# STREAM INVENTORY REPORT

## USAL CREEK



## INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Usal Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Usal Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. There is no known record of adult spawning surveys having been conducted on Usal Creek.

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

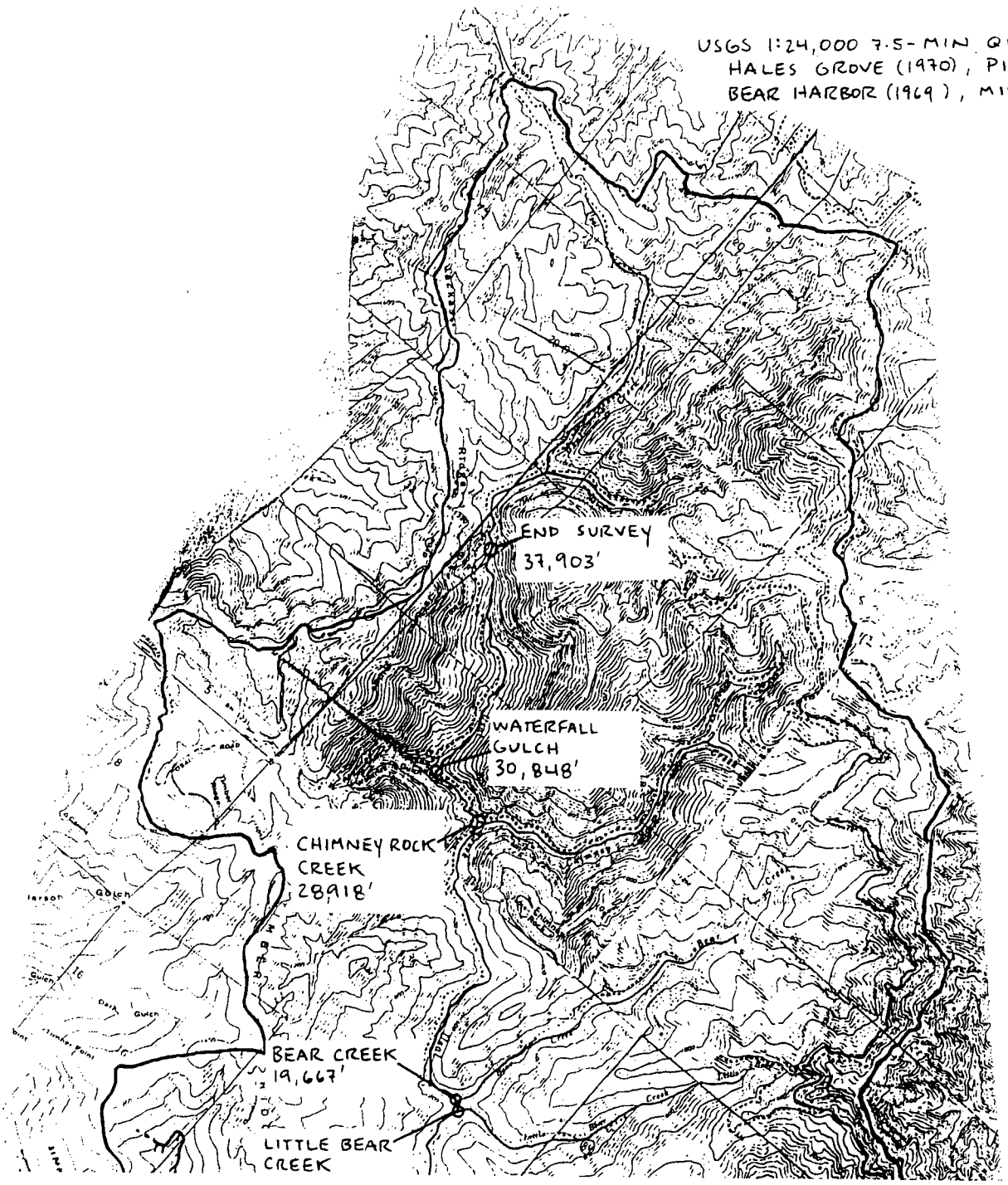
Usal Creek is tributary to the Pacific Ocean, located in Mendocino County, California (Figure 1). Usal Creek's legal description at the confluence with the Pacific Ocean is T23N R18W S22. Its location is 39°49'58" north latitude and 123°51'02" west longitude. Usal Creek is a third order stream and has approximately 21.2 total miles of blue line stream according to the USGS Hales Grove, Piercy, Bear Harbor, and Mistake Point 7.5 minute quadrangles. Usal Creek drains a watershed of approximately 26.7 square miles. Summer base runoff is approximately 2 cubic feet per second (cfs) at the mouth. Elevations range from sea level at the mouth of the creek to 1800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production. The lowermost portion of the stream runs through Sinkyone Wilderness State Park. Vehicle access exists via Usal Road from State Route 1 west of Hales Grove.

## METHODS

The habitat inventory conducted in Usal Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors and 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). Usal Creek personnel were trained in May, 1995, by Gary Flosi. This inventory was conducted by a two-person team.

FIGURE 1. USAL CREEK

USGS 1:24,000 7.5-MIN QUADS:
HALES GROVE (1970), PIERCY (1969),
BEAR HARBOR (1969), MISTAKE POINT (1969)



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## SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

## HABITAT INVENTORY COMPONENTS

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

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the 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. Dewatered units are labeled "dry". Usal Creek

habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form (Hopelain, 1995). Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Usal Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

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

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Usal Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of

approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Usal Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

## BIOLOGICAL INVENTORY

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

## DATA ANALYSIS

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

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

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Usal Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length

- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

## HABITAT INVENTORY RESULTS

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

The habitat inventory of August 15-21, 1995, was conducted by Chris Coyle (CCC) and Kyle Young (WSP/AmeriCorps). The total length of the stream surveyed was 37,903 feet with an additional 6,282 feet of side channel.

Flow was measured above the confluence with Shady Dell with a Marsh-McBirney Model 2000 flowmeter at 1.55 cfs on August 3, 1995.

Usal Creek is a B4 channel type for the first 9,243 feet of stream reach surveyed, an F4 for the next 11,587 feet, an F2 for the next 1,899 feet, an F3 for the next 1,460 feet, a B2 for the next 486 feet, an F4 for the next 6,380 feet, a B2 for the next 1,756 feet, an F3 for the next 2,985 feet, and an A2 for the remaining 2,107 feet. F-type channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. B-type channels are moderately entrenched, moderate gradient, riffle-dominant channels with infrequently spaced pools and stable banks. A-type channels are steep, narrow, cascading, step-pool streams with high energy and debris transport capability. B4 and F4 channels have gravel-dominant substrates; F3 channels have cobble-dominant substrates; and F2, B2, and A2 channels have boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 70 degrees Fahrenheit. Air temperatures ranged from 63 to 96 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 41% pool units, 34% flatwater units, and 18% riffle units (Graph 1). Based on total **length** of Level II habitat types there were 41% flatwater units, 37% pool units, and 12% riffle units (Graph 2).

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Twenty Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools, 21%; step runs, 17%; and low-gradient riffles, 15% (Graph 3). Based on percent total **length**, step runs made up 26%, mid-channel pools 21%, and low-gradient riffles 11%.

A total of 306 pools were identified (Table 3). Main channel pools were most frequently encountered at 60% and comprised 67% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. One hundred two of the 306 pools (33%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 200 pool tail-outs measured, 113 had a value of 1 (56.5%); 73 had a value of 2 (36.5%); 12 had a value of 3 (6%); and 2 had a value of 4 (1%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool habitat types had a mean shelter rating of 40, and riffle habitats had a mean shelter rating of 33 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 45. Backwater pools had a mean shelter rating of 44 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Usal Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Usal Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel and small cobble each was the dominant substrate observed in 6 of the 9 low gradient riffles measured (33%) (Graph 8).

The mean percent canopy density for the stream reach surveyed was 80%. The mean percentages of deciduous and coniferous trees were 76% and 21%, respectively. Graph 9 describes the canopy in Usal Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 63%. The mean percent left bank vegetated was 67%. The dominant elements composing the structure of the stream banks consisted of 5% bedrock, 29% boulder, 50% cobble/gravel, and 16% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 73% of the units surveyed. Additionally, 12% of the units surveyed had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Nine sites were electrofished on August 14 and 18 and September 7, 1995, in Usal Creek. The sites were sampled by Chris Coyle and Craig Mesman (CCC) and Heidi Hickethier and Kyle Young (WSP/AmeriCorps).

