SALMON AND STEELHEAD RESTORATION AND ENHANCEMENT PROGRAM

NORTH COAST

BASIN PLANNING PROJECT

STREAM INVENTORY REPORT

YAGER CREEK

CALIFORNIA DEPARTMENT OF FISH AND GAME

SPORT FISH RESTORATION ACT

1995

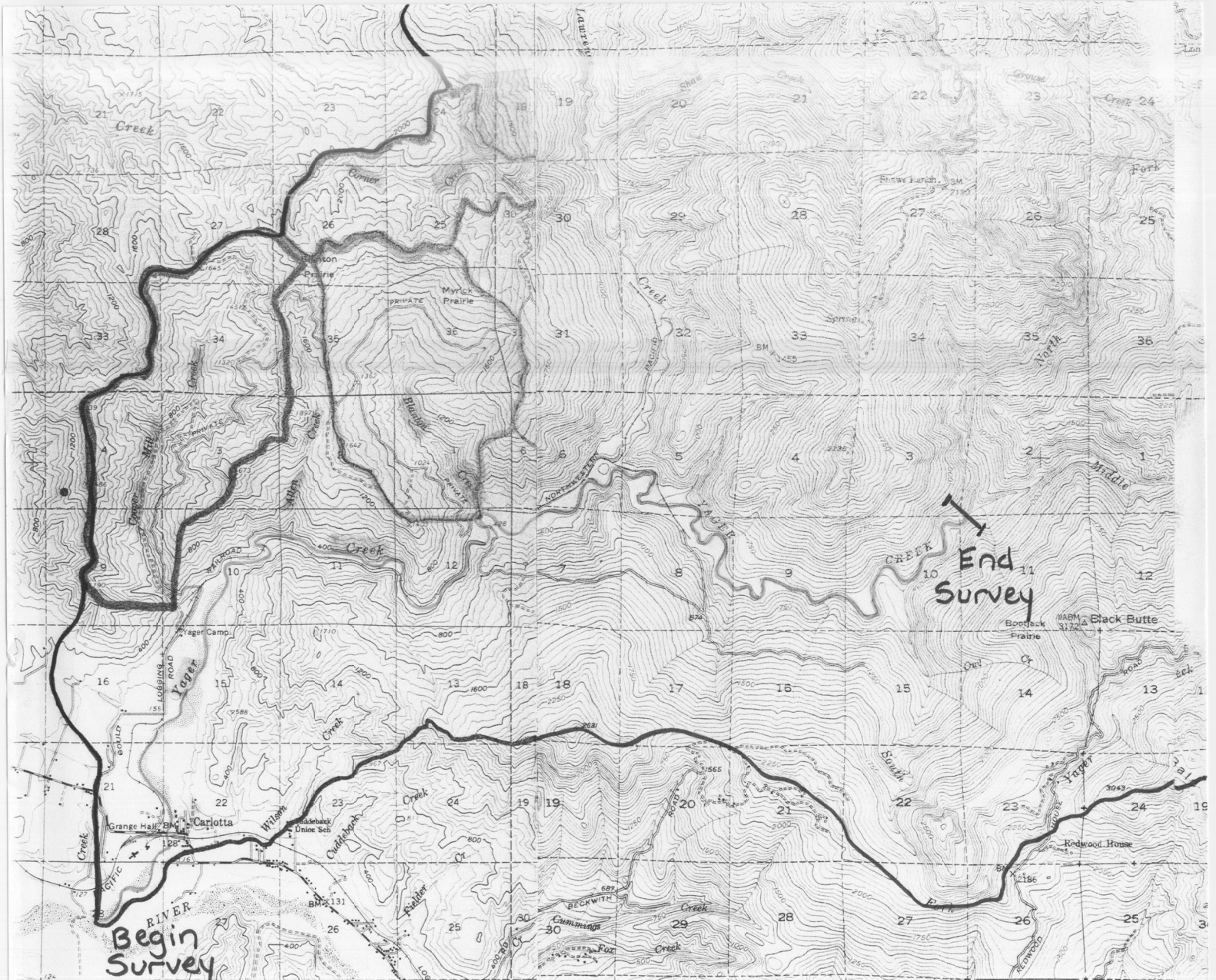
North Coast Basin Planning Project

NORTH COAST BASIN PLANNING PROJECT

The North Coast Basin Planning Project (BPP) was begun in 1991 to develop salmon and steelhead restoration and enhancement programs in North Coast watersheds for the Department of Fish and Game (DFG). The objectives of the project conform with the goals of California's Salmon and Steelhead Restoration and Enhancement Program of 1988. The Restoration Program strives to enhance the status of anadromous salmonid populations and improve the fishing experience for Californians. The program intends to achieve a doubling of the population of salmon and steelhead by the year 2000. The project is supported by the Sport Fish Restoration Act, which uses sport fishermen's funds to improve sport fisheries.

The BPP conducts stream and habitat inventories according to the standard methodologies discussed in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). Biological sampling is conducted using electrofishing and direct observation to determine species presence and distribution; selected streams are electrofished for population estimates. Some streams are also sampled for sediment composition. Collected information is used for base-line data, public cooperation development, restoration program planning, specific project design and implementation, and for project evaluation.

The Eel River system was identified as the initial basin for project planning activities. Most anadromous tributaries to the Van Duzen, South Fork Eel, Mainstem Eel, Middle Fork Eel, and North Fork Eel rivers have been inventoried since 1991. Initial field inventory of the Eel River system should be essentially complete in 1996. BPP personnel have also worked in cooperation with the DFG Salmon Restoration Project's staff to inventory streams on the Mattole River, Mendocino Coast, and Humboldt Bay.



Begin Survey
End Survey
Carlotta
Grange Hall
Yager Camp
Myrick Prairie
Black Butte
Bootjack Prairie
Redwood House
Cuddeback Union Sch

STREAM INVENTORY REPORT

MAINSTEM YAGER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on mainstem Yager Creek to assess habitat conditions for anadromous salmonids. 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 Yager Creek. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

During surveys conducted in December 1991 and January 1992, crews observed 47 chinook carcasses and 79 chinook redds in Yager Creek. The objective of this report is to document the current habitat conditions, and recommend options for the enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Yager Creek is a tributary to the Van Duzen River, a tributary to the Eel River, located in Humboldt County, California (Figure 1). The legal description at the confluence with the Van Duzen River is T2N R1E S28. Its location is 40°31'31" N. latitiude and 124° 04'00" W. longitude. Yager Creek is a fourth order stream and has approximately 125 miles of blue line stream according to the USGS Hydesville, Owl Creek, Iaqua Butte, and Yager Junction 7.5 minute quadrangles. Yager Creek and its tributaries drain a basin of approximately 135 square miles. Summer base flow is approximately 25 cfs at the mouth, but over 5,000 cfs is not unusual during winter storms. Elevations range from about 120 feet at the mouth of the creek to 3,000 feet in the headwater areas. Redwood and Douglas fir forest dominates the watershed, but there are zones of grassland and oak-woodland in the upper watershed. The watershed is owned primarily by the Pacific Lumber Company and is managed for timber production and grazing. Year round vehicle access exists from State Highway 36 near Carlotta, via Fisher Road.

METHODS

The habitat inventory conducted in Yager Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds). The inventory was conducted by two person teams. The California Conservation Corps (CCC) Technical Advisors conducting the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Yager Creek personnel were trained in May and June, 1991, by Gary Flosi and Scott Downie.

Mainstem Yager Creek

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 Yager 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. Flows should also be measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing was conducted according to the classification system developed by David Rosgen (1985). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted during habitat typing operations and follows a standard form to record measurements and observations. There are four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are taken and recorded at each tenth unit typed. The time of the measurement is also recorded. Temperatures are taken in Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing used 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". Yager 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 measurements were accomplished using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Depth of the pool tail crest at each pool habitat unit was measured at the thalweg. All measurements were taken in feet to the nearest tenth.

Mainstem Yager Creek

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 Yager 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).

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 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 Yager 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 habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Yager Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentages of the total canopy area was then further analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

9. Bank Composition:

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 Yager Creek, the dominant composition type in both the right and left banks was selected from a list of

eight options on 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. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in Yager Creek to document the fish species composition and distribution. Five sites were electrofished in Yager Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. Fish from each site were counted by species, measured, and returned to the stream.

