CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Alder Creek

Report Revised April 14, 2006
Assessment Completed 1995
Report Completed 2000

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Alder 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 amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution. After analysis of historical information and data gathered recently, stream restoration and enhancement recommendations are presented.

WATERSHED OVERVIEW

Alder Creek is a tributary to Ackerman Creek, which is a tributary to the Russian River, located in Mendocino County, California (see Alder Creek map). The legal description at the confluence with Ackerman Creek is T15N,R13W,S9. Its location is 39°10'53" N. latitude and 123°17'58" W. longitude. Year round vehicle access exists from a private road running east of State Highway 101 just north of Ukiah.

Alder Creek is a second order stream and has approximately 3.3 miles of blue line stream, according to the USGS Orrs Springs 7.5 minute quadrangle. Alder Creek and its tributaries drain a basin of approximately 4 square miles. Elevations range from about 1,040 feet at the mouth of the creek to 2,796 feet in the headwater areas. Grassland and oak-woodland dominate most of the watershed, but there are zones of Redwood and Douglas Fir forest in the upper most watershed areas. The watershed is owned primarily by the Louisiana-Pacific Corporation, and is managed for timber production and grazing.

No sensitive plants were listed in DFG's Natural Diversity Database for Alder Creek watershed.

METHODS

The habitat inventory conducted in Alder Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The AmeriCorps members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and

Game (DFG) under the supervision of DFG's Russian River Basin Planner, Robert Coey in June, 1995. This inventory was conducted by a two person team.

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 Alder 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 were also measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is 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 simultaneously with habitat typing 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:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Alder 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. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken 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 Alder 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 Alder 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 Alder Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

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 Alder 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.

DATA ANALYSIS

Data from the habitat inventory form are entered into the Habitat Program, a dBASE IV data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following 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
- Shelter type areas by habitat types

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

- Level II Habitat Types by % Occurrence
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Percent Embeddedness by Reach
- Percent Cover Types in Pools
- Substrate Composition in Low Gradient Riffles
- Mean Percent Canopy
- Percent Bank Composition
- Percent Canopy by Reach

HABITAT INVENTORY RESULTS

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

The habitat inventory of June 5-28, 1995 was conducted by Kurt Gregory, Pamela Higgins and Gregory Bates. The survey began at the confluence with Ackerman Creek and extended up Alder Creek to the end of the survey. The total length of the stream surveyed was 14,131 feet (2.7 miles).

This section of Alder Creek has 5 channel types, with one type occurring in two separate reaches: from the mouth to 435 feet an

F4; the next 829 feet an F1; the next 1979 feet an F4; the next 3092 feet a G2; the next 6568 feet an F6; and the upper 1228 feet a G4. F4 channels are meandering riffle/pool channels on low gradients (<2%) with high width/depth ratio and consist predominantly of gravel. F1 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with high width/depth ratio and are very stable since they are bedrock controlled. G2 channels are predominantly boulder "gully" step pool channels on a moderate gradient (2-4%) with low width/depth ratio. F6 channels are silt and clay meandering riffle/pool channels on a low gradient (<2%) with high width/depth ratio. G4 channel types are entrenched "gully" step pool and low width/depth ratio gravel channels on a moderate gradient (2-4%).

Water temperatures ranged from 51°F to 78°F. Air temperatures ranged from 58°F to 89°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent occurrence, pools made up 49%, riffles 37%, and flatwater 15% (Graph 1). Riffle habitat types made up 43% of the total survey **length**, pools 36%, and flatwater 21%.

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%. Percent occurrence of mid-channel pools was 11%, high gradient riffles 9%, and root wad scours 9% (Graph 2). By percent total **length**, low gradient riffles made up 32%, mid-channel pools 6%, high gradient riffles 9%, and root wad scours 7%.

One hundred sixty-five pools were identified (Table 3). Scour pools were the most often encountered at 59%, and comprised 54% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Forty-nine of the 165 pools (30%) had a depth of two feet or greater (Graph 4).

