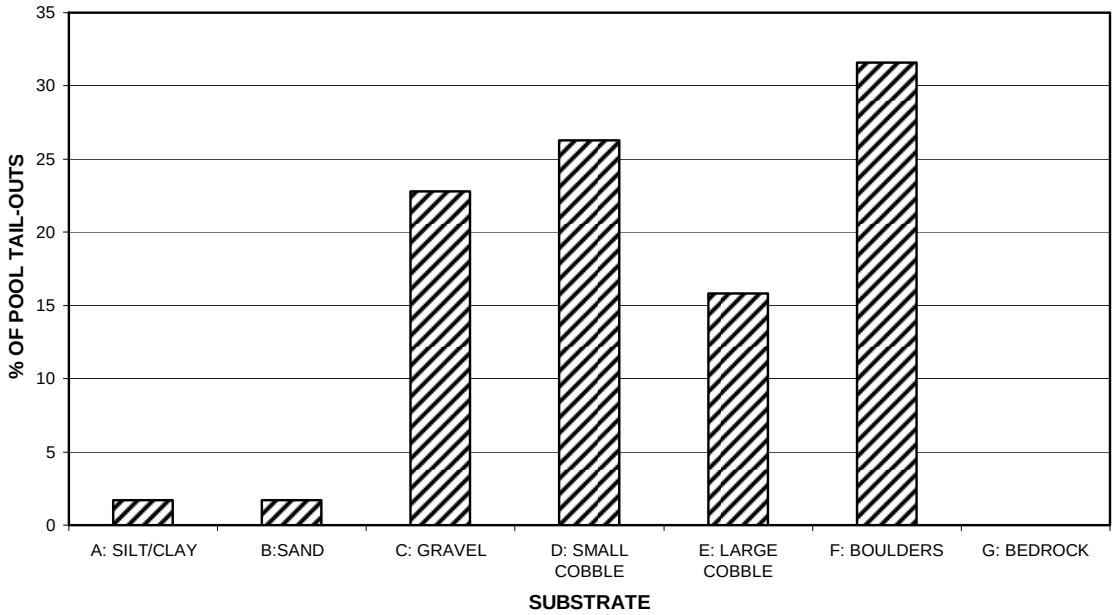
GRAPH 6

NORTH FORK MILL CREEK 2001
MEAN PERCENT COVER TYPES IN POOLS



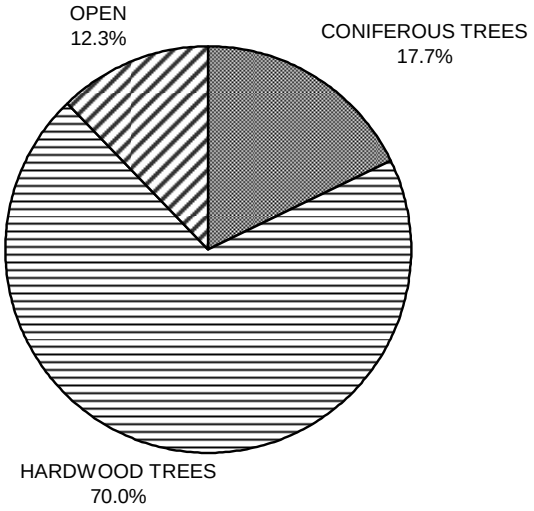
GRAPH 7

NORTH FORK MILL CREEK 2001
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



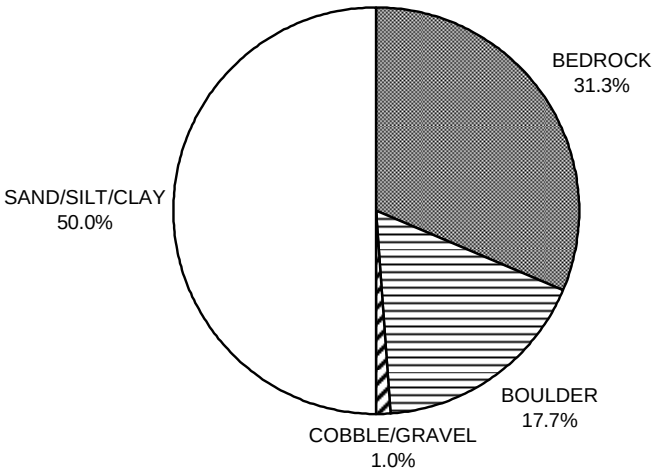
GRAPH 8