SUBSTRATE SAMPLING

Gravel sampling is conducted using either a 6 or 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream.

Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37, and 0.85 mm). During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field form. The remainder of the sample is sealed in plastic bags with an identification and information ribbon, then taken to the laboratory for final processing.

In the laboratory the samples are wet sieved using standard Tyler screens. All particles greater than 0.85 mm diameter are measured by displacement in graduated cylinders. The volume of fine sediment less than 0.85 mm is measured following one hour of settling in graduated cylinders or Imhoff cones. The fines measured in the field are added to these results.

Gravel sampling is conducted to determine the percentage of fine sediment present in probable fish spawning areas. These areas are generally found in low gradient riffles at the tail-outs of pools. The higher the percent of fine sediment, the lower the probability for eggs to 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 from emerging from the gravel.

DATA ANALYSIS

Data from the habitat inventory form is entered into Habtype, a dBASE 3+ data entry program developed by the Department and Fish and Game. From Habtype, the data is summarized by Habtab, a dBASE 4.1 program in development by DFG.

The Habtab program produces the following summary 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 Yager 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

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 12-16, 19-22, and 26, 1991, was conducted by Tony Sartori, Brian Humphrey, Jerry Suissa, Steve Liebhardt, and Craig Mesman (CCC). The survey began at the confluence with the Van Duzen River and extended up Yager to the confluence of the North and Middle Forks. The total length of the stream surveyed was 77,297 feet, with 4,775 feet of side channel.

Flow was estimated to be 25 cfs during the survey period.

Mainstem Yager Creek

This section of Yager Creek has six channel types: from the mouth to 15,087 a C1; next 15,957 feet a B2; next 1,880 an A2; next 2,016 a B2; next 17,363 a C2; and the upper 24,994 feet a C3. C1 streams have gentle gradient, meandering, cobble/gravel channels. B2 channels are moderate gradient (1.0-2.5%), moderately confined, large cobble/boulder channels. B1 channels are moderate gradient (2.5-4.0%), moderately confined boulder/large cobble channels. C2 are low gradient (< 1%), moderately confined streams, with stable stream banks. C3 channels are low gradient (<1%), meandering gravel bed channels.

Water temperatures ranged from 63 to 77 degrees Fahrenheit. Air temperatures ranged from 57 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 28.8%, flatwater types were 45.6%, and pools 25.4% (Graph 1). Flatwater habitat types made up 58.6% of the total survey **length**, riffles were 20.8%, and pools 20.5% (Graph 2).

Twenty Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 26.8%, runs, 19.7%, step runs, 13.5%, and glides, 12.3% (Graph 3). By percent total **length**, step runs made up 24.9%, low gradient riffles 19.5%, runs 17.5%, and glides 15.1%.

One-hundred-fifty-one pools were identified (Table 3). Scour pools were most often encountered at 74.8%, and comprised 74.9% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. One-hundred-thirty-seven of the 151 pools (91%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 145 pool tail-outs measured, four (2.8%) had a value of 1; 40 (27.1%) had a value of 2; 41 (28.5%) had a value of 3; and 60 (41.4%) had a value of 4. On this scale, a value of one is best for fisheries (Graph 6).

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 types had the highest shelter rating at 67.3. Pools had the lowest rating with 37.7 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 42.5, main channel pools rated 42.0, and scour pools 36.2 (Table 3).

Mainstem Yager Creek

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Yager Creek and are extensive. Large wood and root masses are the next most common cover type. Graph 7 describes the pool cover in Yager Creek.

Table 6 summarizes the dominant substrate by habitat type. Boulder was the dominant substrate observed in 58 of the 159 low gradient riffles (36.5%). Gravel was the next most frequently observed dominant substrate type, and occurred in 25.8% of the low gradient riffles (Graph 8).

Nearly 96% of Yager Creek lacked shade canopy. Of the 4% of the stream that was covered with canopy, 81% was composed of deciduous trees, and 19% was composed of coniferous trees. Graph 9 describes the canopy in Yager Creek.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 54.8%. The mean percent left bank vegetated was 69.5%. The elements composing the structure of the stream banks consisted of 5.6% bedrock, 7.3% boulder, 11.5% cobble/gravel, 3.0% bare soil, 2.4% grass, 3.7% brush. Additionally, 62.0% of the banks were covered with deciduous trees, and 4.6% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Five electrofishing sites were sampled on Yager Creek. The objective was to identify fish species and distribution within Yager basin. The units were sampled on September 11 and 16, 1991 by Erick Elliot, Brian Humphrey, and Shea Monroe (CCC). Each unit was end-blocked with nets to contain the fish within the sample reach. Two passes were conducted at each site, fork lengths measured and recorded, and the fish returned to the stream. All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 029, a step run, approximately 5,772 feet from the confluence with the Van Duzen River, and 100 yards downstream from the Highway 36 bridge. The site had an area of 2,235 sq ft, and a volume of 2,092 cu ft. The sample included 4 steelhead, ranging from 86 to 112 mm; 58 roach, ranging from 31 to 75 mm; 19 sculpin, ranging from 50 to 120 mm; and 1 Pacific lamprey ammocete 148 mm total length.

The second sample site was habitat unit 066, a step run, approximately 14,594 above the confluence with the Van Duzen River, and 100 feet upstream from the confluence with Cooper Mill Creek. This site had an area of 1,330 sq ft, and a volume of

1,862 cu ft. The sample included 14 steelhead, ranging from 81 to 193 mm; 9 sculpin, ranging from 46 to 115 mm; and 15 roach, which were not measured.

The third site was habitat unit 188, a bedrock formed lateral scour pool, approximately 31,216 feet from the confluence with the Van Duzen River and 75 feet above the second PALCO bridge. This site had an area of 1,500 sq ft, and a volume of 4,500 cu ft. The sample included 27 steelhead, ranging from 71 to 190 mm; 13 sculpin, ranging from 70 to 129 mm; 5 roach, ranging from 57 to 78 mm; and 1 Pacific lamprey ammocete 106 mm total length.

The fourth site was habitat unit 335, a step run, approximately 52,523 feet from the confluence with the Van Duzen River. This site had an area of 560 sq ft, and a volume of 336 cu ft. The sample included 212 roach, ranging from 26 to 95 mm; and 11 sucker, ranging from 43 to 63 mm.

The fifth site was habitat unit 556, a root wad enhanced lateral scour pool, approximately 72.207 feet from the confluence with the Van Duzen River and 150 yards downstream from the Middle Fork Yager bridge. The site had an area of 2,220 sq ft, and a volume of 6,000 cu ft. The sample included 3 steelhead 74, 75, and 105 mm: 14 roach, 34 to 71 mm; 2 sucker, 111 and 145 mm; and 3 Pacific lamprey ammocetes 103, 105, and 109 mm total length.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Yager Creek

DISCUSSION

Yager Creek has five channel types: B1, B2, C1, C2 and C3. The high energy and steep gradient of the B1 channel type is generally not suitable for instream enhancement structures. The B2 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 17,973 feet of this type of channel in Yager Creek, along with a plenitude of LOD either in or nearby the stream. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The lower 15,087 feet of Yager Creek is a C1 channel type. There is also a 17,363' reach of C2 channel in the middle section of Yager Creek. Both C1 and C2 channels have suitable gradients and the stream bank stability that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective cover for fish. Well

placed and engineered structures that constrict the channel to form pool habitat or cover structures are usually appropriate and have a good chance of success in these channel types.

The upper 24,994' of the survey reach is a C3 channel. C3 channels are meandering steam types on uncohesive gravel beds which have poorly consolidated and unstable stream banks. They are generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover and shelter structures in straight reaches are often appropriate. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded on the survey days August 12-26, 1991 ranged from 61 F to 77 F. Air temperatures ranged from 57 F to 80 F. The warmer water and air temperatures were recorded in the upper half of the survey reach. These temperatures, if sustained, are above the threshold stress level for salmonids. It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the lower sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 58.6% of the total **length** of this survey, riffles 20.8%, and pools 20.5%. The pools are relatively deep with 137 of the 151 pools having a maximum depth greater than 3 feet. However, in coastal coho and steelhead streams, it is generally desirable to have pools comprise approximately 50% of total habitat. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation will not jeopardize the unstable C3 stream banks, or subject the structures to high stream energy.