The first site sampled included residual pools near the mouth of the stream in the B4 channel type. These receding pools were depletion fished, and the fish sampled were relocated upstream to permanently wetted habitat. The site yielded several hundred 0+ and 1+ steelhead (estimate), plus numerous three-spine stickleback, one staghorn sculpin, and one lamprey ammocete.

The second site included habitat units 251 and 252, a step run and mid-channel pool located approximately 18,609 feet above the creek mouth and within the first F4 channel type. This site had a length of 230 feet. The site yielded twenty-five 0+ steelhead, twenty 1+ steelhead, two 2+ steelhead, and eight sculpin.

The third site sampled included habitat units 278, 279, and 280, two step runs and a high-gradient riffle located approximately 20,803 feet above the creek mouth and within the F2 channel type. The site had a length of 90 feet. The site yielded nineteen 0+ steelhead, four 1+ steelhead, one 2+ steelhead, and nine sculpin.

The fourth site sampled included habitat units 337 and 338, a mid-channel pool and step run located approximately 23,915 feet above the creek mouth and within the first F3 channel type. The site had a length of 103 feet. The site yielded twenty-nine 0+ steelhead, six 1+ steelhead, two 2+ steelhead, and three Pacific giant salamanders.

The fifth site sampled included habitat units 345 and 346, a mid-channel pool and step run located approximately 24,284 feet above the creek mouth and within the first B2 channel type. The site had a length of 112 feet. The site yielded fourteen 0+ steelhead, five 1+ steelhead, and one 2+ steelhead.

The sixth site sampled was habitat unit 409, a mid-channel pool located approximately 29,037 feet above the creek mouth and within the second F4 channel type. The site had an area of 400 square feet and a volume of 400 cubic feet. The site yielded eight 0+ steelhead, twelve 1+ steelhead, and two 2+ steelhead.

The seventh site sampled was habitat unit 453, a mid-channel pool located approximately 31,327 feet above the creek mouth and within the second B2 channel type. The site had an area of 330 square feet and a volume of 264 cubic feet. The site yielded six 0+ steelhead, four 1+ steelhead, and one 2+ steelhead.

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The eighth site sampled was habitat unit 512, a mid-channel pool located approximately 33,725 feet above the creek mouth and within the second F3 channel type reach. The site had a length of 39 feet. The site yielded three 0+ steelhead, five 1+ steelhead, and four 2+ steelhead.

The ninth site sampled was habitat unit 569, a series of step pools located approximately 36,011 feet above the creek mouth and within the A2 channel type reach. The site had a length of 25 feet. The site yielded three 0+ steelhead and six 1+ steelhead.

## DISCUSSION

Usal Creek is a B4 channel type for the first 9,243 feet of stream reach surveyed, an F4 for the next 11,587 feet, an F2 for the next 1,899 feet, an F3 for the next 1,460 feet, a B2 for the next 486 feet, an F4 for the next 6,380 feet, a B2 for the next 1,756 feet, an F3 for the next 2,985 feet, and an A2 for the remaining 2,107 feet. A2 channels are generally considered not suitable for fish habitat improvement structures due to high stream energy. The suitability of B2 channel types for fish habitat improvement structures is as follows: excellent for low- and medium-stage plunge weirs, single and opposing wing deflectors, and bank cover. B4 channels are considered: excellent for low-stage plunge weirs, boulder clusters, bank-placed boulders, single and opposing wing deflectors, and log cover; and good for medium-stage plunge weirs. F2 channels are considered: fair for low-stage weirs, single and opposing wing deflectors, and log cover; and poor for medium-stage weirs. F3 channels are considered: good for bank-placed boulders and single and opposing wing deflectors; fair for low-stage weirs, boulder clusters, channel constrictors, and log cover; and poor for medium-stage weirs. F4 channels are considered: good for bank-placed boulders; fair for low-stage weirs, single and opposing wing deflectors, channel constrictors, and log cover; and poor for medium-stage weirs and boulder clusters.

The water temperatures recorded on the survey days August 15-21, 1995, ranged from 58 to 70 degrees Fahrenheit. Air temperatures ranged from 63 to 96 degrees Fahrenheit. Seventy degrees Fahrenheit, if sustained, is above the threshold stress level for coho. 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 41% of the total **length** of this survey, riffles 12%, and pools 37%. The pools are relatively shallow, with only 102 of the 306 (33%) pools having a maximum depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. 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. Installing structures that will increase or deepen pool habitat is recommended.

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One hundred thirteen of the 200 pool tail-outs measured had embeddedness ratings of 1. Only 14 had a rating of 3 or 4. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

The mean shelter rating for pools was low with a rating of 40. The shelter rating in the flatwater habitats was lower at 27. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Six of the 9 low gradient riffles measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 80%. This is a relatively high percentage of canopy. 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 63% and 67%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

## RECOMMENDATIONS

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

2) 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 for 3 to 5 years.

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

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

5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 9,858', should then be treated to reduce the amount of fine sediments entering the stream.

## PROBLEM SITES AND LANDMARKS

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

| | |
|---|---|
| 0' | Begin survey at back of seasonal berm at confluence with Pacific Ocean. Channel type is B4. First 775 feet of channel are dry with a few residual pools. |
| 1321' | Left bank tributary. Estimated flow <0.1 cfs. Not accessible to fish (NAF). |
| 1469' | Shady Dell enters left bank. |
| 2340' | Partly impacted right bank 1.5' diameter corrugated metal pipe (CMP) culvert. No outfall. |
| 3126' | Usal Road flatcar bridge 150' wide x 13' long x 3' clearance. |
| 3623' | Hotel Gulch enters right bank. |
| 5460' | Aggraded channel with numerous side channels. Stream may be abandoning historic main channel due to accumulation of at least 4' of excess bedload. |
| 9228' | South Fork Usal Creek enters left bank. |
| 9243' | Channel type changes to F4. |
| 9294' | Vehicle crossing. |
| 9751' | Dry left bank tributary. |
| 9858' | Left bank erosion 10' high x 30' long contributing fines. |
| 11943' | Soldier Creek enters left bank. |
| 13079' | Right bank 1.5' diameter CMP culvert. No outfall. |

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| | |
|---|---|
| 15691' | Right bank tributary. Estimated flow <0.1 cfs. NAF. |
| 18479' | Right bank erosion 20' high x 40' long contributing fines. |
| 18577' | Right bank erosion 30' high x 45' long contributing fines. |
| 18895' | Vehicle crossing. |
| 19520' | Little Bear Creek enters left bank. |
| 19667' | Bear Creek enters left bank. |
| 20489' | Right bank tributary. Estimated flow <0.1 cfs. NAF. |
| 20578' | Right bank 1.5' diameter CMP culvert. <0.1 cfs outfall. |
| 20803' | Channel type changes to F2. |
| 21691' | Right bank spring. |
| 22702' | Channel type changes to F3. |
| 24005' | Left bank spring. |
| 24189' | Channel type changes to B2. |
| 24675' | Channel type changes to F4. |
| 25487' | Right bank 1.5' diameter CMP culvert. No outfall. |
| 26419' | Right bank tributary. Estimated flow <0.1 cfs. NAF. |
| 27469' | Left bank erosion 20' high x 40' long contributing fines. |
| 27662' | Right bank 2' diameter CMP culvert. <0.1 cfs outfall. |
| 27800' | Right bank road cribbing. |
| 28146' | Right bank erosion 10' high x 15' long contributing fines. |
| 28663' | Left bank erosion 15' high x 30' long contributing fines. |