NORTH FORK MILL CREEK 2001
MEAN PERCENT CANOPY



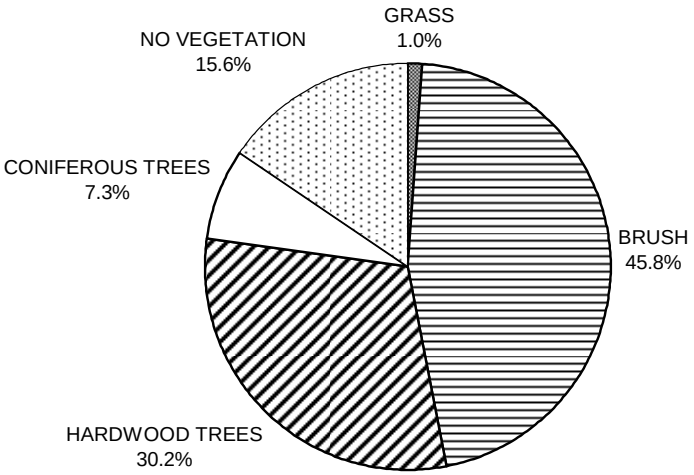
GRAPH 9

NORTH FORK MILL CREEK 2001
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

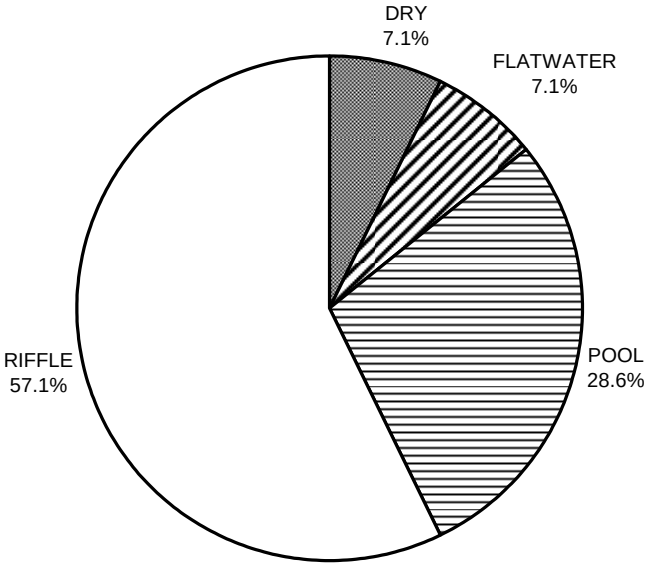
NORTH FORK MILL CREEK 2001
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