One-hundred-one of the 145 pool tail-outs measured had an embeddedness rating of 3 or 4. Only four had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Yager Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was low with a rating of 37.7. The shelter rating in the flatwater habitats was better at 41.6. Riffles rated highest at 67.3. However, 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. Additionally, large and small woody debris contribute a small amount. Log and root wad cover structures in

the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Seventy-one of the 159 low gradient riffles had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the survey reach was only 4%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. Cooler water temperatures are desirable in Yager Creek. The large trees required to contribute shade to the wide channel typical of this reach would also eventually provide a long term source of large woody debris needed for instream structure.

RECOMMENDATIONS

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

2) Temperatures in this section of Yager Creek, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) 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.

4) Where feasible, increase woody cover in the pool and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations. In some areas the material is at hand.

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

6) 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.

7) Increase the canopy on Yager Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this inventory section must be treated as well, since the water being delivered here is being warmed above. In many cases, planting will need to coordinated to follow bank stabilization or upslope erosion control projects.

PROBLEM SITES AND LANDMARKS

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

0'	Begin survey at confluence with Van Duzen River. Channel type is C1.
6466'	Highway 36 railroad bridge.
15421'	Cooper Mill Creek enters from the right bank.
15087'	Channel changes type from C1 to B2.
16925'	Log bridge 5' high x 10' wide' x 35' long, crosses the creek. This is a seasonal logging bridge.
19448'	Access to creek for water trucks.
20105'	One foot diameter culvert 30' high on the right bank.
22567'	Trestle logging bridge 42' high x 20' wide x 52' long. This is PALCO bridge # 1.
23141'	Right bank erosion 60' high x 100' long, partially revegetated.
23500'	Allen Creek enters from the right bank.
24672'	Cable car crosses the stream; road is on left bank.
28452'	Right bank erosion.
28923'	Left bank erosion 40' high x 150' long, well armored by 2-4' boulders. Road is at the top.
30126'	Adult steelhead 18-24" observed. Summer run?

Mainstem Yager Creek

31043' Trestle bridge 35' high x 20' wide x 55' long. This is PALCO bridge # 2.

31044' Channel changes type from B2 to A2.

32924' Channel changes type from A2 to B2.

34940' Area of abundant, high quality spawning gravel.

34940' Channel changes type from B2 to C2.

37587' Left bank erosion 50' wide, well vegetated.

38612' Summer log bridge 4' high x 15' wide x 55' long.

38853' Blanton Creek enters from the right bank.

44517' Six redwoods (one foot diameter) fallen from the left bank across wetted width.

44928' Left bank blue slide 20' high x 20' long.

46150' Road access from right bank.

46223' Lawrence Creek enters from the right bank.

48513' Road access to creek from right bank. Road is first right past Bridge four on Lawrence Creek.

49210' Stream is very wide, gravel floodplain in this area.

51713' Road crossing for 4 wheel drive vehicles.

52413' Strawberry Creek (dry) enters from the right bank. Road access to the creek.

52303' Channel changes type from C2 to C3.

52843' Right bank slide 40-80' high x 400' long, partially revegetated by alder.

54239' Left bank head cut 15' high x 400' long.

55788' Left bank erosion 40' high x 200' long.

55874' Right bank erosion 40' high x 100' long.

57235' Right bank erosion 60' high x 20' long.

Mainstem Yager Creek

61716' Very high densities of roach observed in this section of survey.

61847' Road crossing culvert 1.5' diameter x 30' long. First road access since Strawberry Creek. Gravel floodplain is 300' wide.

63149' Right bank erosion 30' high x 50' long, with boulder/bedrock toe.

63029' Dead steelhead 4" in length found in stream.

63349' Four large 2+ size steelhead observed with 100 roach.

65372' Log and debris accumulation (LDA) 20' long x 20' wide x 10' high.

65423' LDA 10' long x 10' wide x 10' high, no barrier.

66297' Left bank blue slide 30' high x 70' long.

66981' Left bank blue slide 20-100' high x 741' long, with little or no vegetation.

68800' Railroad car bridge, 16' high x 15' wide x 70' long.

68924' Left bank has boulder rip rap (4' diameter boulders), 10' high x 426' long.

70427' South Fork Yager enters from the left bank.

71000' The stream in this area is often braided.

72584' Left bank erosion, 20' high x 20' long.

74051' Log bridge crosses the channel, 20' high x 16' wide x 42' long.

75128' Cat trail crosses the channel in active logging area.

76735' Left bank erosion 40' high x 100' long, partially stabilized by boulders and alder at the toe.

77332' End of survey (confluence with Middle and South Fork Yager Creek).

FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: YAGER CREEK
SAMPLE DATES: 08/12/91 - 08/26/91
STREAM LENGTH: 77297 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: HYDESVILLE — Latitude: 40°31'31"
Legal Description: T2N,R1E,S28 — Longitude: 124°4'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: C1	Canopy Density: 11%
Channel Length: 15087 ft.	Coniferous Component: 29%
Flowing Water Mean Width: 47 ft.	Deciduous Component: 71%
Flowing Water Mean Depth: 1.0 ft.	Pools by Stream Length: 14%
Base Flow: 25.0 cfs	Pools >=3 ft.deep: 92%
Water: 63 - 69 °F Air: 57 - 66 °F	Mean Pool Shelter Rtn: 44
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 65%	Occurrence of LOD: 0%
Dom. Bank Substrate: No Data	Dry Channel: 0%

Embeddness Value: 1. 0% 2. 29% 3. 14% 4. 57%

STREAM REACH 2

Channel Type: B2	Canopy Density: 8%
Channel Length: 15957 ft.	Coniferous Component: 49%
Flowing Water Mean Width: 44 ft.	Deciduous Component: 51%
Flowing Water Mean Depth: 1.2 ft.	Pools by Stream Length: 23%
Base Flow: 25.0 cfs	Pools >=3 ft.deep: 97%
Water: 64 - 75 °F Air: 61 - 75 °F	Mean Pool Shelter Rtn: 38
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 57%	Occurrence of LOD: 0%
Dom. Bank Substrate: No Data	Dry Channel: 0%

Embeddness Value: 1. 8% 2. 34% 3. 29% 4. 29%

STREAM REACH 3

Channel Type: A2	Canopy Density: 15%
Channel Length: 1880 ft.	Coniferous Component: 46%
Flowing Water Mean Width: 39 ft.	Deciduous Component: 54%
Flowing Water Mean Depth: 1.2 ft.	Pools by Stream Length: 22%
Base Flow: 25.0 cfs	Pools >=3 ft.deep: 100%
Water: 65 - 67 °F Air: 66 - 72 °F	Mean Pool Shelter Rtn: 54
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 43%	Occurrence of LOD: 0%
Dom. Bank Substrate: No Data	Dry Channel: 0%

Embeddness Value: 1. 0% 2. 40% 3. 0% 4. 60%

STREAM REACH 4

Channel Type: B2	Canopy Density: 5%
Channel Length: 2016 ft.	Coniferous Component: 45%
Flowing Water Mean Width: 53 ft.	Deciduous Component: 55%
Flowing Water Mean Depth: 1.1 ft.	Pools by Stream Length: 13%
Base Flow: 25.0 cfs	Pools >=3 ft.deep: 100%
Water: 67 - 69 °F Air: 72 - 72 °F	Mean Pool Shelter Rtn: 35
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 68%	Occurrence of LOD: 0%
Dom. Bank Substrate: No Data	Dry Channel: 0%

Embeddness Value: 1. 0% 2. 33% 3. 0% 4. 67%

STREAM REACH 5

Channel Type: C2	Canopy Density: 20%
Channel Length: 17363 ft.	Coniferous Component: 29%
Flowing Water Mean Width: 36 ft.	Deciduous Component: 71%
Flowing Water Mean Depth: 0.9 ft.	Pools by Stream Length: 19%
Base Flow: 25.0 cfs	Pools >=3 ft.deep: 100%
Water: 64 - 75 °F Air: 57 - 78 °F	Mean Pool Shelter Rtn: 29
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 81%	Occurrence of LOD: 4%
Dom. Bank Substrate: No Data	Dry Channel: 0%
Embeddness Value: 1. 3% 2. 37% 3. 27% 4. 33%	