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| | |
|---|---|
| 28918' | Chimney Rock Creek enters left bank. |
| 29257' | Flatcar bridge 45' wide x 15' long x 6' clearance. |
| 30797' | Flatcar bridge 28' wide x 25' long x 8' clearance. |
| 30848' | Waterfall Gulch enters right bank. Estimated flow 0.5 cfs. Accessible to fish. |
| 31055' | Channel type changes to B2. |
| 31355' | Right bank tributary. Estimated flow <0.1 cfs. NAF. |
| 31604' | Log and debris accumulation (LDA) 10' high x 50' wide x 10' long. Not a barrier. |
| 31674' | Left bank erosion 40' high x 20' long contributing fines. |
| 31790' | LDA 10' high x 30' wide x 15' long. Not a barrier. |
| 32583' | LDA 10' high x 40' wide x 20' long retaining sediment 6' deep at base. |
| 32811' | Channel type changes to F3. |
| 35404' | Right bank tributary with failed culvert. Estimated flow 0.1 cfs. NAF. |
| 35796' | Channel type changes to A2. |
| 36236' | LDA 8' high x 75' wide x 58' long. No gravel retention and not a barrier. |
| 37903' | End of survey. Boulder cascade with estimated 40% gradient. |

## REFERENCES


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

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

# LEVEL III and LEVEL IV HABITAT TYPE KEY

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

Usal Creek — Drainage: Usal Creek

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 08/15/95 to 08/21/95

Confluence Location: QUAD: Hales Grov LEGAL DESCRIPTION: T23NR18WS22 LATITUDE: 39°49'58" LONGITUDE: 123°51'2"

| HABITAT UNITS | UNITS FULLY MEASURED | HABITAT TYPE | HABITAT PERCENT OCCURRENCE | MEAN LENGTH (ft.) | TOTAL LENGTH (ft.) | PERCENT TOTAL LENGTH | MEAN WIDTH (ft.) | MEAN 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 132 | 11 | RIFFLE | 18 | 41 | 5432 | 12 | 16.7 | 0.3 | 1140 | 150419 | 313 | 41378 | 0 | 33 |
| 251 | 24 | FLATWATER | 34 | 72 | 18165 | 41 | 17.7 | 0.5 | 1517 | 380807 | 775 | 194647 | 0 | 27 |
| 306 | 49 | POOL | 41 | 54 | 16418 | 37 | 19.3 | 1.7 | 1376 | 420904 | 2647 | 809970 | 2256 | 40 |
| 43 | 0 | DRY | 6 | 85 | 3662 | 8 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | CULVERT | 1 | 85 | 508 | 1 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |

| TOTAL UNITS | TOTAL UNITS | TOTAL LENGTH (ft.) | TOTAL AREA (sq. ft.) | TOTAL VOL. (cu. ft.) |
|---|---|---|---|---|
| 738 | 84 | 44185 | 952129 | 1045996 |

Usal Creek — Drainage: Usal Creek

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 08/15/95 to 08/21/95

Confluence Location: QUAD: Hales Grov LEGAL DESCRIPTION: T23NR18WS22 LATITUDE: 39°49'58" LONGITUDE: 123°51'2"

| HABITAT UNITS # | UNITS FULLY MEASURED | HABITAT TYPE | HABITAT OCCURRENCE % | MEAN LENGTH ft. | TOTAL LENGTH ft. | TOTAL LENGTH % | MEAN WIDTH ft. | MEAN DEPTH ft. | MAXIMUM DEPTH ft. | MEAN AREA sq.ft. | TOTAL AREA EST. sq.ft. | MEAN VOLUME cu.ft. | TOTAL VOLUME EST. cu.ft. | MEAN RESIDUAL POOL VOL cu.ft. | MEAN SHELTER RATING | MEAN CANOPY % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 112 | 9 | LGR | 15 | 44 | 4961 | 11 | 17 | 0.2 | 1.3 | 1340 | 150069 | 353 | 39587 | 0 | 17 | 65 |
| 20 | 2 | HGR | 3 | 24 | 471 | 1 | 15 | 0.6 | 1.9 | 238 | 4758 | 134 | 2671 | 0 | 105 | 86 |
| 2 | 1 | POW | 0 | 38 | 75 | 0 | 25 | 1.3 | 2.5 | 720 | 1440 | 936 | 1872 | 0 | 60 | 50 |
| 69 | 6 | GLD | 9 | 63 | 4337 | 10 | 17 | 0.3 | 2.2 | 1411 | 97347 | 604 | 41699 | 0 | 13 | 45 |
| 53 | 5 | RUN | 7 | 46 | 2461 | 6 | 21 | 0.6 | 2.4 | 1300 | 68921 | 598 | 31690 | 0 | 21 | 68 |
| 127 | 12 | SRN | 17 | 89 | 11292 | 26 | 17 | 0.5 | 1.7 | 1727 | 219337 | 922 | 117053 | 0 | 34 | 89 |
| 1 | 1 | TRP | 0 | 148 | 148 | 0 | 17 | 2.8 | 4.8 | 2516 | 2516 | 7045 | 7045 | 5787 | 30 | 97 |
| 158 | 19 | MCP | 21 | 58 | 9230 | 21 | 22 | 1.7 | 5.6 | 2029 | 320566 | 3618 | 571637 | 3047 | 27 | 78 |
| 5 | 2 | CCP | 1 | 98 | 490 | 1 | 20 | 2.5 | 2.7 | 2422 | 12110 | 4588 | 22940 | 4274 | 3 | 40 |
| 20 | 5 | STP | 3 | 53 | 1068 | 2 | 21 | 1.7 | 4.7 | 1105 | 22102 | 2067 | 41333 | 1664 | 81 | 72 |
| 15 | 2 | CRP | 2 | 54 | 809 | 2 | 11 | 1.4 | 2.4 | 664 | 9960 | 948 | 14220 | 882 | 10 | 69 |
| 8 | 1 | LSL | 1 | 61 | 491 | 1 | 12 | 1.1 | 2.1 | 528 | 4224 | 581 | 4646 | 475 | 90 | 85 |
| 20 | 3 | LSR | 3 | 44 | 881 | 2 | 13 | 2.0 | 3.7 | 385 | 7707 | 789 | 15781 | 692 | 73 | 92 |
| 19 | 4 | LSBk | 3 | 56 | 1062 | 2 | 26 | 2.8 | 8.0 | 1586 | 30139 | 5300 | 100705 | 4785 | 11 | 85 |
| 3 | 1 | LSBo | 0 | 37 | 110 | 0 | 16 | 0.8 | 1.4 | 486 | 1459 | 389 | 1167 | 195 | 20 | 100 |
| 8 | 1 | PLP | 1 | 31 | 250 | 1 | 25 | 2.5 | 5.5 | 390 | 3120 | 975 | 7800 | 312 | 150 | 75 |
| 41 | 7 | SCP | 6 | 41 | 1694 | 4 | 13 | 1.0 | 2.7 | 722 | 29597 | 894 | 36634 | 784 | 45 | 77 |
| 2 | 1 | BPB | 0 | 20 | 39 | 0 | 16 | 0.9 | 1.9 | 304 | 608 | 274 | 547 | 182 | 20 | 95 |
| 1 | 1 | BPR | 0 | 25 | 25 | 0 | 30 | 2.0 | 3.6 | 188 | 188 | 375 | 375 | 300 | 90 | 95 |
| 5 | 1 | BPL | 1 | 24 | 121 | 0 | 17 | 0.5 | 1.3 | 187 | 935 | 94 | 468 | 75 | 10 | 98 |
| 43 | 0 | DRY | 6 | 85 | 3662 | 8 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | CUL | 1 | 85 | 508 | 1 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| TOTAL UNITS | TOTAL UNITS | LENGTH (ft.) | AREA (sq.ft) | TOTAL VOL. (cu.ft) |
|---|---|---|---|---|
| 738 | 84 | 44185 | 987103 | 1059870 |