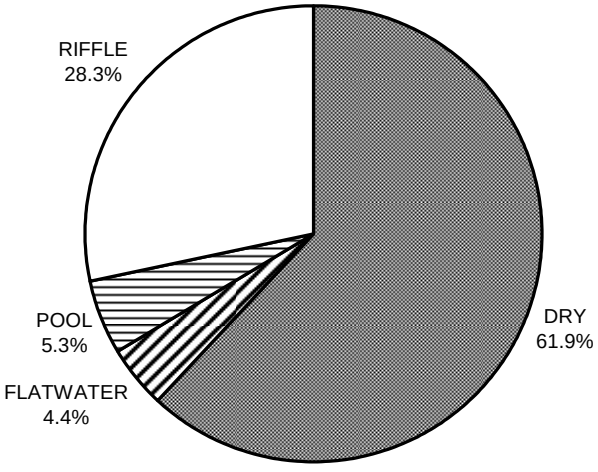
Appendix D: Graphs

WILLOW CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE



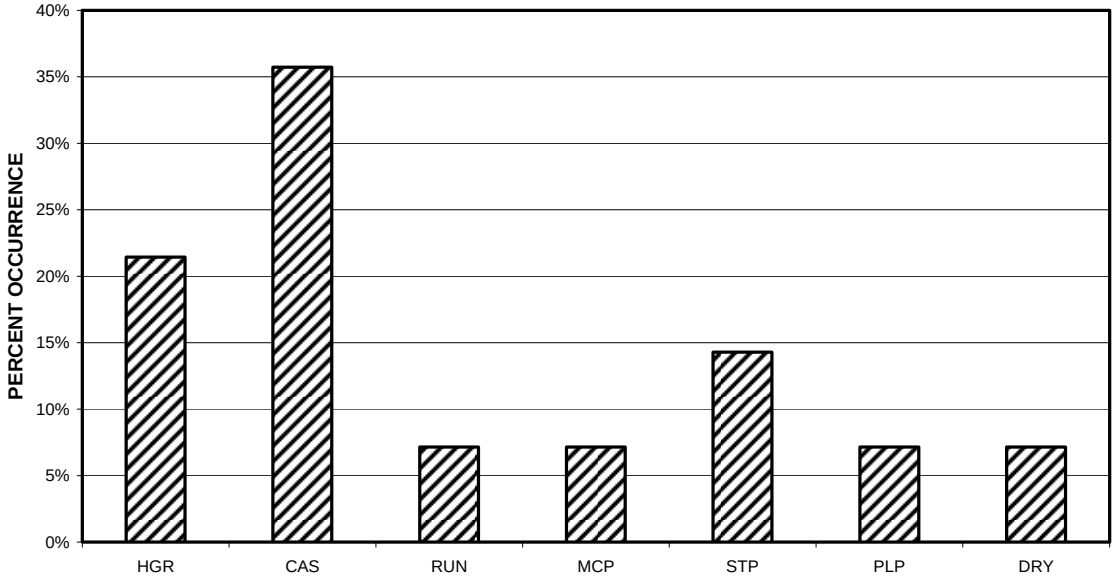
GRAPH 1 Level II habitat types by percent occurence

WILLOW CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH



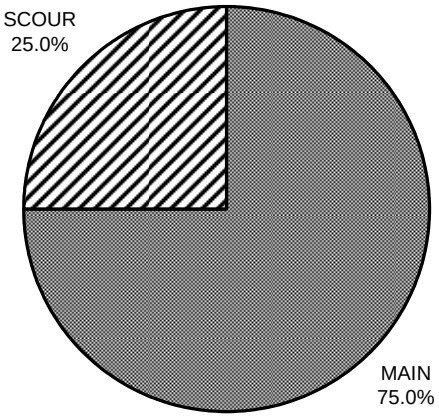
GRAPH 2 Level II habitat types by percent total length

WILLOW CREEK 2001
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3 Level IV habitat types by percent occurence