STREAM REACH 6

Channel Type: C3	Canopy Density: 15%
Channel Length: 24994 ft.	Coniferous Component: 39%
Flowing Water Mean Width: 28 ft.	Deciduous Component: 61%
Flowing Water Mean Depth: 0.7 ft.	Pools by Stream Length: 24%
Base Flow: 25.0 cfs	Pools >=3 ft.deep: 87%
Water: 64 - 77 °F Air: 60 - 80 °F	Mean Pool Shelter Rtn: 37
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 75%	Occurrence of LOD: 7%
Dom. Bank Substrate: No Data	Dry Channel: 0%
Embeddness Value: 1. 0% 2. 19% 3. 36% 4. 45%	

YAGER CREEK

Drainage: VAN DUZEN

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 08/12/91 - 08/26/91

Confluence Location: QUAD: HYDESVILLE LEGAL DESCRIPTION: T2N,R1E,S28 LATITUDE: 40°31'31" LONGITUDE: 124°4'0"

UNITS 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 (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME (cu.ft)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
171	RIFFLE	29	100	17047	21	32.0	0.6	2890	494107	1962	335548	0	67
271	FLATWATER	46	178	48107	59	36.4	1.1	6701	1815923	7954	******	0	42
151	POOL	25	111	16818	20	38.0	2.6	4513	681525	12249	******	7480	38
1	DRY	0	100	100	0	0.0	0.0	0	0	0	0	0	90

TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
594	82072	2991555	4340549

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

YAGER CREEK

Drainage: VAN DUZEN

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/12/91 - 08/26/91

Confluence Location: QUAD: HYDESVILLE LEGAL DESCRIPTION: T2N,R1E,S28 LATITUDE: 40°31'31" LONGITUDE: 124°4'0"

UNITS MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	TOTAL LENGTH	MEAN WIDTH	MEAN DEPTH	MAXIMUM DEPTH	MEAN AREA	TOTAL AREA	MEAN VOLUME	TOTAL VOLUME	MEAN RESIDUAL POOL VOL	MEAN SHELTER RATING	MEAN RT. BANK VEGETATED	MEAN LT. BANK VEGETATED	MEAN CANOPY
#		%	ft.	ft.	%	ft.	ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%	%	%
159	LGR	27	101	15998	19	31	0.6	3.3	2896	460541	1888	300165	0	64	66	76	13
9	HGR	2	97	875	1	45	1.0	3.4	3237	29137	3523	31706	0	110	48	50	5
1	CAS	0	50	50	0	30	1.4	2.9	1050	1050	1470	1470	0	120	30	50	5
2	BRS	0	62	124	0	43	0.7	3.8	1690	3379	1104	2207	0	98	60	45	15
1	POW	0	1000	1000	1	80	1.9	3.4	80000	80000	*****	152000	0	30	100	100	10
73	GLD	12	169	12350	15	44	1.0	4.7	7911	577513	9077	662648	0	18	81	81	13
117	RUN	20	123	14342	17	32	1.2	4.8	4224	494194	5373	628673	0	47	69	74	16
80	SRN	13	255	20415	25	35	1.0	3.8	8303	664217	8901	712113	0	57	69	77	16
3	TRP	1	62	185	0	17	8.0	6.6	1237	3711	7581	22742	6185	35	53	30	42
26	MCP	4	121	3154	4	41	2.3	6.6	5108	132818	12388	322086	6892	40	63	79	7
2	CCP	0	151	302	0	59	2.7	7.1	8508	17016	22880	45761	16556	9	95	95	18
3	STP	1	67	201	0	35	2.9	4.9	2069	6207	5935	17806	2223	85	50	60	12
2	CRP	0	164	327	0	38	3.2	6.2	6498	12996	20658	41317	14458	30	50	60	8
15	LSL	3	94	1416	2	39	1.9	6.5	3844	57667	7561	113408	3810	40	89	59	12
31	LSR	5	84	2607	3	33	2.2	9.0	2873	89061	7092	219850	4519	43	61	71	21
32	LSBk	5	125	3998	5	39	3.1	13.0	5381	172194	17888	572430	11305	34	38	42	9
30	LSBo	5	136	4067	5	42	2.6	9.5	5844	175305	15573	467185	9785	28	72	72	14
3	PLP	1	62	186	0	33	1.7	5.5	2140	6420	3989	11968	1850	50	70	87	35
3	SCP	1	99	297	0	19	1.6	5.0	1930	5789	3835	11505	1628	37	63	73	10
1	DPL	0	78	78	0	30	1.5	3.0	2340	2340	3510	3510	0	60	0	100	100
1	DRY	0	100	100	0	0	0.0	0.0	0	0	0	0	0	90	90	90	5

TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
594	82072	2991555	4340549

YAGER CREEK

Drainage: VAN DUZEN

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/12/91 - 08/26/91

Confluence Location: QUAD: HYDESVILLE LEGAL DESCRIPTION: T2N,R1E,S28 LATITUDE: 40°31'31" LONGITUDE: 124°4'0"

UNITS 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 (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME (cu.ft)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
34	MAIN	23	113	3842	23	39.6	2.9	4699	159753	12012	408394	6986	42
113	SCOUR	75	112	12601	75	38.1	2.5	4546	513643	12621	******	7850	36
4	BACKWATER	3	94	375	2	21.5	1.6	2032	8129	3754	15015	1221	43

TOTAL MEASURED	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
151	16818	681525	1849567

YAGER CREEK Drainage: VAN DUZEN

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 08/12/91 - 08/26/91

Confluence Location: QUAD: HYDESVILLE LEGAL DESCRIPTION: T2N,R1E,S28 LATITUDE: 40°31'31" LONGITUDE: 124°4'0"

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
3	TRP	2	0	0	0	0	0	0	2	67	1	33
26	MCP	17	0	0	0	0	1	4	13	50	12	46
2	CCP	1	0	0	0	0	0	0	1	50	1	50
3	STP	2	0	0	0	0	0	0	0	0	3	100
2	CRP	1	0	0	0	0	0	0	0	0	2	100
15	LSL	10	0	0	0	0	3	20	4	27	8	53
31	LSR	21	0	0	2	6	3	10	5	16	21	68
32	LSBk	21	0	0	0	0	1	3	4	13	27	84
30	LSBo	20	0	0	0	0	1	3	4	13	25	83
3	PLP	2	0	0	0	0	2	67	0	0	1	33
3	SCP	2	1	33	0	0	0	0	1	33	1	33
1	DPL	1	0	0	0	0	0	0	1	100	0	0

TOTAL
UNITS
151

YAGER CREEK Drainage: VAN DUZEN

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE Survey Dates: 08/12/91 - 08/26/91

Confluence Location: QUAD: HYDESVILLE LEGAL DESCRIPTION: T2N,R1E,S28 LATITUDE: 40°31'31" LONGITUDE: 124°4'0"

UNITS MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % RCOT MASS	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
159	LGR	0	1	0	0	4	3	10	80	0
9	HGR	0	0	0	0	0	2	20	76	2
1	CAS	0	0	0	0	0	0	20	80	0
2	BRS	0	0	0	0	0	0	20	75	5
1	POW	20	0	0	0	20	10	0	50	0
73	GLD	5	2	2	3	13	10	0	58	5
117	RUN	1	0	1	2	6	3	2	84	1
80	SRN	0	1	1	4	2	2	4	86	0
3	TRP	0	0	0	0	0	0	13	33	53
26	MCP	2	1	4	0	3	0	3	81	5
2	CCP	0	0	0	0	50	0	0	35	15
3	STP	0	0	0	0	0	0	13	87	0
2	CRP	0	15	45	35	3	3	0	0	0
15	LSL	9	5	55	9	12	4	1	5	0
31	LSR	3	2	8	64	4	0	0	17	1
32	LSBk	8	0	2	0	3	3	2	48	34
30	LSBo	2	0	2	0	2	0	0	85	7
3	PLP	17	0	70	0	10	0	0	3	0
3	SCP	0	7	3	0	3	7	0	80	0
1	DPL	30	20	30	0	0	0	0	20	0
1	DRY	0	0	0	0	0	0	0	100	0

YAGER CREEK Drainage: VAN DUZEN

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 08/12/91 - 08/26/91

Confluence Location: QUAD: HYDESVILLE LEGAL DESCRIPTION: T2N,R1E,S28 LATITUDE: 40°31'31" LONGITUDE: 124°4'0"

