

CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Unnamed tributary to Hensley Creek
Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2002

INTRODUCTION

A stream inventory was conducted during 6/27/2002 to 7/1/2002 on Hensley Creek, Trib. The survey began at the confluence with Hensley Creek and extended upstream 2.1 miles. Stream inventories and reports OR subsections to this report were also completed for one, two, or etc... tributaries to Hensley Creek, Trib .

The Hensley Creek, Trib inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Hensley Creek, Trib. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

Hensley Creek, Trib is a tributary to Hensley Creek, is a tributary to Russian River, is a tributary to Pacific Ocean, located in Mendocino County, California (Appendix A). Hensley Creek, Trib's legal description at the confluence with Hensley Creek is T15N R12W S05. Its location is 39°11'28.0" N latitude and 123°13'12.0" W longitude, LLID number 1232201391911. Hensley Creek, Trib is a second order stream and has approximately 2.9 miles of blue line stream according to the USGS Orrs Springs 7.5 minute quadrangle. Hensley Creek, Trib drains a watershed of approximately 2.7 square miles. Elevations range from about 668 feet at the mouth of the creek to 1522 feet in the headwater areas. Mixed hardwood/mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for recreation. Vehicle access exists via private jeep trails near the Yokayo Ranch.

METHODS

The habitat inventory conducted in Hensley Creek, Trib follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members 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.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement. All pools except step-pools are fully sampled.

HABITAT INVENTORY COMPONENTS

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

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

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

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the 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 (1990). 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". Hensley Creek, Trib 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 measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

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

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Hensley Creek, Trib, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

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

9. Bank Composition and Vegetation:

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

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Hensley Creek, Trib. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

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 Hensley Creek, Trib 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

HABITAT INVENTORY RESULTS

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

The habitat inventory survey of 6/27/2002 to 7/1/2002, was conducted by J. Newell (DFG) and C. Simons (WSP). The total length of the stream surveyed was 11,281 feet.

Stream flow was not measured on Hensley Creek, Trib.

Hensley Creek, Trib is a C4 channel type for 1,783 feet of the stream surveyed (Reach 1), a B3 channel type for 7,047 feet of the stream surveyed (Reach 2), an A2 channel type for 861 feet of the stream surveyed (Reach 3), a G3 channel type for 1,234 feet of the stream surveyed (Reach 4), an A2 channel type for 335 feet of the stream surveyed (Reach 5)

C4 channels are meandering point-bar riffle/pool alluvial channels with broad well defined floodplain on low gradients and gravel dominant substrates. B3 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and cobble dominant

substrates. A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and boulder dominant substrates. G3 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and cobble dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 98 degrees Fahrenheit. Air temperatures ranged from 69 to 95 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of *occurrence* there were 48% dry units, 18% pool units, 32% flatwater units, 1% riffle units, (Graph 1). Based on total *length* of Level II habitat types there were 91% dry units, 5% pool units, 4% flatwater units, (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent *occurrence* were 48% Dry units, 13% Mid-Channel Pool units, 25% Glide units, 1% Lateral Scour Pool - Root Wad Enhanced units, 1% Dammed Pool units, 3% Run units, 1% Bedrock Sheet units, 4% Step Run units, 1% Step Pool units, 1% Plunge Pool units, (Graph 3). Based on percent total *length*, 91% Dry units, 1% Mid-Channel Pool units, 3% Glide units, 3% Dammed Pool units, 1% Run units, 1% Step Run units.

A total of 13 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 77%, and comprised 40% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Three of the 12 pools (25%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 11 pool tail-outs measured, four had a value of 2 (36.4%); two had a value of 3 (18.2%); five had a value of 5 (45.5%); (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 0, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 20 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 18, Scour pools had a mean shelter rating of 22, Backwater pools had a mean shelter rating of 40, (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Hensley Creek, Trib. Graph 7 describes the pool cover in Hensley Creek, Trib. Aquatic vegetation is the dominant pool cover type followed by root mass.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant

substrate observed in pool tail-outs. Gravel observed in 31% of pool tail-outs, and bedrock observed in 31% of pool tail-outs.

The mean percent canopy density for the surveyed length of Hensley Creek, Trib was 64%. The mean percentages of hardwood and coniferous trees were 59% and 42%, respectively. Thirty six percent of the canopy was open. Graph 9 describes the mean percent canopy in Hensley Creek, Trib.