Usal Creek

Drainage: Usal Creek

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/15/95 to 08/21/95

Confluence Location: QUAD: Hales Grov LEGAL DESCRIPTION: T23NR18WS22 LATITUDE: 39°49'58" LONGITUDE: 123°51'2"

| HABITAT UNITS | UNITS FULLY MEASURED | HABITAT TYPE | HABITAT PERCENT OCCURRENCE | MEAN LENGTH (ft.) | TOTAL LENGTH (ft.) | PERCENT TOTAL LENGTH | MEAN WIDTH (ft.) | MEAN DEPTH (ft.) | MEAN AREA (sq.ft.) | TOTAL AREA EST. (sq.ft.) | MEAN VOLUME (cu.ft.) | TOTAL VOLUME EST. (cu.ft.) | MEAN RESIDUAL POOL VOL. (cu.ft.) | MEAN SHELTER RATING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 184 | 27 | MAIN | 60 | 59 | 10936 | 67 | 21.2 | 1.8 | 1905 | 350517 | 3529 | 649420 | 2983 | 36 |
| 73 | 12 | SCOUR | 24 | 49 | 3603 | 22 | 18.2 | 2.0 | 853 | 62253 | 2284 | 166739 | 1997 | 45 |
| 49 | 10 | BACKWATER | 16 | 38 | 1879 | 11 | 15.7 | 1.1 | 573 | 28085 | 700 | 34284 | 605 | 44 |

| TOTAL UNITS | TOTAL UNITS | TOTAL LENGTH (ft.) | TOTAL AREA (sq.ft.) | TOTAL VOL. (cu.ft.) |
|---|---|---|---|---|
| 306 | 49 | 16418 | 440855 | 850442 |

Usal Creek

Drainage: Usal Creek

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 08/15/95 to 08/21/95

Confluence Location: QUAD: Hales Grov LEGAL DESCRIPTION: T23NR18WS22 LATITUDE: 39°49'58" LONGITUDE: 123°51'2"

| UNITS MEASURED | HABITAT TYPE | HABITAT PERCENT OCCURRENCE | <1 FOOT MAXIMUM DEPTH | <1 FOOT PERCENT OCCURRENCE | 1-<2 FT. MAXIMUM DEPTH | 1-<2 FOOT PERCENT OCCURRENCE | 2-<3 FT. MAXIMUM DEPTH | 2-<3 FOOT PERCENT OCCURRENCE | 3-<4 FT. MAXIMUM DEPTH | 3-<4 FOOT PERCENT OCCURRENCE | >=4 FEET MAXIMUM DEPTH | >=4 FEET PERCENT OCCURRENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TRP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100 |
| 158 | MCP | 52 | 0 | 0 | 43 | 27 | 58 | 37 | 37 | 23 | 20 | 13 |
| 5 | CCP | 2 | 0 | 0 | 2 | 40 | 2 | 40 | 0 | 0 | 1 | 20 |
| 20 | STP | 7 | 1 | 5 | 1 | 5 | 13 | 65 | 3 | 15 | 2 | 10 |
| 15 | CRP | 5 | 0 | 0 | 5 | 33 | 6 | 40 | 1 | 7 | 3 | 20 |
| 8 | LSL | 3 | 0 | 0 | 1 | 13 | 2 | 25 | 4 | 50 | 1 | 13 |
| 20 | LSR | 7 | 0 | 0 | 4 | 20 | 10 | 50 | 4 | 20 | 2 | 10 |
| 19 | LSBk | 6 | 0 | 0 | 4 | 21 | 4 | 21 | 2 | 11 | 9 | 47 |
| 3 | LSBo | 1 | 0 | 0 | 1 | 33 | 0 | 0 | 2 | 67 | 0 | 0 |
| 8 | PLP | 3 | 0 | 0 | 1 | 13 | 1 | 13 | 0 | 0 | 6 | 75 |
| 41 | SCP | 13 | 3 | 7 | 24 | 59 | 12 | 29 | 2 | 5 | 0 | 0 |
| 2 | BPB | 1 | 0 | 0 | 1 | 50 | 1 | 50 | 0 | 0 | 0 | 0 |
| 1 | BPR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100 | 0 | 0 |
| 5 | BPL | 2 | 0 | 0 | 3 | 60 | 1 | 20 | 0 | 0 | 1 | 20 |

TOTAL UNITS
306

Usal Creek

Drainage: Usal Creek

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 08/15/95 to 08/21/95

Confluence Location: QUAD: Hales Grov LEGAL DESCRIPTION: T23NR18WS22 LATITUDE: 39°49'58" LONGITUDE: 123°51'2"

| UNITS MEASURED | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 112 | 9 | LGR | 4 | 16 | 2 | 0 | 11 | 0 | 3 | 53 | 0 |
| 20 | 2 | HGR | 0 | 5 | 0 | 0 | 0 | 0 | 10 | 85 | 0 |
| 2 | 1 | POW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 69 | 6 | GLD | 0 | 8 | 22 | 0 | 20 | 17 | 0 | 0 | 0 |
| 53 | 5 | RUN | 0 | 20 | 0 | 0 | 0 | 5 | 0 | 55 | 0 |
| 127 | 12 | SRN | 1 | 2 | 3 | 0 | 5 | 5 | 13 | 73 | 1 |
| 1 | 1 | TRP | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 70 | 25 |
| 158 | 19 | MCP | 2 | 5 | 5 | 15 | 14 | 0 | 0 | 53 | 1 |
| 5 | 2 | CCP | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 |
| 20 | 5 | STP | 0 | 0 | 0 | 3 | 0 | 0 | 11 | 86 | 0 |
| 15 | 2 | CRP | 65 | 20 | 0 | 0 | 0 | 15 | 0 | 0 | 0 |
| 8 | 1 | LSL | 20 | 20 | 30 | 0 | 20 | 10 | 0 | 0 | 0 |
| 20 | 3 | LSR | 8 | 15 | 10 | 60 | 7 | 0 | 0 | 0 | 0 |
| 19 | 4 | LSBk | 8 | 3 | 0 | 0 | 5 | 0 | 0 | 39 | 46 |
| 3 | 1 | LSBo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 8 | 1 | PLP | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 80 | 0 |
| 41 | 7 | SCP | 11 | 39 | 31 | 3 | 4 | 1 | 0 | 11 | 0 |
| 2 | 1 | BPB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 1 | 1 | BPR | 0 | 30 | 0 | 70 | 0 | 0 | 0 | 0 | 0 |
| 5 | 1 | BPL | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43 | 0 | DRY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | CUL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Usal Creek

Drainage: Usal Creek

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/15/95 to 08/21/95

Confluence Location: QUAD: Hales Grov LEGAL DESCRIPTION: T23NR18WS22 LATITUDE: 39°49'58" LONGITUDE: 123°51'2"

| TOTAL HABITAT UNITS | UNITS FULLY MEASURED | HABITAT TYPE | % TOTAL SILT/CLAY DOMINANT | % TOTAL SAND DOMINANT | % TOTAL GRAVEL DOMINANT | % TOTAL SM COBBLE DOMINANT | % TOTAL LG COBBLE DOMINANT | % TOTAL BOULDER DOMINANT | % TOTAL BEDROCK DOMINANT |
|---|---|---|---|---|---|---|---|---|---|
| 112 | 9 | LGR | 0 | 0 | 33 | 33 | 33 | 0 | 0 |
| 20 | 2 | HGR | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 2 | 1 | POW | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 69 | 6 | GLD | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 53 | 5 | RUN | 0 | 0 | 60 | 20 | 20 | 0 | 0 |
| 127 | 12 | SRN | 0 | 0 | 8 | 25 | 50 | 17 | 0 |
| 1 | 1 | TRP | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 158 | 19 | MCP | 0 | 11 | 58 | 5 | 16 | 11 | 0 |
| 5 | 2 | CCP | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 20 | 5 | STP | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 15 | 2 | CRP | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 8 | 1 | LSL | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 20 | 3 | LSR | 0 | 33 | 0 | 33 | 33 | 0 | 0 |
| 19 | 4 | LSBk | 0 | 25 | 75 | 0 | 0 | 0 | 0 |
| 3 | 1 | LSBo | 0 | 0 | 0 | 0 | 100 | 0 | 0 |
| 8 | 1 | PLP | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 41 | 7 | SCP | 0 | 29 | 57 | 0 | 14 | 0 | 0 |
| 2 | 1 | BPB | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 1 | 1 | BPR | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 5 | 1 | BPL | 0 | 0 | 0 | 100 | 0 | 0 | 0 |
| 43 | 0 | DRY | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | CUL | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Usal Creek
SAMPLE DATES: 08/15/95 to 08/21/95
STREAM LENGTH: 37903 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Hales Grov — Latitude: 39°49'58"
Legal Description: T23NR18WS22 — Longitude: 123°51'2"

## SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

### STREAM REACH 01

Channel Type: B4
Channel Length: 9243 ft.
Flowing Water Mean Width: 12 ft.
Flowing Water Mean Depth: 0.3 ft.
Base Flow: 1.6 cfs
Water: - 70 °F Air: - 96 °F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 54%
Dom. Bank Substrate: Cobble/Gravel
Embeddness Value: 1. 52% 2. 37% 3. 7% 4. 3%

Canopy Density: 64%
Coniferous Component: 13%
Deciduous Component: 99%
Pools by Stream Length: 28%
Pools >=3 ft.deep: 27%
Mean Pool Shelter Rtn: 19
Dom. Shelter: Small Woody Debris
Occurrence of LOD: 48%
Dry Channel: 1946 ft.