UNITS MEASURED	HABITAT TYPE	# UNITS SILT/CLAY DOMINANT	% TOTAL SILT/CLAY DOMINANT	# UNITS SAND DOMINANT	% TOTAL SAND DOMINANT	# UNITS GRAVEL DOMINANT	% TOTAL GRAVEL DOMINANT	# UNITS SM COBBLE DOMINANT	% TOTAL SM COBBLE DOMINANT	# UNITS LG COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	# UNITS BOULDER DOMINANT	% TOTAL BOULDER DOMINANT	# UNITS BEDROCK DOMINANT	% TOTAL BEDROCK DOMINANT
159	LGR	0	0	3	2	41	26	30	19	27	17	58	36	0	0
9	HGR	0	0	0	0	0	0	0	0	0	0	9	100	0	0
1	CAS	0	0	0	0	0	0	0	0	0	0	1	100	0	0
2	BRS	0	0	0	0	0	0	0	0	1	50	1	50	0	0
1	POW	0	0	0	0	1	100	0	0	0	0	0	0	0	0
73	GLD	0	0	21	29	50	68	1	1	0	0	1	1	0	0
117	RUN	0	0	3	3	47	40	14	12	22	19	31	26	0	0
80	SRN	0	0	1	1	22	28	9	11	10	13	38	48	0	0
3	TRP	0	0	0	0	1	33	0	0	0	0	0	0	2	67
26	MCP	0	0	5	19	11	42	1	4	2	8	7	27	0	0
2	CCP	0	0	1	50	1	50	0	0	0	0	0	0	0	0
3	STP	0	0	0	0	0	0	0	0	0	0	3	100	0	0
2	CRP	0	0	2	100	0	0	0	0	0	0	0	0	0	0
15	LSL	0	0	6	40	9	60	0	0	0	0	0	0	0	0
31	LSR	0	0	13	42	12	39	3	10	1	3	2	6	0	0
32	LSBk	1	3	10	31	11	34	1	3	0	0	8	25	1	3
30	LSBo	0	0	9	30	18	60	0	0	1	3	2	7	0	0
3	PLP	0	0	3	100	0	0	0	0	0	0	0	0	0	0
3	SCP	0	0	1	33	1	33	0	0	1	33	0	0	0	0
1	DPL	0	0	0	0	1	100	0	0	0	0	0	0	0	0
1	DRY	0	0	0	0	0	0	0	0	1	100	0	0	0	0

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	0	0	0

Mean Percentage of Dominant Vegetation

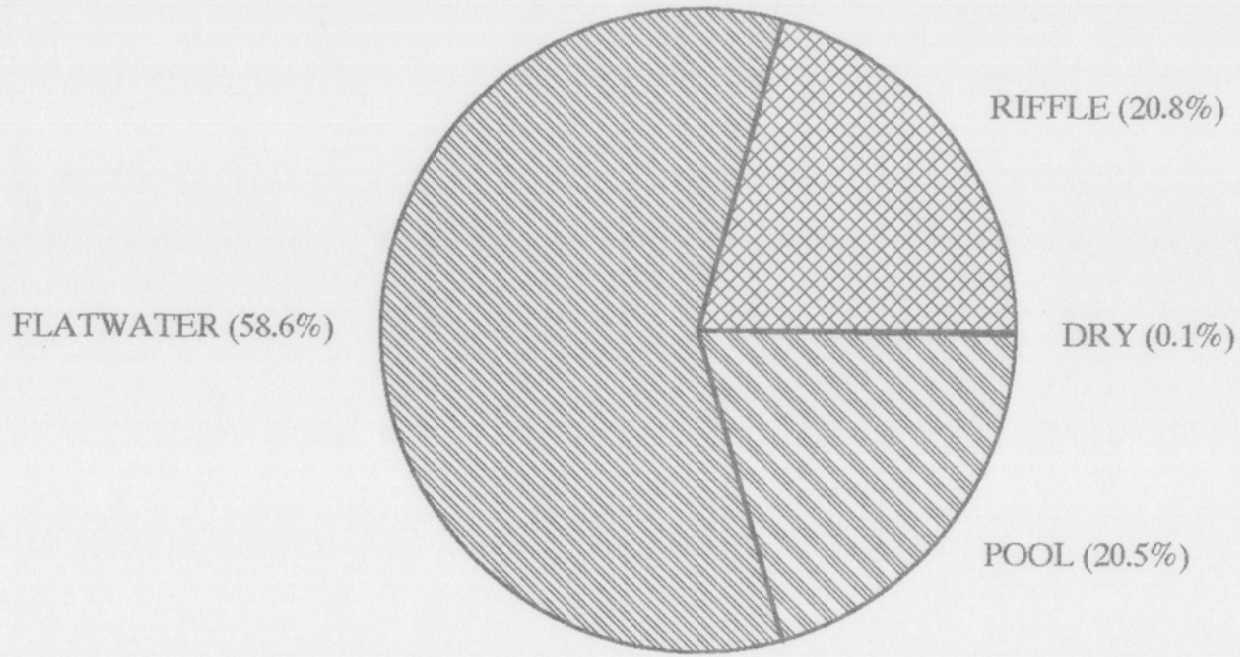
Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	10	5	1.26
Brush	8	26	2.86
Decid. Trees	437	439	73.74
Conif. Trees	14	17	2.61
No Vegetation	3	8	0.93

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
13.95	37.79	62.29	67.56	72.99

YAGER CREEK

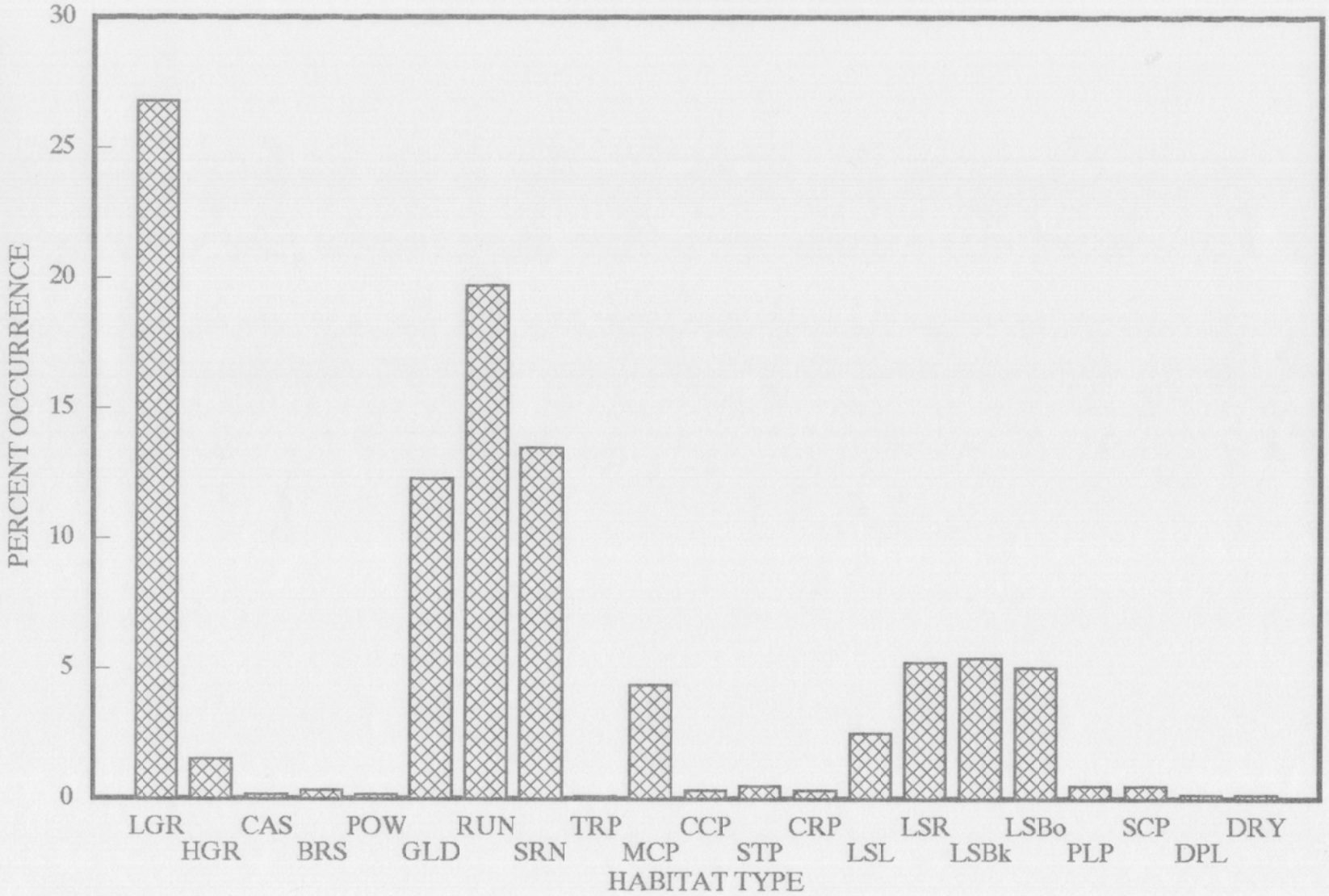
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