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 types in general had a shelter rating at 26. The main channel pools rated highest at 30, while backwater pools rated 25 and scour pools 24 (Table 3).

Table 10 summarizes shelter type areas by habitat type. Boulders are the dominant cover type for pools in Alder Creek. Undercut banks and large woody debris are the next most common pool cover types. Graph 6 describes the pool cover in Alder Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 72% of the low

gradient riffles measured. Gravel was the next most frequently observed dominant substrate type, and occurred in 18% of the low gradient riffles (Graph 7).

The depth of cobble embeddedness was estimated at pool tail-outs. One hundred and three of the 165 pool tail-outs measured had embeddedness ratings of either three or four and only 10 had a rating of one. Cobble embeddedness measured to be 25% or less, a rating of one, is considered best for the needs of salmon and steelhead. Graph 5 describes embeddedness in detail by reach.

Nearly 44% of Alder Creek lacked shade canopy. Thirty-two percent of the stream had canopy consisting of coniferous trees and 24% had a canopy of deciduous trees (Graph 8). Graph 11 describes the canopy in detail by reach.

For the stream reach surveyed, the mean percent vegetated for the right bank was 70% and the mean percent vegetated for the left bank was 66%. For the habitat units measured, the dominant vegetation types for the stream banks were: 51% coniferous trees, 29% deciduous trees, 15% grass, 4% bare soil and 1% brush. The dominant substrate for the stream banks were: 79% silt/clay/sand, 12% bedrock, 7% cobble/gravel, 2% boulder (Graph 9). In Alder Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On November 2-7, 1995 a biological inventory was conducted in Alder Creek to document the fish species composition and distribution at several locations. The air temperature ranged from 43-69°F. and the water temperature ranged from 34-55°F. The observers were Ken Mogan and Kurt Gregory (AmeriCorps). Each site was single pass electrofished using one Smith Root Model 12 electrofisher. Fish from each site were counted by species and returned to the stream.

The inventory of Reach 1 was conducted 100 ft. upstream from the confluence with Ackerman Creek in habitat units 6-15. In riffle, pool, glide and run habitat types 197 0+, 8 1+ and 2 2+ steelhead were observed along with 306 roach, frogs (including some Yellow-legged Frogs), and 5 newts.

The inventory of Reach 2 was conducted 20 ft. downstream from bridge #2. In pool, riffle and run habitat types 168 0+, 19 1+, 2 2+ steelhead and 16 roach were observed along with 135 frogs and 1 newt.

The inventory of Reach 3 was conducted 300 yds. upstream from the LP hunting camp in habitat units 91-107. In pool, riffle, glide and

run habitat types 183 0+, 9 1+, 3 2+ steelhead and 9 roach were observed along with 55 frogs (species not identified) and 1 Pacific Giant Salamander.

The inventory of Reach 4 was conducted 100 ft. upstream from a tributary on the right bank in habitat units 178-195. In pool, riffle, run and glide habitat types 183 0+ 20 1+ and 6 2+ steelhead were observed along with 22 frogs.

The inventory of Reach 5 was conducted 30 ft. upstream from a dirt road that goes down to the creek from habitat units 235-251. In riffle, pool, glide and run habitat types 232 0+, 21 1+ and 1 2+ steelhead were observed along with 28 frogs and 2 Pacific Giant Salamanders. The following is a summary of species observed:

SUMMARY OF SPECIES OBSERVED IN 1995 DFG SURVEYS ON ALDER CREEK

SPECIES	Native/Introduced
Steelhead	N
Roach	N
Frogs (unidentified)	N
Yellow-legged Frogs	N
Newts (unidentified)	N
Pacific Giant Salamander	N

DISCUSSION

Alder Creek has 5 channel types: F4, F1, G2, F6 and G4, with F4 types occurring twice in the surveyed reach. Instream enhancement suitability in the F4 types is fair to poor for most low to medium-stage structures, but good for bank-placed boulders. There are 435 feet of this type of channel in Reach 1 and 1979 feet in Reach 3.