WILLOW CREEK 2001
LEVEL I POOL TYPES BY PERCENT OCCURRENCE

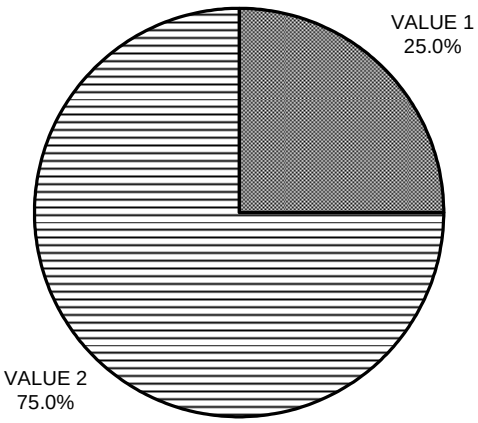


GRAPH 4 Level I pool types by percent occurence

WILLOW CREEK 2001
MAXIMUM DEPTH IN POOLS

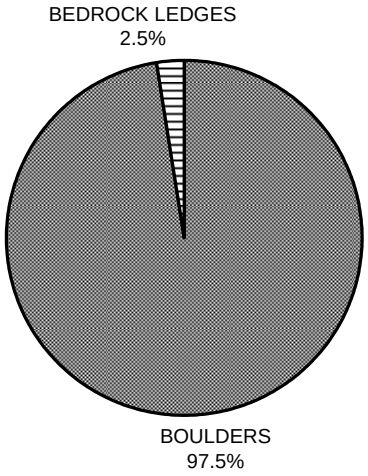
GRAPH 5

WILLOW CREEK 2001
PERCENT EMBEDDEDNESS



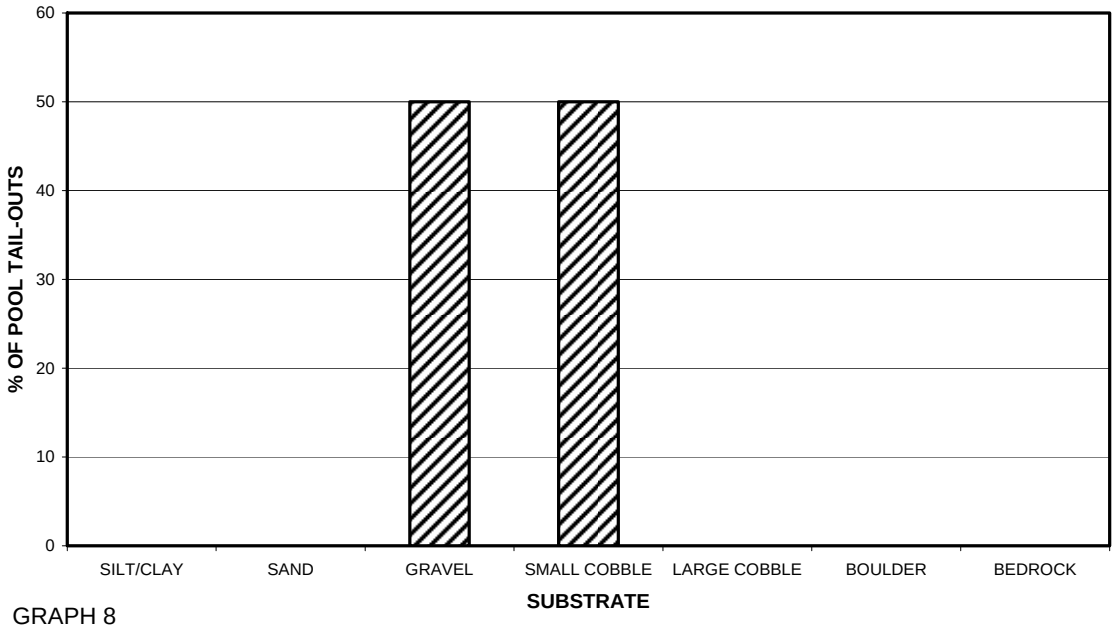
GRAPH 6

WILLOW CREEK 2001
MEAN PERCENT COVER TYPES IN POOLS



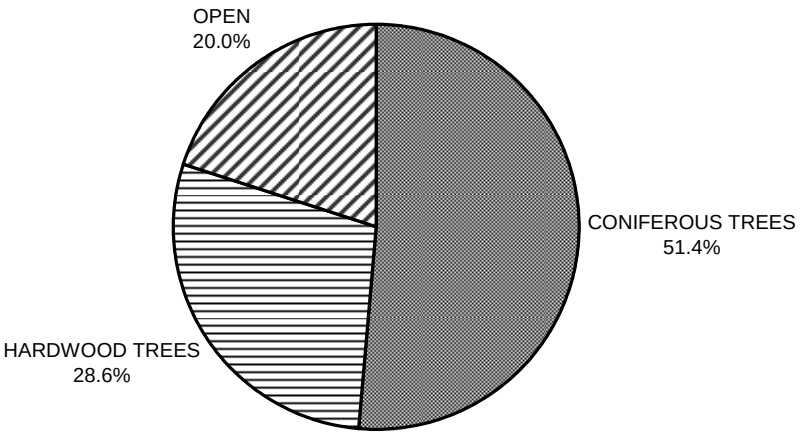
GRAPH 7

WILLOW CREEK 2001
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



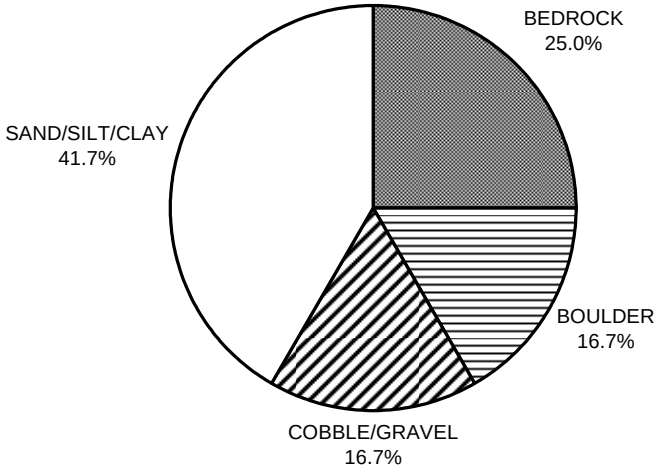
GRAPH 8

WILLOW CREEK 2001
MEAN PERCENT CANOPY



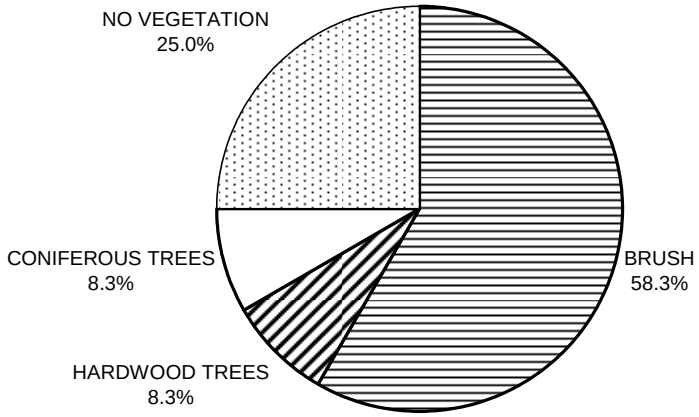
GRAPH 9

WILLOW CREEK 2001
DOMINANT BANK COMPOSITION



GRAPH 10

WILLOW CREEK 2001
DOMINANT BANK VEGETATION



GRAPH 11

Watershed Hydroid **436** Mill Creek, North Fork (McClure Creek)

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:
Mill Creek, North Fork (McClure C	1231551391315	Mendocino

Tributary to McClure Creek
Tributary to Russian River
Tributary to

Location: **T:** 15N **R:** 12W **S:** 26 **Latitude:** 39.1315311106221 **Longitude** 123.155150526593

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: 3 **Total Length:** 5.02 Miles 8.08 Km

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 2442 Hectares; 6034 Acres; 9.42 sq. mi.

Elevations: Mouth: 581 feet; Headwaters: 3766 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:
6965.8 acres	132.7	0.0	4050.7
62.47 %	1.19 %	0.00 %	36.34 %

Note: Source for owneship 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:
794.44 acres	3091.12	109.80	1022.39	173.59
32.2 %	41.8 %	1.5 %	13.8 %	2.3 %

Shrub:	Herbaceous:	Barren/rock:	Water:
5726.95	194.59	0.00	18.68
77.4 %	2.6 %	0.0 %	0.2 %