YAGER CREEK

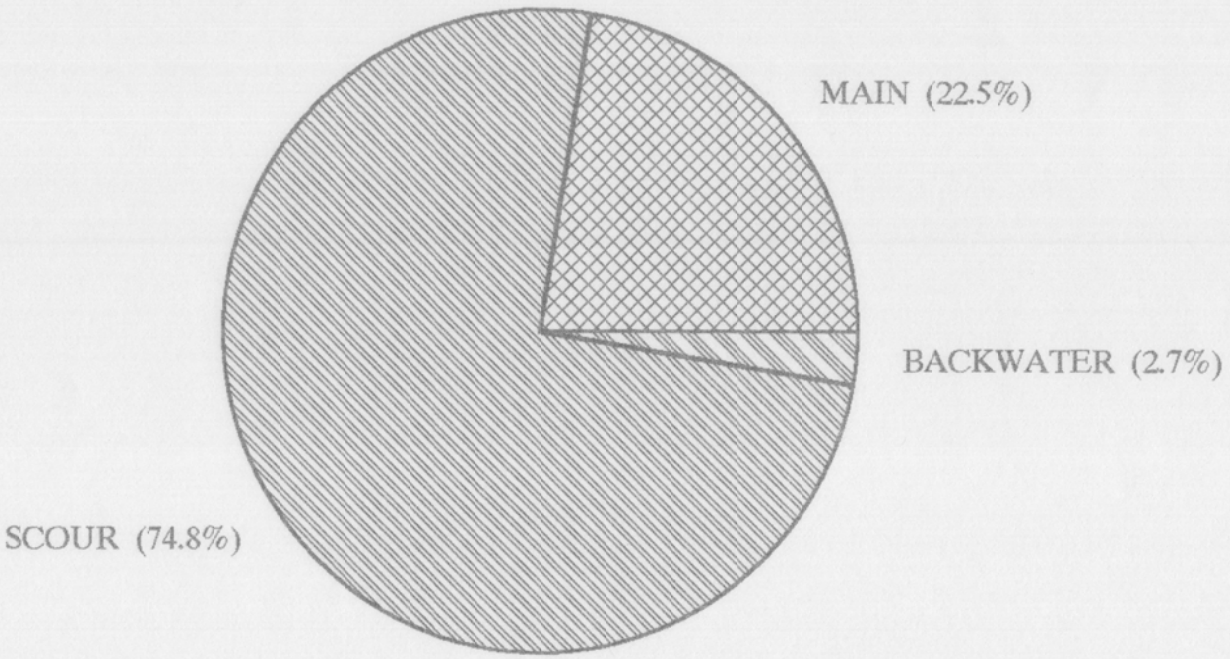
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

YAGER CREEK

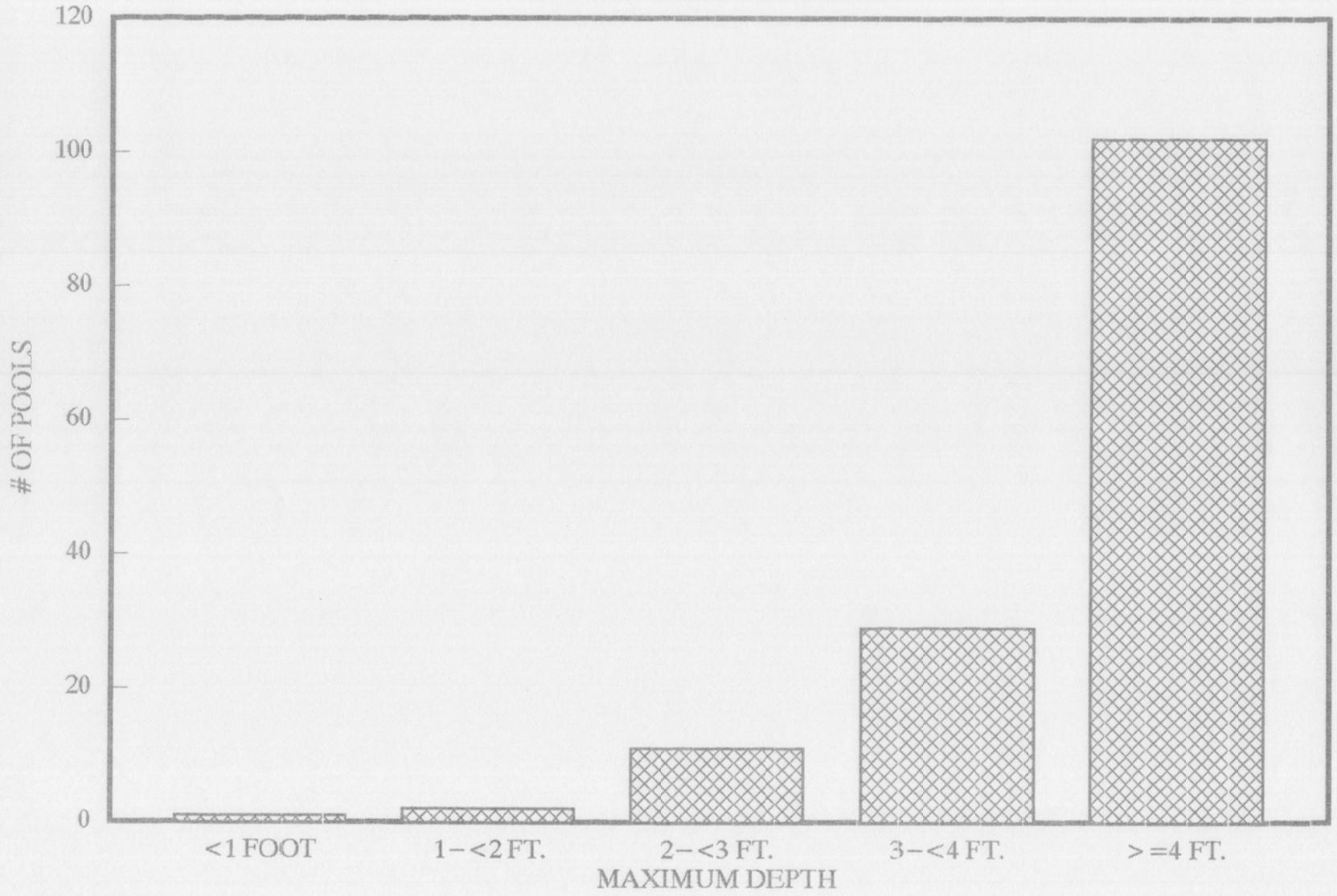
POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