There are 829 feet of F1 channel type in Reach 2 of Alder Creek. This channel type is well suited for bank-placed boulders and fairly suited for single wing deflectors and log cover.

There are 3092 feet of G2 channel type in Reach 4 of Alder Creek. G2 channel types are generally unsuitable for most instream enhancement structures except log cover.

There are 6491 feet of F6 channel type in Reach 5. This channel

type is well suited for bank-placed boulders and fairly suited for low-stage weirs, boulder clusters, single and opposing wing deflectors, and log cover.

There are 1228 feet of G4 channel type in Reach 6. This channel type is well suited for bank-placed boulders, and fairly suited for low-stage weirs, opposing wing deflectors and log cover. Any instream enhancement structures designed to increase pool habitat, trap spawning gravels, and provide protective cover for fish in Alder Creek will require very careful design and placement.

The water temperatures recorded on the survey days June 6-28, 1995 ranged from 51°F to 78°F. Air temperatures ranged from 58°F to 89°F. The warmer water temperatures were recorded in Reach 5. These warmer temperatures, if sustained, are well above the threshold stress level for salmonids. 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 needs to be conducted.

Pools comprised 36% of the total **length** of this survey. The pools are relatively shallow with only 49 of the 165 pools having a maximum depth greater than 2 feet (30%). However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. In first and second order streams a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation is suitable.

The mean shelter rating for pools was 26. A pool shelter rating of approximately 100 is desirable. The relatively small amount of pool cover that now exists is being provided primarily by boulders. Undercut banks and large woody debris were the next most common cover types for pools. 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.

Ninety percent of the 60 low gradient riffles measured had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

One hundred and three of the 165 pool tail-outs measured had embeddedness ratings of either three or four. Only 10 had a rating of one, cobble embeddedness measured to be 25% or less. A rating of one is considered best for the needs of salmon and steelhead. The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced

quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In Alder Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey reach was only 56%. This is a very low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures are undesirable in Alder Creek and could be lowered by increasing stream canopy. The large trees required to contribute shade to this creek could also eventually provide a long term source of large woody debris needed for Salmonid rearing habitat.

SUMMARY

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. The 1995 spring surveys documented many 0+ fish indicating successful spawning in all reaches of Alder Creek. However, few 1+ fish were observed indicating poor rearing conditions the year before or poor holding-over conditions in general. Coho were not observed in the 1995 surveys.

There are few pools with adequate depth and shelter. Most of the pool cover is from boulders. Although riffle habitat exists, much of it is impacted from sediment throughout all reaches. Shade canopy is low and stream temperatures are high in Alder Creek.

GENERAL RECOMMENDATIONS

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

The winter 1995-1996 storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the date of this survey. This woody debris, if left undisturbed, will provide fish cover and rearing habitat, and offset channel incision. Many signs of recent and historic tree and log removal were evident in the active channel during our survey. Past efforts to increase flood protection or improve fish access in the short run, have led to long term problems in the system. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

SPECIFIC FISHERY ENHANCEMENT RECOMMENDATIONS

1) There is at least one section (Reach 1) where the stream is being impacted from livestock in the riparian zone. Livestock in streams generally inhibit the growth of new trees, exasperate erosion, and reduce summertime survival of juvenile fish by defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with the landowner, and developed if possible.(Proposed)

2) Increase the canopy on Alder Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

3) In Alder Creek, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

4) Map sources of upslope and in-channel erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability.