### STREAM REACH 02

Channel Type: F4
Channel Length: 11587 ft.
Flowing Water Mean Width: 26 ft.
Flowing Water Mean Depth: 0.4 ft.
Base Flow: 1.6 cfs
Water: 58 - 65 °F Air: 07 - 74 °F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 74%
Dom. Bank Substrate: Cobble/Gravel
Embeddness Value: 1. 67% 2. 26% 3. 8% 4. 0%

Canopy Density: 84%
Coniferous Component: 13%
Deciduous Component: 90%
Pools by Stream Length: 41%
Pools >=3 ft.deep: 66%
Mean Pool Shelter Rtn: 30
Dom. Shelter: Bedrock Ledges
Occurrence of LOD: 43%
Dry Channel: 0 ft.

### STREAM REACH 03

Channel Type: F2
Channel Length: 1899 ft.
Flowing Water Mean Width: 25 ft.
Flowing Water Mean Depth: 0.7 ft.
Base Flow: 1.6 cfs
Water: 59 - 61 °F Air: 64 - 68 °F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 63%
Dom. Bank Substrate: Cobble/Gravel
Embeddness Value: 1. 78% 2. 11% 3. 11% 4. 0%

Canopy Density: 67%
Coniferous Component: 73%
Deciduous Component: 27%
Pools by Stream Length: 35%
Pools >=3 ft.deep: 38%
Mean Pool Shelter Rtn: 58
Dom. Shelter: Undercut Banks
Occurrence of LOD: **********%
Dry Channel: 0 ft.

### STREAM REACH 04

Channel Type: F3
Channel Length: 1460 ft.
Flowing Water Mean Width: 14 ft.
Flowing Water Mean Depth: 1.2 ft.
Base Flow: 1.6 cfs
Water: 60 - 62 °F Air: 70 - 72 °F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 62%
Dom. Bank Substrate: Cobble/Gravel
Embeddness Value: 1. 14% 2. 86% 3. 0% 4. 0%

Canopy Density: 92%
Coniferous Component: 18%
Deciduous Component: 82%
Pools by Stream Length: 40%
Pools >=3 ft.deep: 36%
Mean Pool Shelter Rtn: 20
Dom. Shelter: Undercut Banks
Occurrence of LOD: **********%
Dry Channel: 0 ft.

STREAM REACH 02

| | |
|---|---|
| Channel Type: F4 | Canopy Density: 84% |
| Channel Length: 11587 ft. | Coniferous Component: 13% |
| Flowing Water Mean Width: 26 ft. | Deciduous Component: 90% |
| Flowing Water Mean Depth: 0.4 ft. | Pools by Stream Length: 41% |
| Base Flow: 1.6 cfs | Pools >=3 ft.deep: 66% |
| Water: 58 - 65 °F Air: 07 - 74 °F | Mean Pool Shelter Rtn: 30 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Bedrock Ledges |
| Vegetative Cover: 74% | Occurrence of LOD: 43% |
| Dom. Bank Substrate: Cobble/Gravel | Dry Channel: 0 ft. |
| Embeddness Value: 1. 67% 2. 26% 3. 8% 4. 0% | |

STREAM REACH 04

| | |
|---|---|
| Channel Type: F3 | Canopy Density: 92% |
| Channel Length: 1460 ft. | Coniferous Component: 18% |
| Flowing Water Mean Width: 14 ft. | Deciduous Component: 82% |
| Flowing Water Mean Depth: 1.2 ft. | Pools by Stream Length: 40% |
| Base Flow: 1.6 cfs | Pools >=3 ft.deep: 36% |
| Water: 60 - 62 °F Air: 70 - 72 °F | Mean Pool Shelter Rtn: 20 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Undercut Banks |
| Vegetative Cover: 62% | Occurrence of LOD: **********% |
| Dom. Bank Substrate: Cobble/Gravel | Dry Channel: 0 ft. |
| Embeddness Value: 1. 14% 2. 86% 3. 0% 4. 0% | |

STREAM REACH 05

| | |
|---|---|
| Channel Type: B2 | Canopy Density: 81% |
| Channel Length: 486 ft. | Coniferous Component: 52% |
| Flowing Water Mean Width: ********** f | Deciduous Component: 48% |
| Flowing Water Mean Depth: **** ft. | Pools by Stream Length: 69% |
| Base Flow: 1.6 cfs | Pools >=3 ft.deep: 56% |
| Water: 62 - 62 °F Air: 72 - 72 °F | Mean Pool Shelter Rtn: 67 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Undercut Banks |
| Vegetative Cover: 57% | Occurrence of LOD: 10% |
| Dom. Bank Substrate: Cobble/Gravel | Dry Channel: 0 ft. |
| Embeddness Value: 1. 33% 2. 67% 3. 0% 4. 0% | |

STREAM REACH 06

| | |
|---|---|
| Channel Type: F4 | Canopy Density: 92% |
| Channel Length: 6380 ft. | Coniferous Component: 27% |
| Flowing Water Mean Width: 20 ft. | Deciduous Component: 73% |
| Flowing Water Mean Depth: 0.5 ft. | Pools by Stream Length: 33% |
| Base Flow: 1.6 cfs | Pools >=3 ft.deep: 35% |
| Water: 61 - 64 °F Air: 63 - 74 °F | Mean Pool Shelter Rtn: 23 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Undercut Banks |
| Vegetative Cover: 67% | Occurrence of LOD: **********% |
| Dom. Bank Substrate: Cobble/Gravel | Dry Channel: 0 ft. |
| Embeddness Value: 1. 33% 2. 58% 3. 8% 4. 0% | |

STREAM REACH 07

| | |
|---|---|
| Channel Type: B2 | Canopy Density: 79% |
| Channel Length: 1756 ft. | Coniferous Component: 37% |
| Flowing Water Mean Width: 9 ft. | Deciduous Component: 63% |
| Flowing Water Mean Depth: 0.7 ft. | Pools by Stream Length: 52% |
| Base Flow: 1.6 cfs | Pools >=3 ft.deep: 29% |
| Water: 61 - 63 °F Air: 65 - 76 °F | Mean Pool Shelter Rtn: 43 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Undercut Banks |
| Vegetative Cover: 74% | Occurrence of LOD: 10% |
| Dom. Bank Substrate: Cobble/Gravel | Dry Channel: 0 ft. |
| Embeddness Value: 1. 45% 2. 55% 3. 0% 4. 0% | |

STREAM REACH 08

| | |
|---|---|
| Channel Type: F3 | Canopy Density: 97% |
| Channel Length: 2985 ft. | Coniferous Component: 22% |
| Flowing Water Mean Width: 10 ft. | Deciduous Component: 78% |
| Flowing Water Mean Depth: 0.4 ft. | Pools by Stream Length: 38% |
| Base Flow: 1.6 cfs | Pools >=3 ft.deep: 15% |
| Water: 62 - 63 °F Air: 73 - 76 °F | Mean Pool Shelter Rtn: 20 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Root masses |
| Vegetative Cover: 76% | Occurrence of LOD: 18% |
| Dom. Bank Substrate: Cobble/Gravel | Dry Channel: 0 ft. |
| Embeddness Value: 1. 59% 2. 41% 3. 0% 4. 0% | |