For the stream reach surveyed, the mean percent right bank vegetated was 19%. The mean percent left bank vegetated was 20%. The dominant elements composing the structure of the stream banks consisted of 38% bedrock, 2% boulder, 28% cobble/gravel, 28% sand/silt/clay, (Graph 10). Grass and brush were the dominant vegetation type observed in 15% and 12%, respectively, of the units surveyed. Additionally, 32% of the units surveyed had hardwood trees as the dominant vegetation type, and 25% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Due to inadequate staffing levels, no biological inventory surveys were conducted in Hensley Creek, Trib in 2002.

DISCUSSION

Hensley Creek, Trib is a C4 channel type for 1,783 feet of the stream surveyed (Reach 1), a B3 channel type for 7,047 feet of the stream surveyed (Reach 2), an A2 channel type for 861 feet of the stream surveyed (Reach 3), a G3 channel type for 1,234 feet of the stream surveyed (Reach 4), an A2 channel type for 335 feet of the stream surveyed (Reach 5).

According to the DFG Salmonid Stream Habitat Restoration Manual, C4 channel types are good for bank-placed boulders and log cover. They are fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover.

B3 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs. 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.

G3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days 6/27/2002 to 7/1/2002, ranged from 58 to 98 degrees Fahrenheit. Air temperatures ranged from 69 to 95 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, and pools 5%. The pools are relatively shallow, with only three of the 12 (25%) 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 11 pool tail-outs measured had embeddedness ratings of 1 or 2. Two of the pool tail-outs had embeddedness ratings of 3 or 4. Five 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 Hensley Creek, Trib should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Seven of the 13 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 20. The shelter rating in the flatwater habitats was 11. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Boulders in Hensley Creek, Trib. Aquatic vegetation is the dominant cover type in pools followed by root mass. 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 64%. Reach 1 had a canopy density of 66.7%, Reach 2 had a canopy density of 67.9%, Reach 4 had a canopy density of 70%, Reach 5 had a canopy density of 52.5%, Reach 6 had a canopy density of 56.7%, . In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 19% and 20%, 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

Unnamed tributary to Hensley 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.

RECOMMENDATIONS

Increase the canopy on Hensley Creek, Trib by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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

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

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

Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from aquatic vegetation. Adding high quality complexity with woody cover is desirable.

The limited water temperature data available suggest that maximum temperatures are above the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed.

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.

Hensley Creek, Trib

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	BRIDGE - at 414' into unit H: 5.5' W: 50' L: 0 Not downcutting, not retaining gravel. Comments: train car bridge, natural bottom, no erosion
433	0002.00	Bull frogs present
1321	0004.00	5 dozen roach
1623	0010.00	W.P.#24 N 39°11'30.3" W 123°13'32.5"
1643	0011.00	Bullfrogs present
2118	0020.00	W.P.#25 N 39°11'33" W 123°13'37.4"
2941	0026.00	Unit is spill way of earthen dam DAM H: 20' L: 200' W: 30' NO flashboards, retaining an un-measurable amount of gravel. Comments: W.P. 29 large Earthen dam, spillway natural channel caused by detonation.
2981	0028.00	Large dam-induced resevoir
6832	0040.00	N 39°11'59.2" W 123°14'26.4"
6860	0041.00	Channel becomes highly entrenched with erosive bare banks
6952	0043.00	General Comment: DEBRIS ACCUMULATION D: 2' L: 4' W: 12' retaining 2' of gravel , no fish observed above , scour pool under jam , erosion downcutting present. Comments: LB eroded 6' back creek, at height of 3' length of 30'
7077	0045.00	Gradient increases

7166	0048.00	Debris Accumulation- H.U. 048 - 050 D: 3.5' L: 43' W: 8' Retaining 1 - 2' of gravel, no scour pool, no erosion or downcutting. Comments: 3+ pieces of LWD, has potential to collect more debris to become a substantial accumulation.
7196	0050.00	W.P.#40 N 39°11'56.2" W 123°14'31.1"
7701	0054.00	LB trib EROSION - active D: 20' L: 25' W: 70', no upslope, high flow influenced, not debris influenced. Comments: No vegetation, sediment source, too dry for willow wall. W.P.#041
8851	0055.00	Channel change to an A2 EROSION - active D: 8' L: 10' W: 70' No upslope, high flow influenced, not debris influenced. Comments: Historic bench, no vegetation, road crossing. W.P.#046
9712	0056.00	Channel change to G3, yellow legged forgs adults and young
9747	0057.00	Trib LB
10505	0059.00	RB trib
10745	0060.00	W.P.#051 N 39°11'51.8" W 123°15'11.7"
10934	0062.00	Hot water!
10946	0063.00	Channel change to an A2
11096	0066.00	END OF SURVEY 70' jump up stream (dry bedrock sheet)