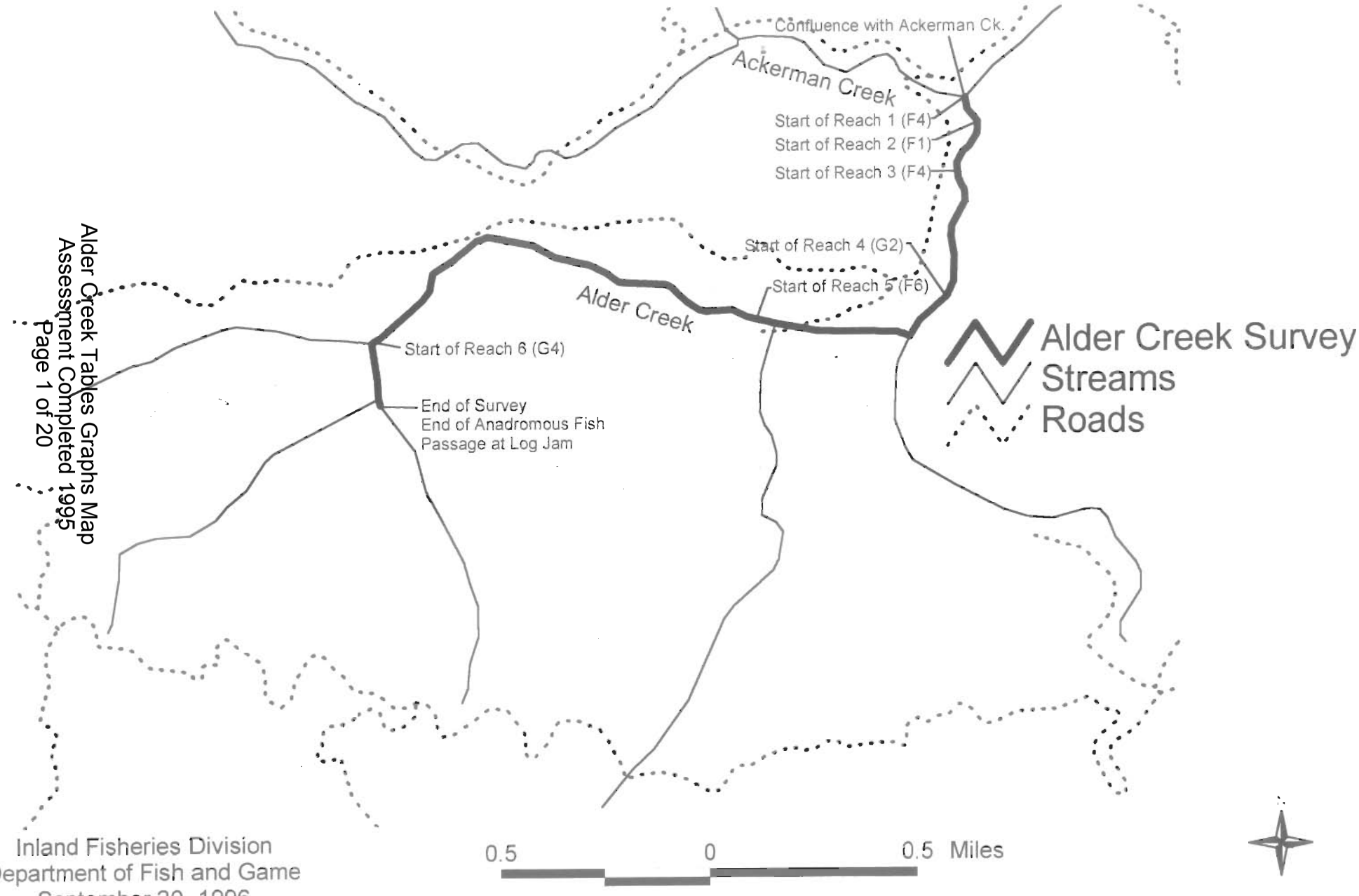
5) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing cover is from boulders. Adding high quality complexity with large woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in all reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

PROBLEM SITES AND LANDMARKS - ALDER CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN.(FT)	COMMENTS
7.00	302	BRIDGE CROSSING 4' CLEARANCE, LENGTH 32', WIDTH 13'
32.00	1869	LEFT BANK EROSION
38.00	2232	SMALL SPRING INLET
46.00	2574	YELLOW - LEGGED FROG LF. BANK