STREAM REACH 09

| | |
|---|---|
| Channel Type: A2 | Canopy Density: 65% |
| Channel Length: 2107 ft. | Coniferous Component: 65% |
| Flowing Water Mean Width: ********** f | Deciduous Component: 35% |
| Flowing Water Mean Depth: **** ft. | Pools by Stream Length: 42% |
| Base Flow: 1.6 cfs | Pools >=3 ft.deep: 38% |
| Water: 63 - 65 °F Air: 75 - 79 °F | Mean Pool Shelter Rtn: 105 |
| Dom. Bank Veg.: Deciduous Trees | Dom. Shelter: Undercut Banks |
| Vegetative Cover: 71% | Occurrence of LOD: 30% |
| Dom. Bank Substrate: Cobble/Gravel | Dry Channel: 0 ft. |
| Embeddness Value: 1. 75% 2. 25% 3. 0% 4. 0% | |

Mean Percentage of Dominant Substrate

| Dominant Class of Substrate | Number Units Right Bank | Number Units Left Bank | Total Mean Percent |
|---|---|---|---|
| Bedrock | 0 | 8 | 4.76 |
| Boulder | 26 | 23 | 29.17 |
| Cobble/Gravel | 44 | 40 | 50 |
| Silt/clay | 14 | 13 | 16.07 |

Mean Percentage of Dominant Vegetation

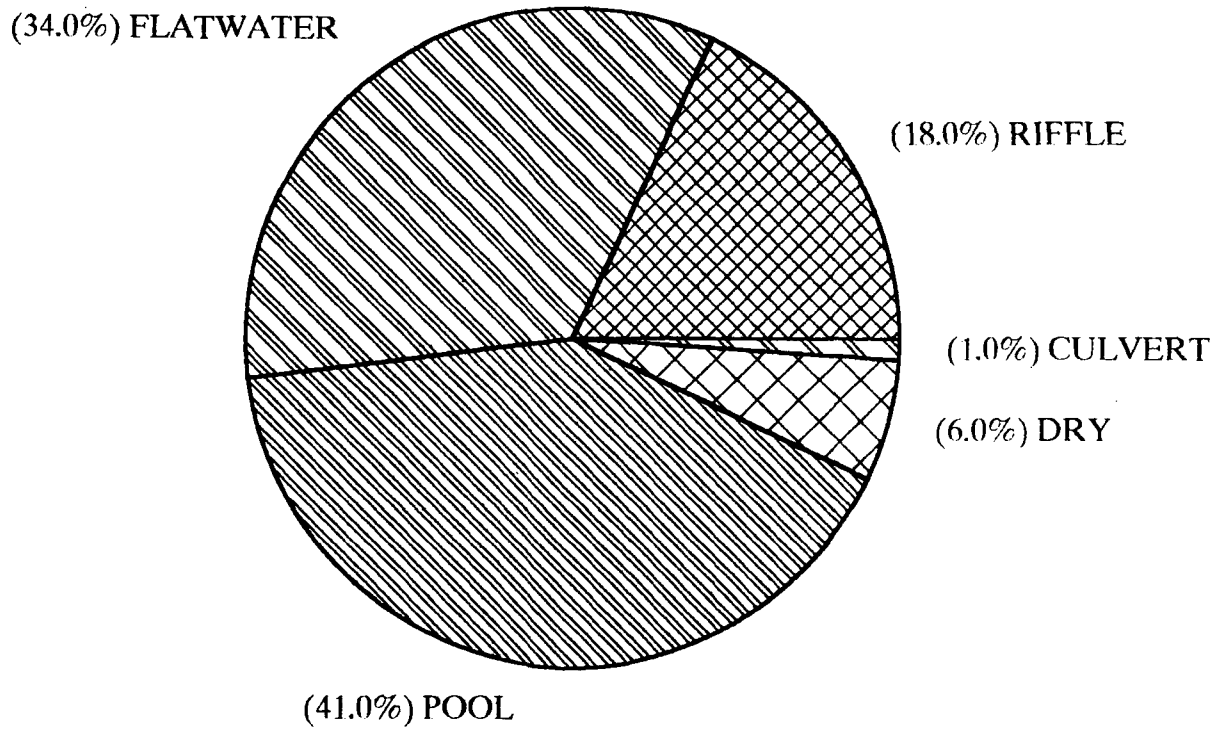
| Dominant Class of Vegetation | Number Units Right Bank | Number Units Left Bank | Total Mean Percent |
|---|---|---|---|
| Grass | 6 | 5 | 6.55 |
| Brush | 0 | 2 | 1.19 |
| Decid. Trees | 59 | 64 | 73.21 |
| Conif. Trees | 15 | 6 | 12.50 |
| No Vegetation | 4 | 7 | 6.55 |

Summary of Mean Percent Vegetative Cover for Entire Stream

| Mean Percent Canopy | Mean Percent Conifer | Mean Percent Decidous | Mean Right bank % Cover | Mean Left Bank % Cover |
|---|---|---|---|---|
| 75.65 | 21.79 | 74.64 | 62.86 | 66.55 |