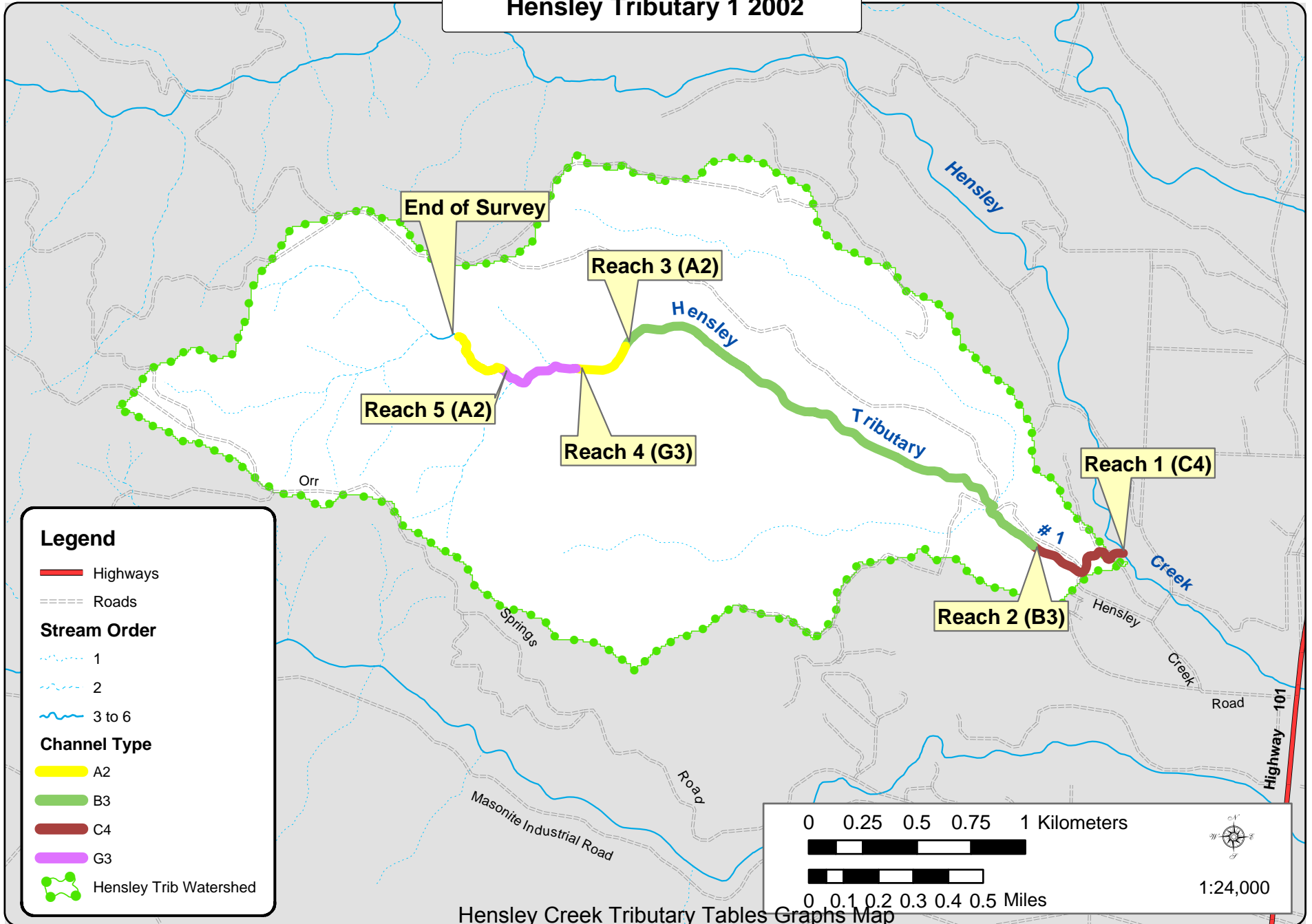
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Rosgen, D.L., 1994. A Classification of Natural Rivers. *Catena*, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

Hensley Tributary 1 2002



Hensley Creek Tributary Tables Graphs Map

Assessment Completed 2002

APPENDIX B: TABLES

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

Stream Name: Hensley Creek, Trib

LLID:

1232201391911

Drainage:

Russian River - Upper

Survey Dates: 6/27/2002 to 7/1/2002

Confluence Location:

Quad: ORRS SPRINGS

Legal Description:

T000R000S00

Latitude: 39:11:28.0N

Longitude: 123:13:12.0W

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	
34	0	DRY	47.9	301	10247	90.8										0
23	15	FLATWATER	32.4	22	506	4.5	3.1	0.3	0.6	65	1486	20	456			11
13	13	POOL	18.3	40	521	4.6	16.3	1.7	1.8	3182	41363	282	3383	278		20
1	1	RIFFLE	1.4	7	7	0.1	0.3	0.0	0.1	2	2	0	0			0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)			
71	29				11281					42850			3839			

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Hensley Creek, Trib

LLID: 1232201391911

Drainage: Russian River - Upper

Survey Dates: 6/27/2002 to 7/1/2002

Confluence Location: Quad: ORRS SPRINGS

Legal Description: T000R000S00

Latitude: 39:11:28.0N

Longitude: 123:13:12.0W

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 (%)
1	1	BRS	1.4	7	7	0.1	0	0.0	0.05	2	2	0	0		0	85
18	11	GLD	25.4	18	331	2.9	3	0.3	0.8	53	945	18	316		14	77
2	2	RUN	2.8	35	70	0.6	2	0.3	0.8	59	119	20	41		5	90
3	2	SRN	4.2	35	105	0.9	4	0.3	0.6	136	409	32	95		3	90
9	9	MCP	12.7	19	167	1.5	6	1.5	2.2	125	1128	306	2756	304	19	49
1	1	STP	1.4	40	40	0.4	4	1.5	3.2	128	128	192	192	192	5	10
1	1	LSR	1.4	11	11	0.1	7	0.8	1.5	77	77	85	85	62	40	95
1	1	PLP	1.4	7	7	0.1	10	5.0	5.7	70	70	350	350	350	5	5
1	1	DPL	1.4	296	296	2.6	135			39960	39960				40	5
34	0	DRY	47.9	301	10247	90.8									0	61

Total Units
71

Total Units Fully Measured
29

Total Length (ft.)
11281

Total Area (sq.ft.)
42837

Total Volume (cu.ft.)
3835

Table 3 - Summary of Pool Types

Stream Name: Hensley Creek, Trib

LLID: 1232201391911

Drainage: Russian River - Upper

Survey Dates: 6/27/2002 to 7/1/2002

Confluence Location: Quad: ORRS SPRINGS

Legal Description: T000R000S00

Latitude: 39:11:28.0N

Longitude: 123:13:12.0W

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	77	21	207	40	5.9	1.5	126	1256	293	2928	18
2	2	SCOUR	15	9	18	3	8.5	2.9	74	147	206	412	23
1	1	BACKWATER	8	296	296	57	135.0		39960	39960		0	40

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
13	13	521	41362	3340

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Hensley Creek, Trib

LLID: 1232201391911

Drainage: Russian River - Upper

Survey Dates: 6/27/2002 to 7/1/2002

Dry Units: 34

Confluence Location: Quad: ORRS SPRINGS

Legal Description: T000R000S00

Latitude: 39:11:28.0N

Longitude: 123:13:12.0W

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
1	1	BRS	0	0	0	0	0	0	0	0	0
1	1	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
18	11	GLD	0	18	5	9	0	5	0	18	9
2	2	RUN	0	0	0	0	0	25	0	50	25
3	2	SRN	0	0	0	0	0	0	0	50	0
23	15	TOTAL FLAT	0	13	3	7	0	7	0	27	10
9	9	MCP	0	20	6	18	11	16	0	16	4
1	1	STP	0	0	0	0	0	0	0	0	10
1	1	LSR	5	15	0	80	0	0	0	0	0
1	1	PLP	0	0	0	0	0	0	0	0	100
1	1	DPL	0	0	0	0	0	100	0	0	0
13	13	TOTAL POOL	0	15	4	18	7	18	0	11	12
71	37	TOTAL	0	11	3	9	3	9	0	15	8

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Hensley Creek, Trib LLID: 1232201391911 Drainage: Russian River - Upper
 Survey Dates: 6/27/2002 to 7/1/2002
 Confluence Location: Quad: ORRS SPRINGS Legal Description: T000R000S00 Latitude: 39:11:28.0N Longitude: 123:13:12.0W

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	14	9	38.3
Boulder	0	1	1.7
Cobble / Gravel	7	10	28.3
Sand / Silt / Clay	8	9	28.3

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	5	4	15.0
Brush	6	2	13.3
Hardwood Trees	10	9	31.7
Coniferous Trees	5	10	25.0
No Vegetation	2	3	8.3