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
PURDYS GARDENS	39123A1
ELLEDGE PEAK	39123A2
COW MOUNTAIN	39123B1
UKIAH	39123B2

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

Scientific Name	Common Name
Horkelia bolanderi	Bolander's horkelia
Arctostaphylos stanfordiana ssp. raichei	Raiche's manzanita

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Ukiah	111431	Upper Russian River	99.84
Lakeport	551355	Upper Cache Creek	0.15
Coyote Valley	111432	Upper Russian River	0.01

Watershed Hydroid **453** Willow Creek (NFMill/McClure)

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:
Willow Creek (NFMill/McClure)	1230966384385	Mendocino

Tributary to Mill Creek
Tributary to McClure Creek
Tributary to Russian River

Location: **T:** 15N **R:** 11W **S:** 19 **Latitude:** 39.1423507597471 **Longitude** 123.112727824739

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: 3 **Total Length:** 2.13 Miles 3.43 Km

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 246 Hectares; 607 Acres; 0.94 sq. mi.

Elevations: Mouth: 1647 feet; Headwaters: 3235 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:
582.5 acres	0.0	0.0	24.9
95.96 %	0.00 %	0.00 %	4.04 %

Note: Source for owneship 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	145.17	0.00	0.00	0.00
0.0 %	23.9 %	0.0 %	0.0 %	0.0 %

Shrub:	Herbaceous:	Barren/rock:	Water:
461.31	0.00	0.00	0.00
76.0 %	0.0 %	0.0 %	0.0 %

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

Watershed HydroId **453** Willow Creek (NFMill/McClure)

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

Quad Name	USGS Code
PURDYS GARDENS	39123A1
COW MOUNTAIN	39123B1

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
Ukiah	111431	Upper Russian River	99.86
Lakeport	551355	Upper Cache Creek	0.14