# USAL CREEK

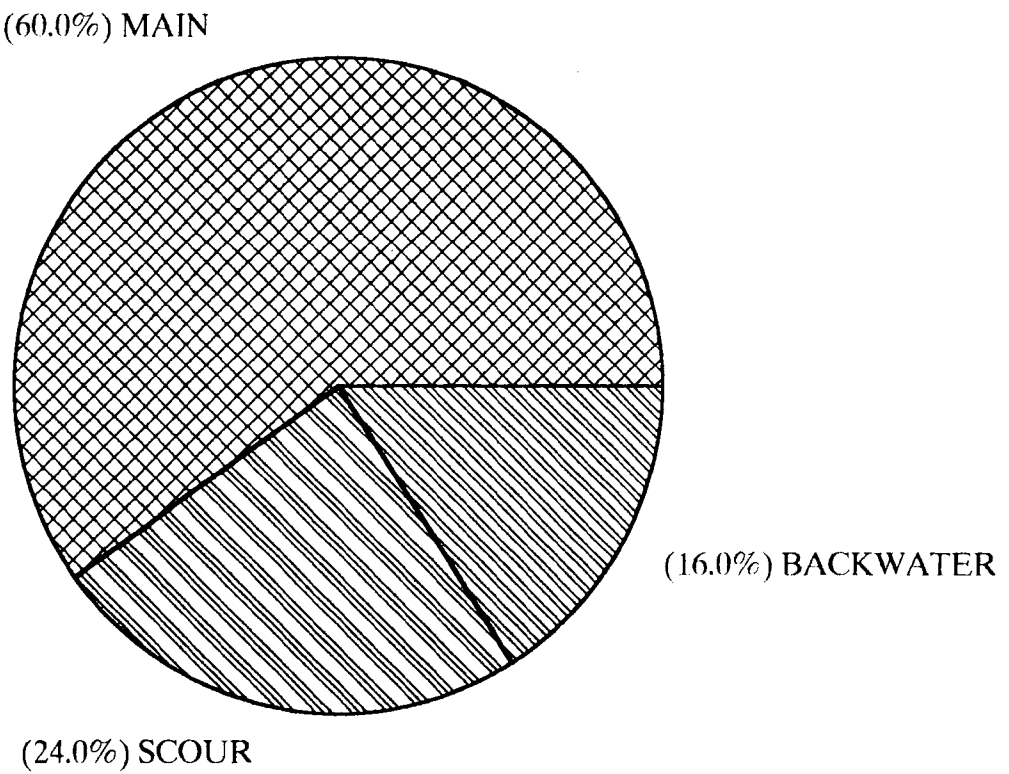
HABITAT TYPES BY PERCENT OCCURRENCE




GRAPH 1

# USAL CREEK

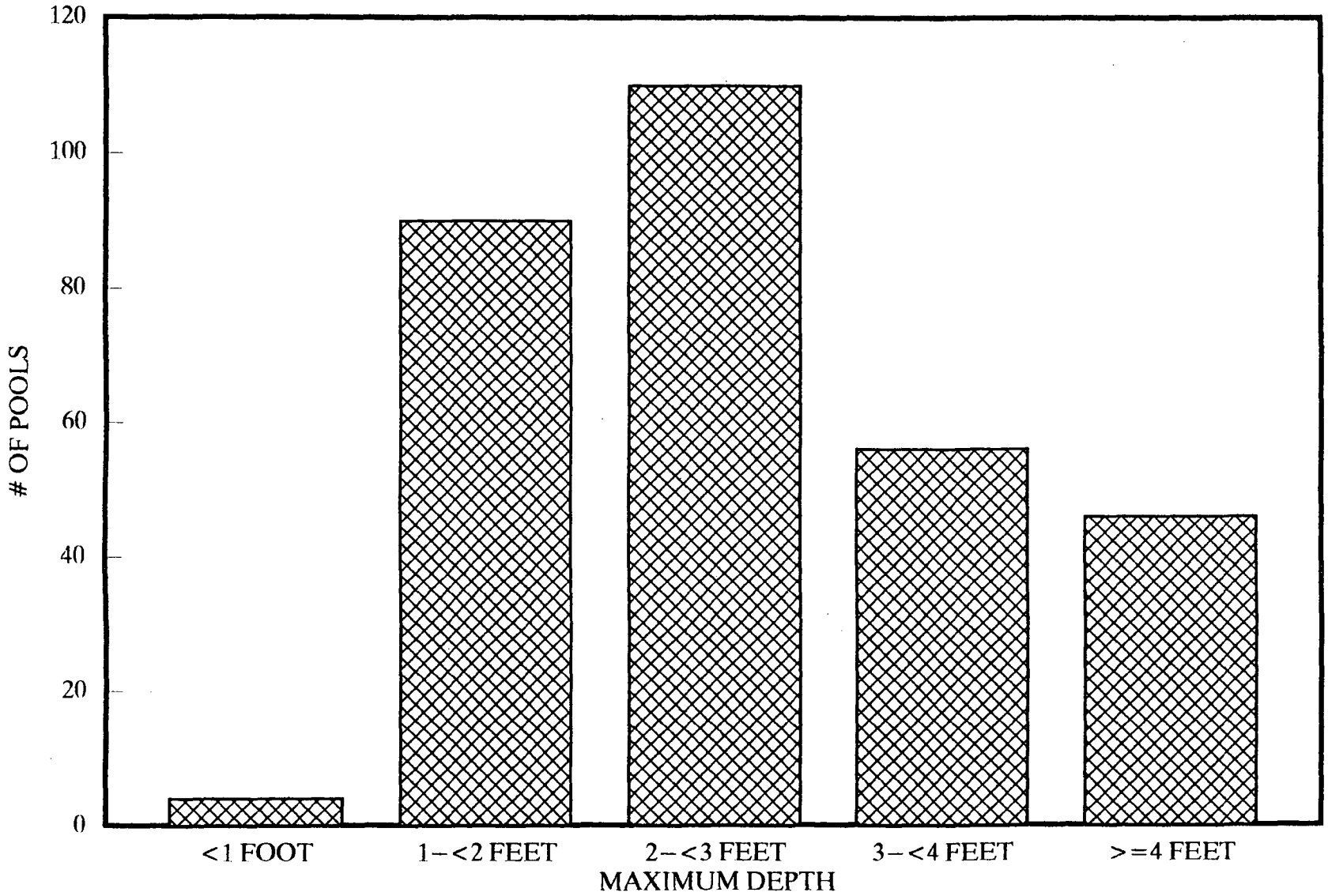
POOL HABITAT TYPES BY PERCENT OCCURRENCE