Total Stream Cobble Embeddedness Values: 4

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

StreamName: Hensley Creek, Trib LLID: 1232201391911 Drainage: Russian River - Upper
 Survey Dates: 6/27/2002 to 7/1/2002
 Confluence Location: Quad: ORRS SPRINGS Legal Description: T000R000S00 Latitude: 39:11:28.0N Longitude: 123:13:12.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	0	13	15
LARGE WOODY DEBRIS (%)	0	3	4
ROOT MASS (%)	0	7	18
TERRESTRIAL VEGETATION (%)	0	0	7
AQUATIC VEGETATION (%)	0	7	18
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	27	11
BEDROCK LEDGES (%)	0	10	12

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: A2	Canopy Density (%): 70.0	Pools by Stream Length (%): 0.0
Reach Length (ft.): 861	Coniferous Component (%): 50.0	Pool Frequency (%): 0.0
Riffle/Flatwater Mean Width (ft.):	Hardwood Component (%): 50.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep:
Range (ft.): to	Vegetative Cover (%): 20.0	2 to 2.9 Feet Deep:
Mean (ft.):	Dominant Shelter:	3 to 3.9 Feet Deep:
Std. Dev.:	Dominant Bank Substrate Type: Boulder	>= 4 Feet Deep:
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.):
Water (F): 58 - 58 Air (F): 70 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating:
Dry Channel (ft.): 861	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		

STREAM REACH: 4

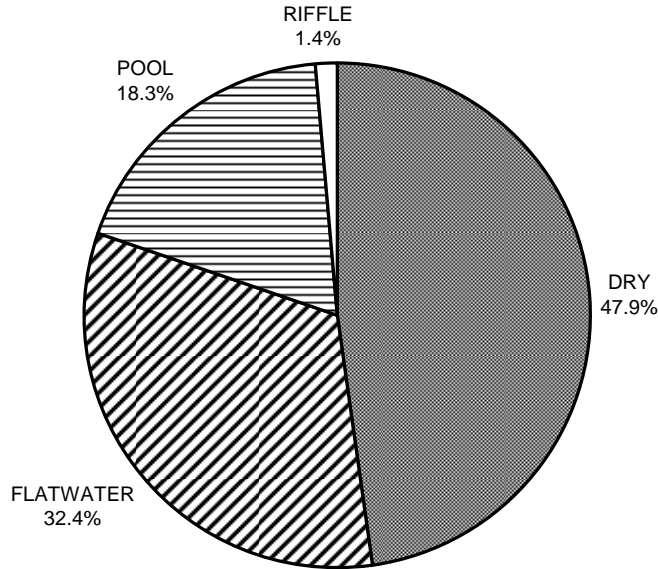
Channel Type: G3	Canopy Density (%): 52.5	Pools by Stream Length (%): 1.0
Reach Length (ft.): 1234	Coniferous Component (%): 25.0	Pool Frequency (%): 14.3
Riffle/Flatwater Mean Width (ft.): 2.8	Hardwood Component (%): 75.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Grass	< 2 Feet Deep: 100.0
Range (ft.): to	Vegetative Cover (%): 6.7	2 to 2.9 Feet Deep: 0.0
Mean (ft.):	Dominant Shelter:	3 to 3.9 Feet Deep: 0.0
Std. Dev.:	Dominant Bank Substrate Type: Bedrock	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.): 0.6
Water (F): 58 - 98 Air (F): 70 - 95	LWD per 100 ft.:	Mean Pool Shelter Rating: 0
Dry Channel (ft.): 1170	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 100. Gravel: 0.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 0.0 4. 0.0 5. 0.0		

STREAM REACH: 5

Channel Type: A2	Canopy Density (%): 56.7	Pools by Stream Length (%): 14.0
Reach Length (ft.): 335	Coniferous Component (%): 40.8	Pool Frequency (%): 22.2
Riffle/Flatwater Mean Width (ft.): 2.5	Hardwood Component (%): 59.2	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 0.0
Range (ft.): to	Vegetative Cover (%): 6.9	2 to 2.9 Feet Deep: 0.0
Mean (ft.):	Dominant Shelter:	3 to 3.9 Feet Deep: 50.0
Std. Dev.:	Dominant Bank Substrate Type: Bedrock	>= 4 Feet Deep: 50.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.): 4.45
Water (F): 78 - 98 Air (F): 85 - 95	LWD per 100 ft.:	Mean Pool Shelter Rating: 5
Dry Channel (ft.): 262	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 0.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 100.		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 100.0 4. 0.0 5. 100.0		