YAGER CREEK

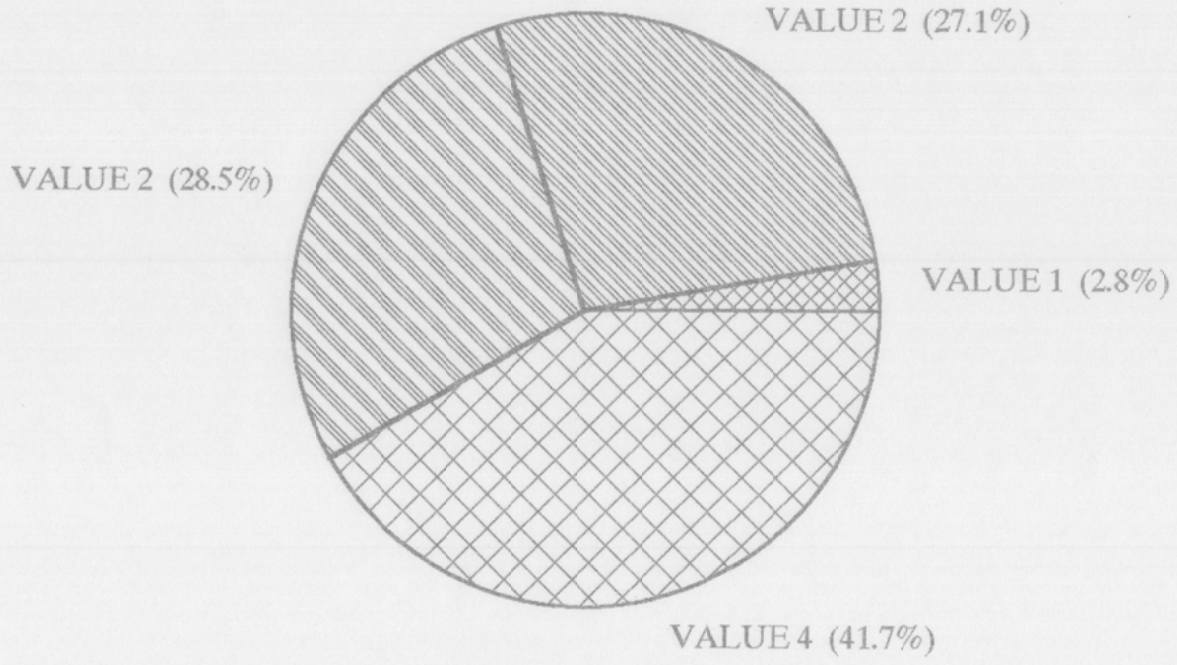
MAXIMUM DEPTH IN POOLS



GRAPH 5

YAGER CREEK

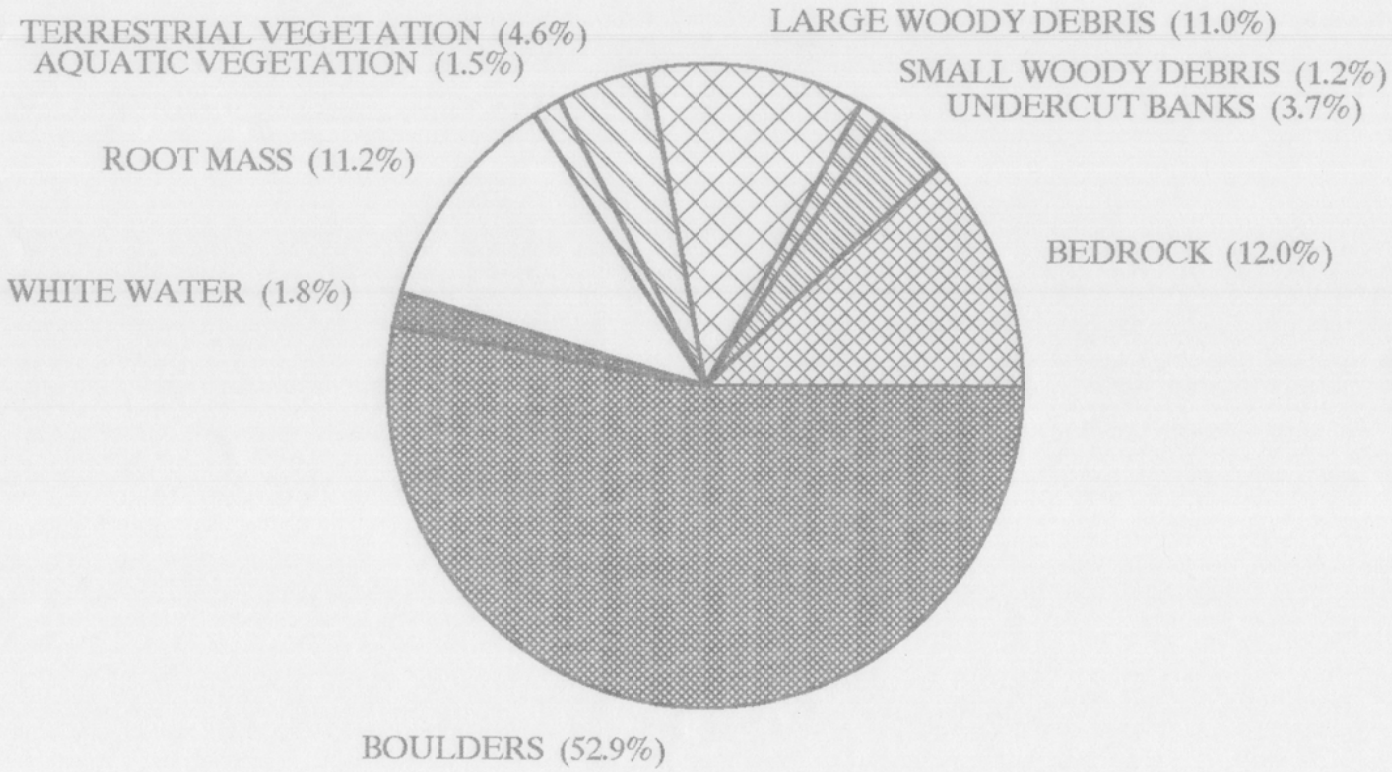
PERCENT EMBEDDEDNESS



GRAPH 6

YAGER CREEK

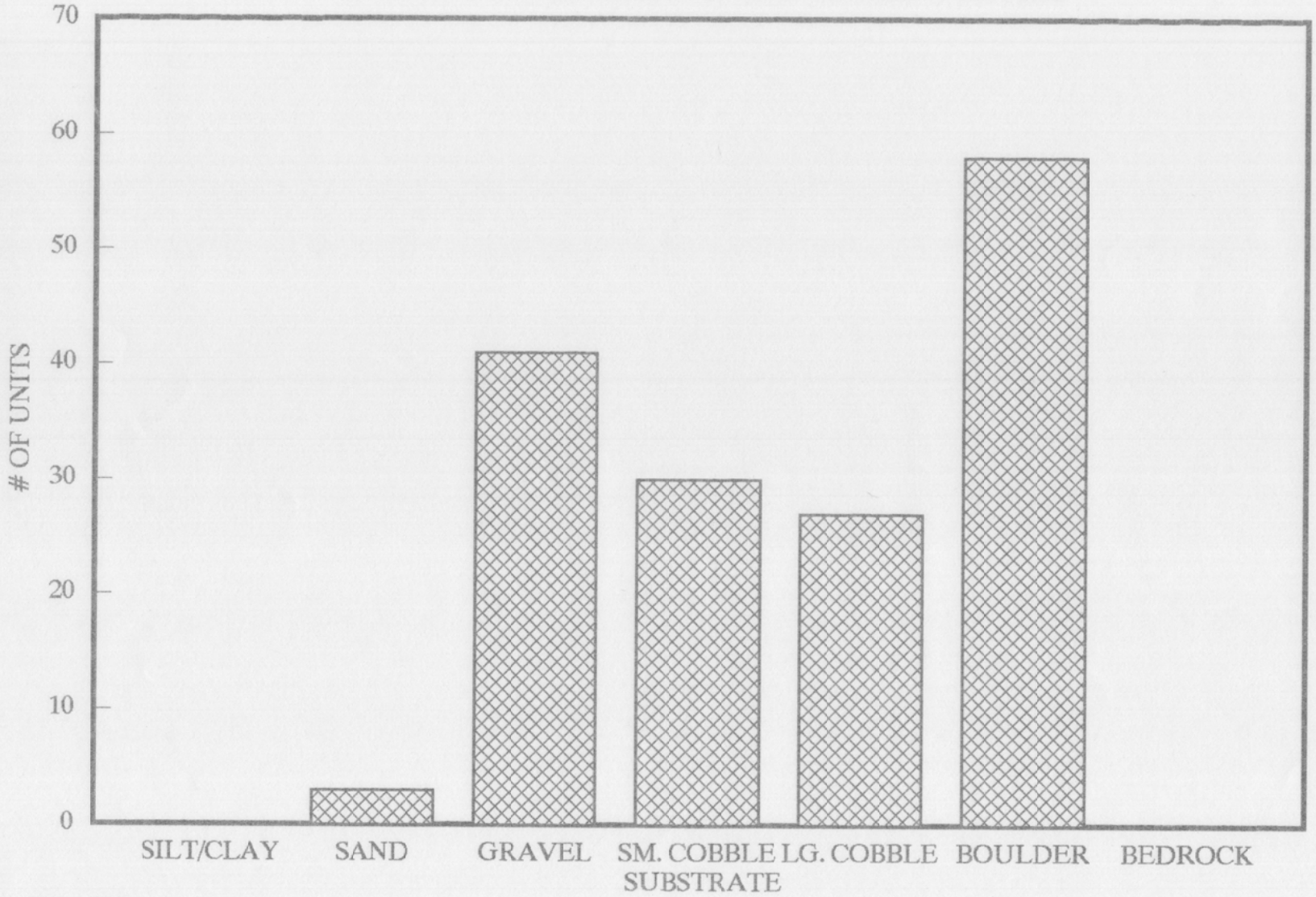
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