GRAPH 4

# USAL CREEK

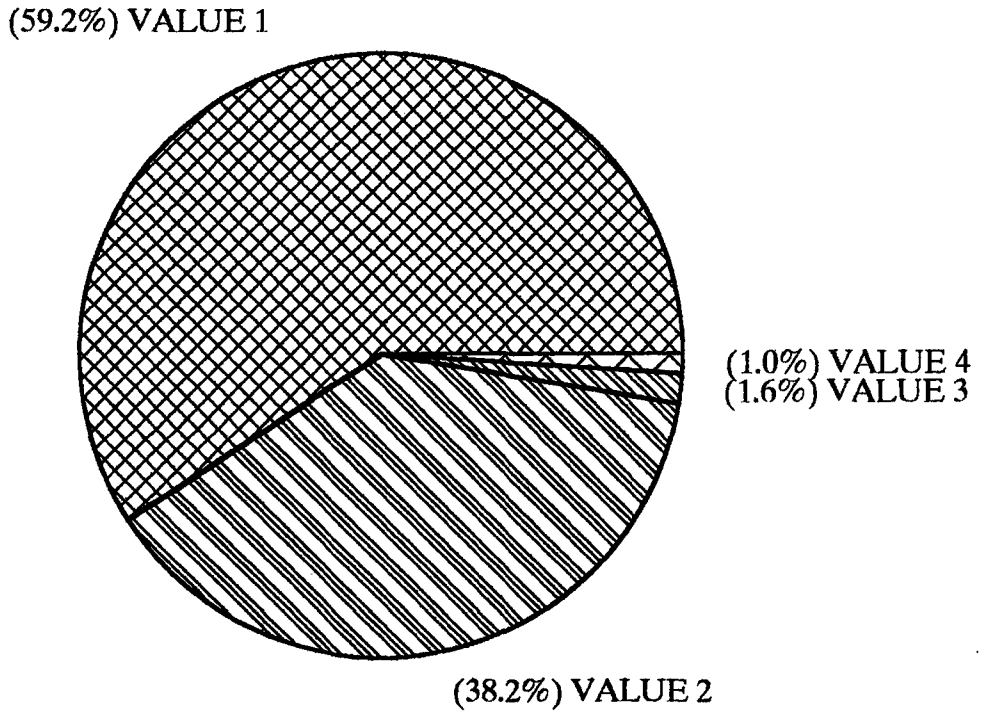
MAXIMUM DEPTH IN POOLS




GRAPH 5

# USAL CREEK

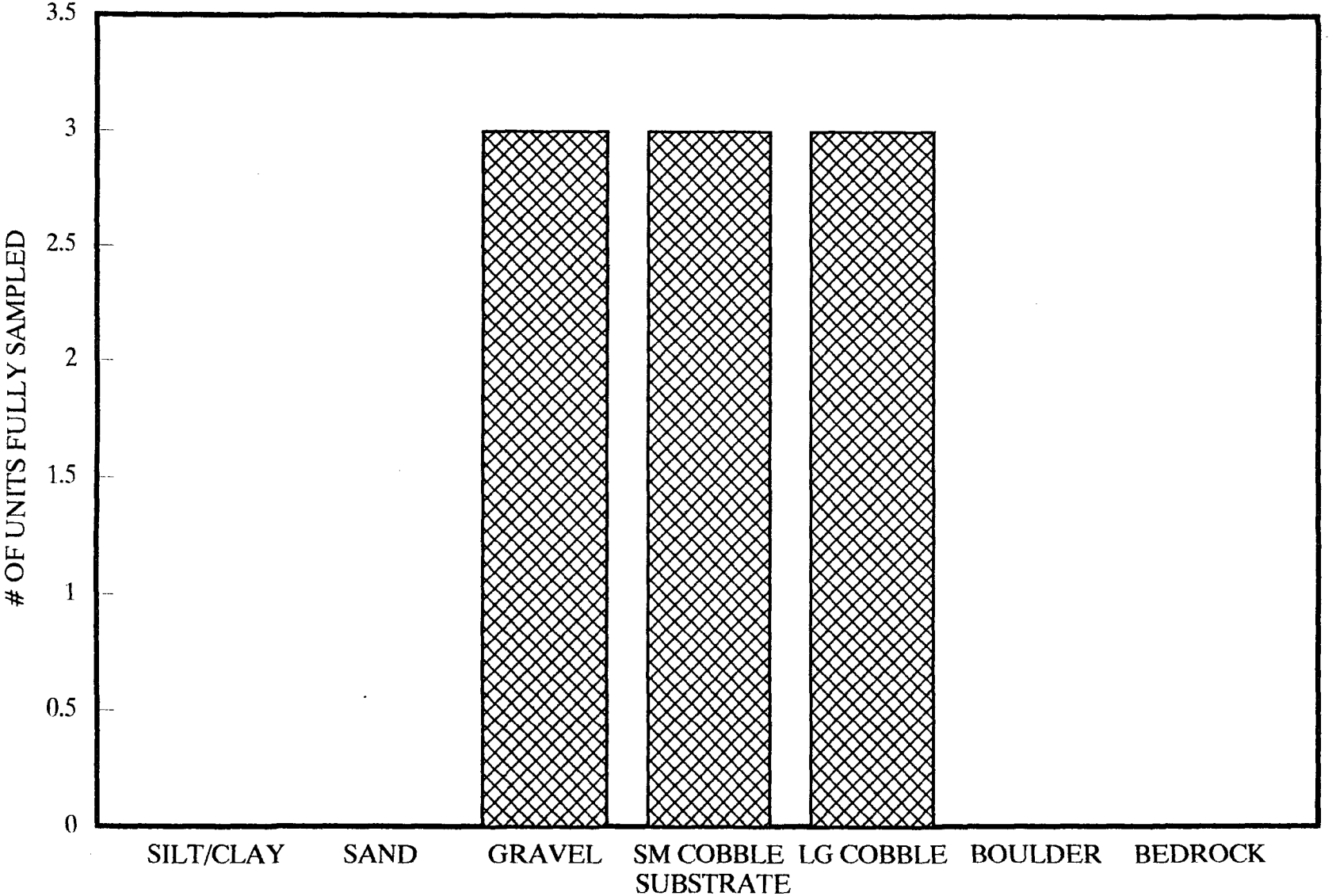
PERCENT EMBEDDEDNESS




GRAPH 6

# BUNKER GULCH

SUBSTRATE COMPOSITION IN LOW GRADIENT RIFFLES

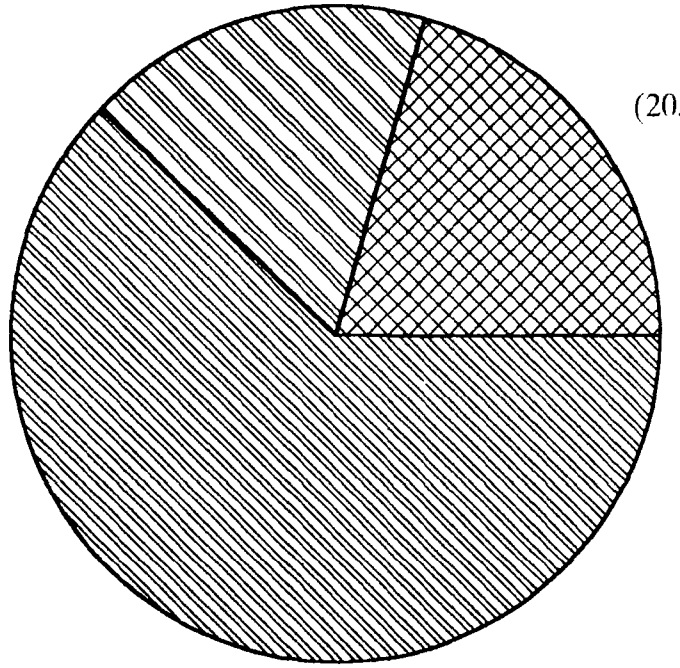



GRAPH 8

# USAL CREEK

PERCENT CANOPY

(17.3%) CONIFEROUS TREES



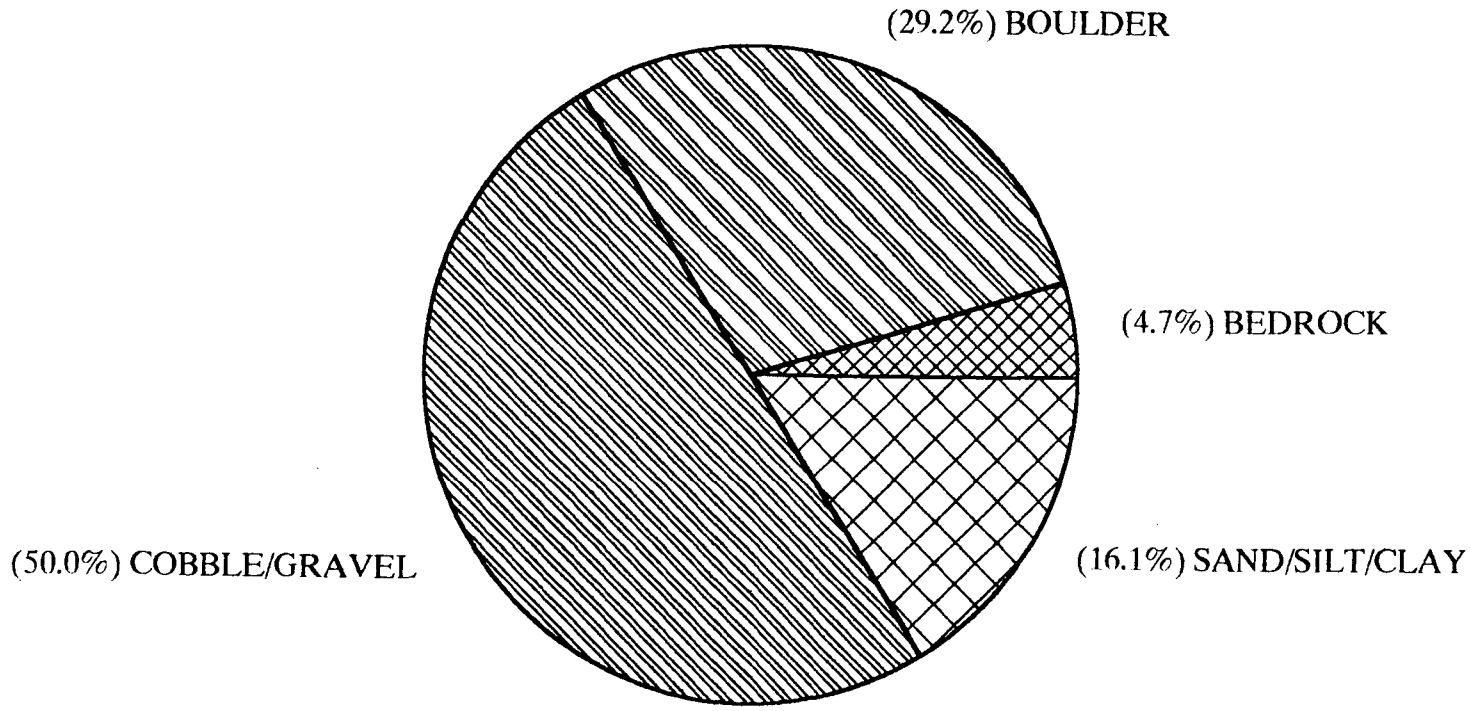
(20.6%) OPEN

(62.1%) DECIDUOUS TREES

GRAPH 9

# USAL CREEK

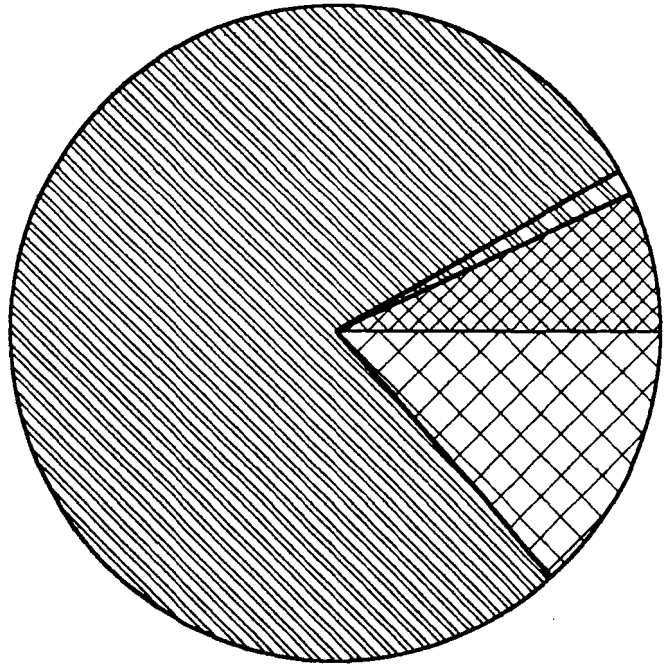
DOMINATE BANK COMPOSITION IN SURVEY REACH




GRAPH 10

# USAL CREEK

DOMINATE BANK VEGETATION IN SURVEY REACH




GRAPH 11