47.00	2609	LF. BANK GULLY TRIB. SMALL
59.00	3320	DRY TRIB. RT. BANK BELOW BRIDGE #2
66.20	3664	EROSION LF. BK., BARB WIRE FENCE IN CREEK
78.00	4296	CAMP CR0SSING
89.00	4809	LF. BK. TRIB./EROSION/CULVERT?
98.00	5193	PIPE EMBEDDED/EXPOSED LF. BK. EROSION
99.00	5255	END OF UNIT, MASSIVE JAM OF LG. WOODY DEBRIS COMPACTED
107.00	5558	LF. BANK CULVERT FAILURE, ROAD BLOWN OUT, IMPASSABLE
112.00	6001	XING. LF./RT. BANK
113.00	6035	TRIB. RT. BANK; BLOWOUT LF. BANK
136.00	7276	END OF UNIT UPSTREAM, 12" DIAM. DRAIN PIPE RT. BANK
146.00	7559	RT. BANK SPRING
152.00	7768	RT. BANK EROSION
158.00	7898	DRY TRIB. LF. BANK
162.00	8103	MASSIVE LWD/SWD JAM
171.00	8595	TRIB. AT END OF STEP RUN
174.00	8674	RT. BANK BADLY ERODING
194.00	9396	LEFT BANK EROSION
207.00	9749	LARGE LOG LF. BANK, IN STREAM
238.00	10821	YELLOW-LEG FROG
247.00	11079	RT. BANK SM. SPRING
287.00	12599	2 LARGE, 6" FISH
309.00	13187	LF. BANK EROSION
312.00	13239	TRIB. ON LF. BANK WATER TEMP. 68F°, 5' MAX. W; RT. BANK TRIB. IS LARGER
315.00	13324	SM. FISH. STEELHEAD SWIMUPS?
316.00	13363	STEELHEAD SWIMUPS
333.00	14002	CREEK SPLITS HERE; LF. TRIB. VERY STEEP (65F°) BEDROCK CASCADE; RT. TRIB. LESS STEEP, BOULDER/BEDROCK
335.00	14148	LARGE BOULDER/LOG JAM AT END OF UNIT; STEELHEAD SWIMUPS

Alder Creek



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Inland Fisheries Division
Department of Fish and Game
September 20, 1996

Alder Creek

Drainage: Ackerman Creek

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

Survey Dates: 06/05/95 to 06/28/95

Confluence Location: QUAD:Orrs Springs LEGAL DESCRIPTION:

LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
74	74	RIFFLE	37	48	6061	43	10.6	0.4	472	58993	172	21528	0	1
31	31	FLATWATER	15	60	2986	21	9.3	0.6	432	21586	232	11586	0	0
96	96	POOL	49	31	5084	36	9.9	1.2	351	57852	445	73370	356	26

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
340	201	14131	138431	106483

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Alder Creek

Drainage: Ackerman Creek

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 06/05/95 to 06/28/95

Confluence Location: QUAD:Orrs Springs LEGAL DESCRIPTION:

LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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 %
89	56	LGR	26	52	4585	32	11	0.3	1.3	551	49070	196	17457	0	0	50
50	13	HGR	9	41	1229	9	9	0.4	1.2	236	7065	110	3294	0	5	59
2	1	CAS	1	75	149	1	11	0.3	0.7	44	88	13	26	0	5	55
4	4	BRS	1	24	98	1	8	0.4	1.2	156	625	56	224	0	0	69
73	13	GLD	7	35	811	6	8	0.6	1.4	334	7692	207	4762	0	1	39
7	7	RUN	2	70	493	3	10	0.5	1.2	695	4866	348	2433	0	0	58
70	11	SRN	6	84	1682	12	10	0.5	1.4	416	8318	199	3982	0	0	59
56	20	MCP	11	22	783	6	11	1.1	4.0	262	9433	328	11799	265	25	56
1	1	CCP	0	19	19	0	12	0.7	1.1	222	222	155	155	111	0	30
79	8	STR	6	67	1278	9	11	0.7	2.0	816	15495	756	14371	562	42	67
37	11	CRP	5	27	458	3	11	1.5	5.5	333	5655	644	10948	533	28	54
7	7	LSL	2	31	220	2	11	1.1	2.5	355	2482	412	2883	329	9	54
99	17	LSR	9	32	931	7	11	1.2	3.6	442	12829	542	15717	423	37	72
25	15	LSBk	7	31	763	5	9	1.2	3.1	341	8521	461	11528	378	18	49
14	6	LSBo	4	18	251	2	7	1.1	12.0	140	1955	123	1715	89	17	62
6	2	PLP	2	19	111	1	10	1.8	3.0	306	1836	560	3357	487	10	85
1	1	SCP	0	21	21	0	12	1.8	2.6	252	252	454	454	403	0	100
3	2	BPB	1	27	80	1	7	0.9	2.3	200	599	225	675	201	3	88
4	4	BPR	1	21	84	1	8	1.2	2.4	173	692	206	824	160	50	75
3	2	BPL	1	28	85	1	6	1.1	2.3	178	533	206	617	182	23	67