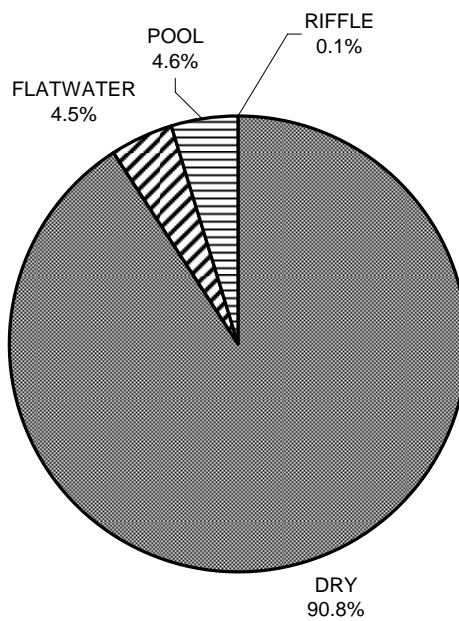
APPENDIX D: GRAPHS

**HENSLEY CREEK, TRIB 2002
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE**



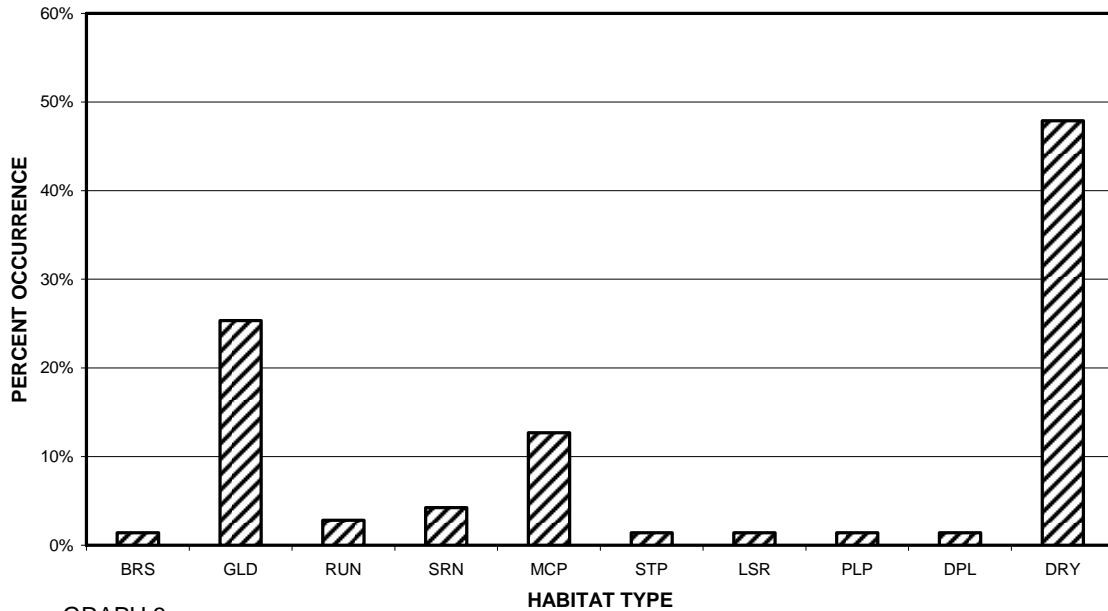
GRAPH 1

**HENSLEY CREEK, TRIB 2002
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH**



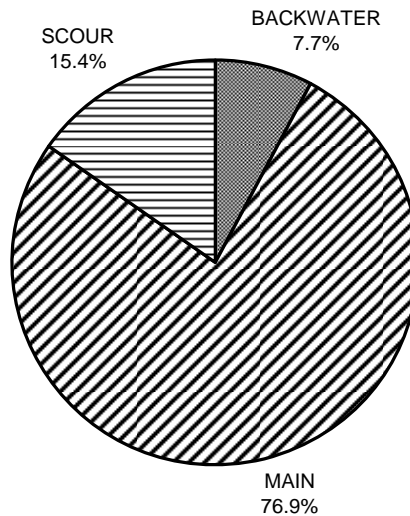
GRAPH 2

**HENSLEY CREEK, TRIB 2002
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE**