YAGER CREEK

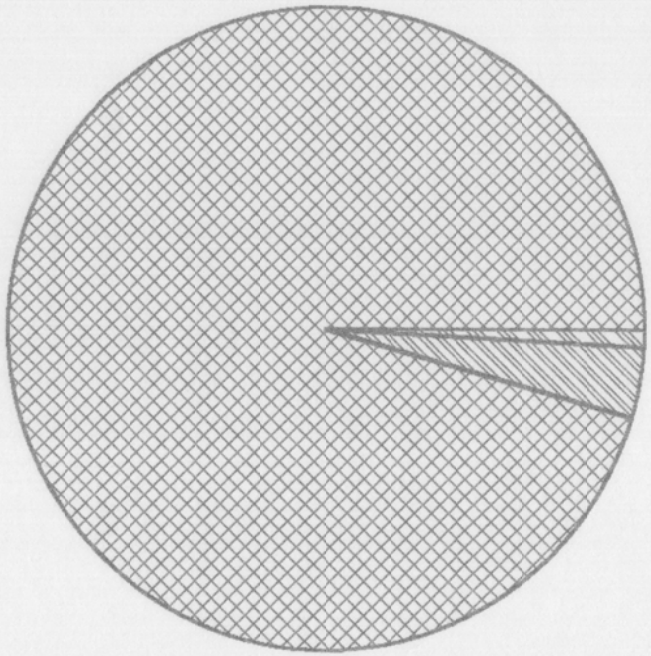
SUBSTRATE COMPOSITION IN LOW GRADIENT RIFFLES



GRAPH 8

YAGER CREEK

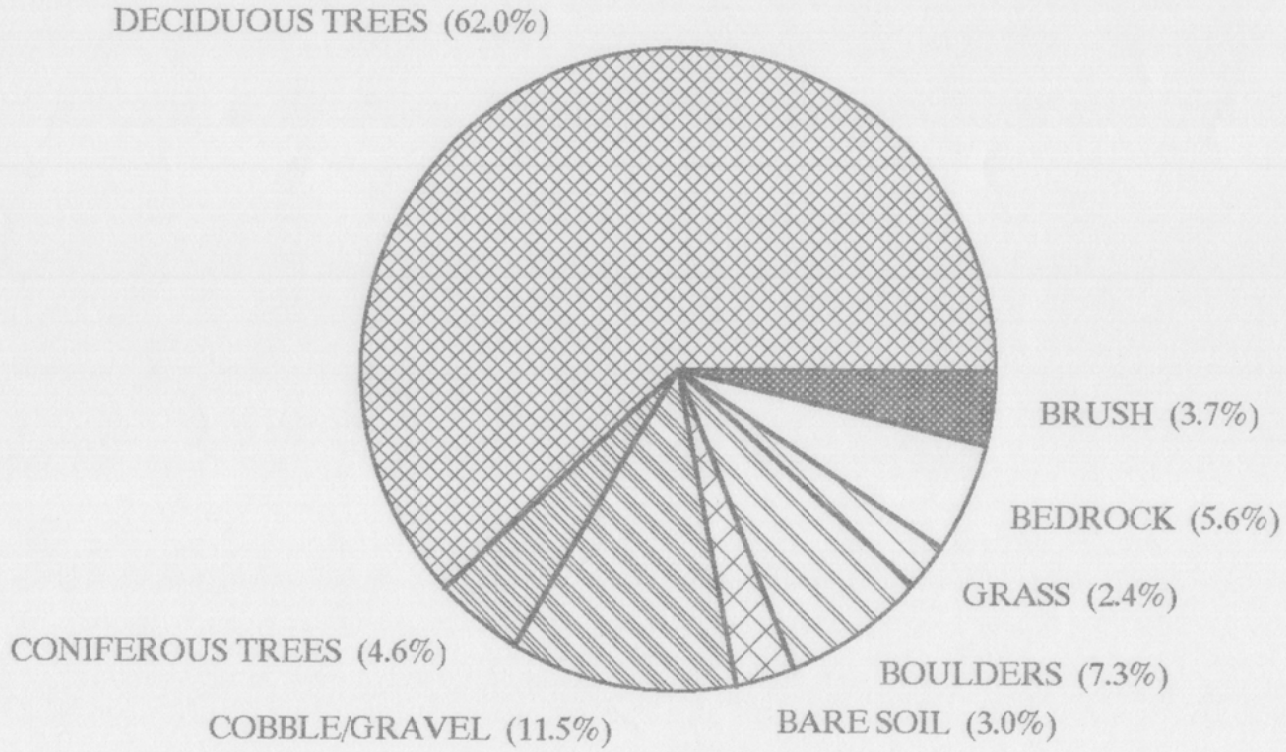
PERCENT CANOPY



GRAPH 9

YAGER CREEK

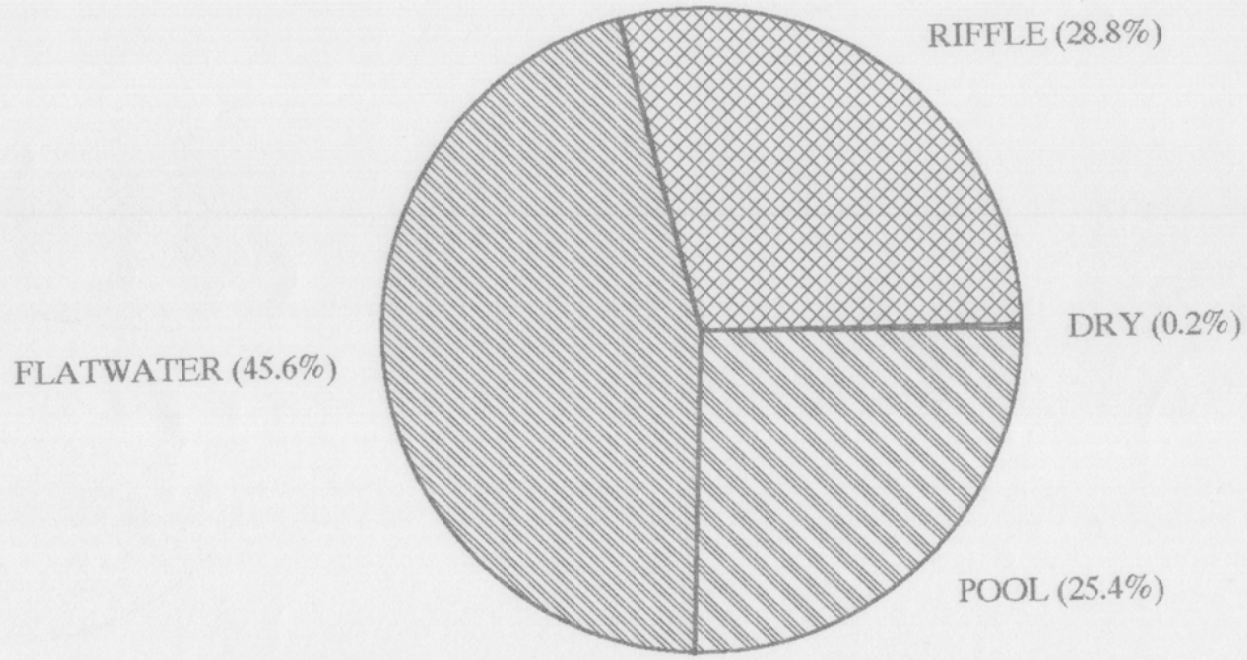
PERCENT BANK COMPOSITION



GRAPH 10

YAGER CREEK

HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1