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
340	201	14131	138228	107219

Alder Creek

Drainage: Ackerman Creek

TABLE 3 - SUMMARY OF POOL TYPES

Survey Dates: 06/05/95 to 06/28/95

Confidence Location: QUAD:Orrs Springs LEGAL DESCRIPTION:

LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
56	29	MAIN	34	37	2080	41	10.8	1.0	413	23146	440	24643	341	30
78	58	SCOUR	59	28	2734	54	10.0	1.2	350	34300	486	47590	392	24
11	9	BACKWATER	7	25	270	5	7.3	1.1	189	2076	234	2569	199	25

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
145	96	5084	59522	74801

Alder Creek

Drainage: Ackerman Creek

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

Survey Dates: 06/05/95 to 06/28/95

Confluence Location: QUAD:Orrs Springs LEGAL DESCRIPTION:

LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
36	MCP	22	1	3	27	75	7	19	0	0	1	3
1	CCP	1	0	0	1	100	0	0	0	0	0	0
19	STP	12	2	11	15	79	2	11	0	0	0	0
17	CRP	10	1	6	9	53	5	29	1	6	1	6
7	LSL	4	0	0	3	43	4	57	0	0	0	0
29	LSR	18	1	3	17	59	6	21	5	17	0	0
25	LSBk	15	1	4	17	68	6	24	1	4	0	0
14	LSBo	8	1	7	11	79	1	7	0	0	1	7
6	PLP	4	1	17	3	50	1	17	1	17	0	0
1	SCP	1	0	0	0	0	1	100	0	0	0	0
3	BPB	2	0	0	2	67	1	33	0	0	0	0
4	BPR	2	0	0	1	25	3	75	0	0	0	0
3	BPL	2	0	0	2	67	1	33	0	0	0	0

TOTAL UNITS 165

Alder Creek | Drainage: Ackerman Creek

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE | Survey Dates: 06/05/95 to 06/28/95

Confluence Location: QUAD:Orrs Springs LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

TOTAL HABITAT UNITS	UNITS SUBSTRATE 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
60	60	LGR	2	0	18	72	8	0	2
13	13	HGR	0	0	8	69	15	8	0
1	1	CAS	0	0	100	0	0	0	0
4	4	BRS	0	0	0	0	0	0	100
16	16	GLD	6	0	38	44	0	0	13
7	7	RUN	0	0	29	71	0	0	0
12	12	SRN	0	8	17	17	42	8	8
20	20	MCP	0	30	30	10	10	5	15
1	1	CCP	0	0	0	0	100	0	0
8	8	STP	0	0	13	13	25	50	0
12	12	CRP	0	17	42	25	17	0	0
7	7	LSL	0	43	43	0	14	0	0
18	18	LSR	0	33	44	17	0	0	6
25	15	LSBk	0	33	27	27	7	0	7
14	6	LSBo	0	17	33	50	0	0	0
6	2	PLP	0	0	50				50
1	1	SCP	100	0	0	0	0	0	0
3	3	BPB	0	33	0	67	0	0	0
4	4	BPR	0	75	0	25	0	0	0
3	2	BPL	50	50	0	0	0	0	0