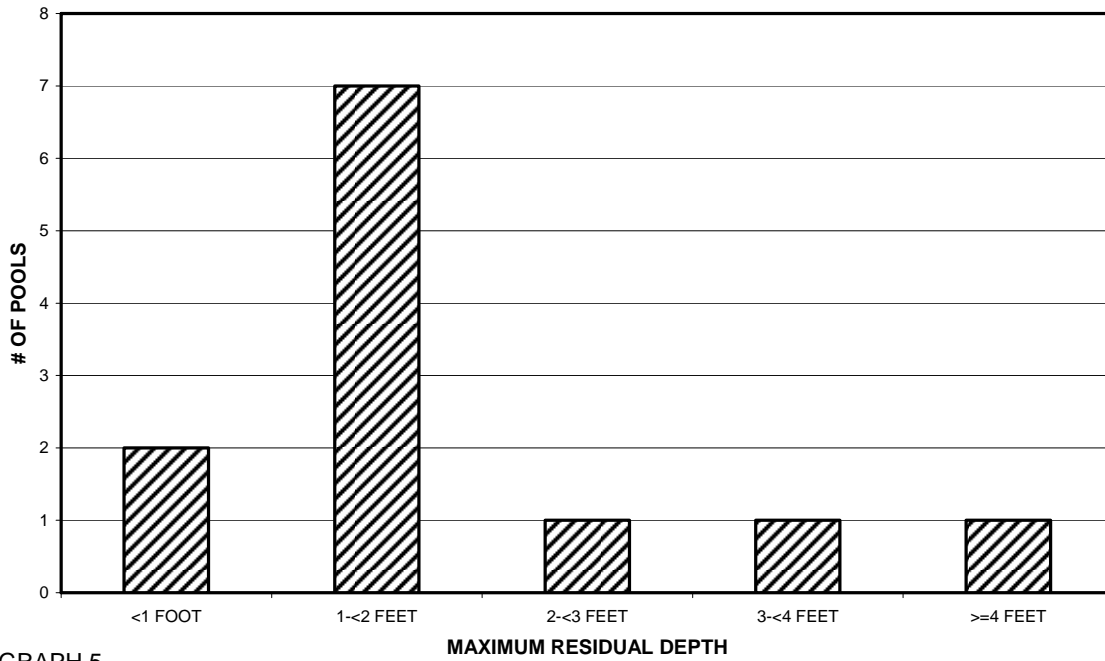
GRAPH 3

**HENSLEY CREEK, TRIB 2002
LEVEL I POOL TYPES BY PERCENT OCCURRENCE**



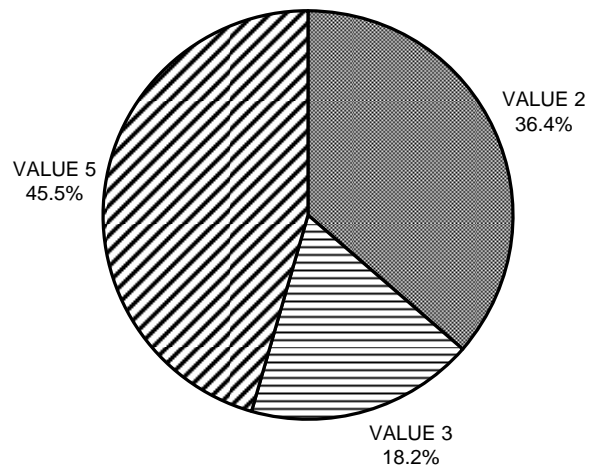
GRAPH 4

**HENSLEY CREEK, TRIB 2002
MAXIMUM DEPTH IN POOLS**



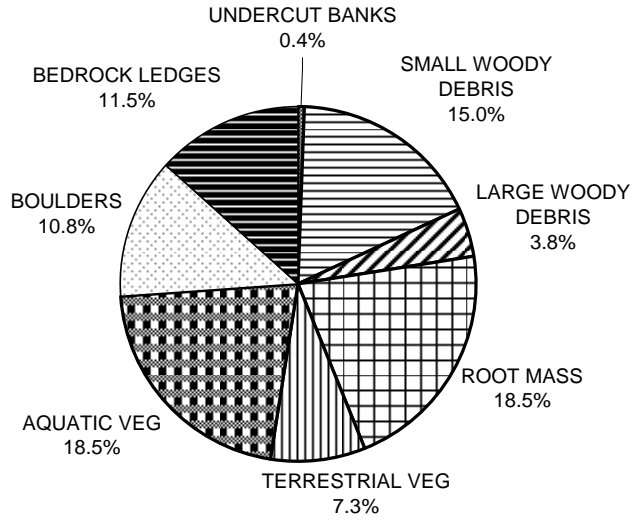
GRAPH 5

**HENSLEY CREEK, TRIB 2002
PERCENT EMBEDDEDNESS**



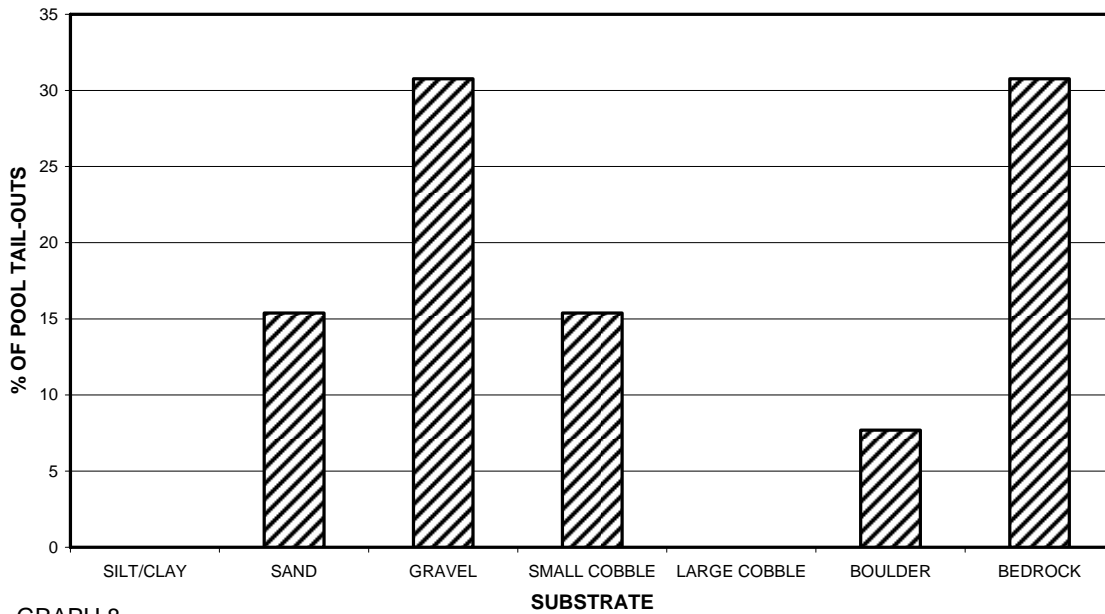
GRAPH 6

**HENSLEY CREEK, TRIB 2002
MEAN PERCENT COVER TYPES IN POOLS**



GRAPH 7

**HENSLEY CREEK, TRIB 2002
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



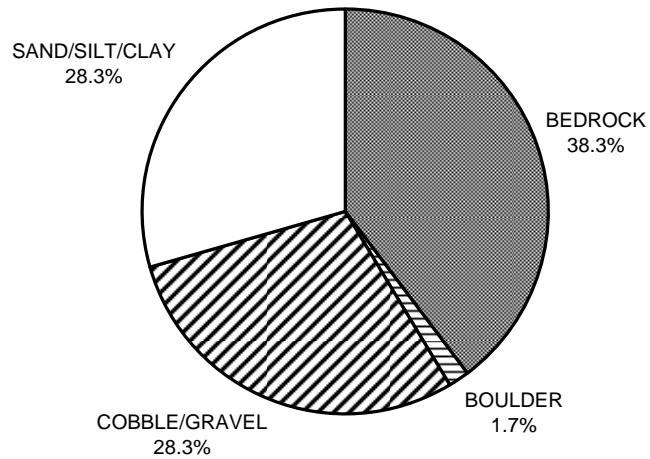
GRAPH 8

**HENSLEY CREEK, TRIB 2002
MEAN PERCENT CANOPY**



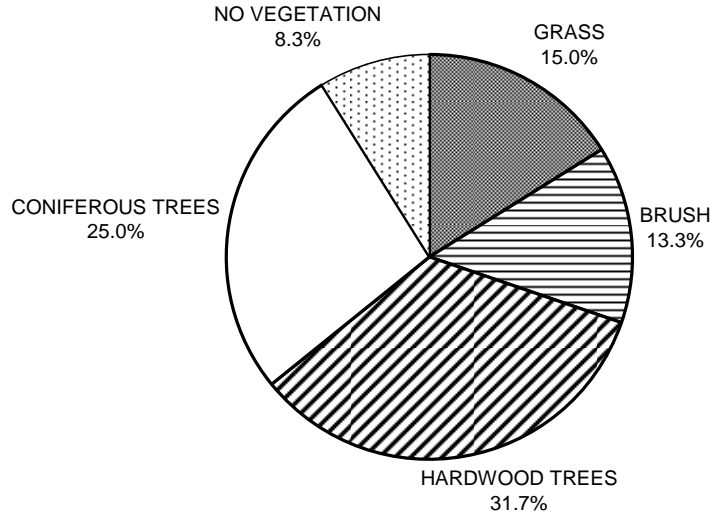
GRAPH 9

**HENSLEY CREEK, TRIB 2002
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**HENSLEY CREEK, TRIB 2002
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11