Alder Creek

Drainage: Ackerman Creek

Table 10 - Summary of Shelter by Habitat Type

Survey Dates: 06/05/95 to 06/28/95

Confluence Location: QUAD:Orrs Springs LEGAL DESCRIPTION:

LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	SQ. FT. UNDERCUT BANKS	SQ. FT. SWD	SQ. FT. LWD	SQ. FT. ROOT MASS	SQ. FT. TERR. VEGETATION	SQ. FT. AQUATIC VEGETATION	SQ. FT. WHITE WATER	SQ. FT. BOULDERS	SQ. FT. BEDROCK LEDGES
89	61	LGR	9	4	0	31	0	0	0	0	0
30	13	HGR	0	45	67	0	0	0	90	22	0
2	1	CAS	0	0	11	0	0	0	0	0	0
4	4	BRS	0	0	0	0	0	0	0	0	0
23	15	GLD	0	0	33	0	0	0	0	3	0
7	7	RUN	0	0	0	0	0	0	0	0	0
20	12	SRN	0	0	0	0	0	0	0	115	0
36	33	MCP	37	137	370	0	3	0	107	327	19
1	1	CCP	0	0	0	0	0	0	0	0	0
19	17	STP	47	24	0	0	0	0	139	2272	0
17	17	CRP	117	198	297	136	0	0	5	41	0
7	7	LSL	0	71	36	23	23	0	0	0	0
29	27	LSR	369	58	191	507	0	27	0	18	0
25	24	LSBK	217	115	14	0	0	13	8	0	327
14	13	LSBO	43	0	0	0	0	0	14	3	21
6	5	PLP	21	0	0	0	0	0	0	0	0
1	1	SCP	0	0	0	0	0	0	0	0	0
		BPB	0	0	0		0	0	0	38	0
4	4	BPR	9	12	9	36	0	0	0	0	0
3	3	BPL	9	9	77	0	0	0	0	0	0
TOTAL 340	268		878	673	1105	733	26	40	363	2839	367
			13%	10%	16%	10%	0%	1%	5%	40%	5%
TOTAL FOR POOLS 165	155		869	624	994	702	26	40	273	2699	367
			13%	9%	15%	11%	0%	1%	4%	41%	6%

APPENDIX A. 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
55.85	56.63	43.16	69.93	65.65

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	29	21	11.68
Boulder	3	5	1.87
Cobble/Gravel	13	19	7.48
Silt/clay	169	169	78.97

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	29	36	15.19
Brush	2	1	0.70
Decid. Trees	65	60	29.21
Conif. Trees	112	106	50.93
No Vegetation	6	11	3.97

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Alder Creek
SAMPLE DATES: 06/05/95 to 06/28/95
STREAM LENGTH: 14131 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: F4
Channel Length: 435 ft.
Riffle/Flatwater Mean Width: 14 ft.
Total Pool Mean Depth: 1.7 ft.
Base Flow: 0.0 cfs
Water: 51 - 62 °F Air: 59 - 66 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 40%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 75% 3. 25% 4. 0%

Canopy Density: 61%
Coniferous Component: 28%
Deciduous Component: 72%
Pools by Stream Length: 23%
Pools >=3 ft.deep: 25%
Mean Pool Shelter Rtn: 55
Dom. Shelter: Undercut Banks
Occurrence of LOD: 30%
Dry Channel: 0 ft.

STREAM REACH 2

Channel Type: F1
Channel Length: 829 ft.
Riffle/Flatwater Mean Width: 14 ft.
Total Pool Mean Depth: 1.3 ft.
Base Flow: 0.0 cfs
Water: 51 - 62 °F Air: 59 - 64 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 76%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 0% 3. 75% 4. 25%

Canopy Density: 73%
Coniferous Component: 41%
Deciduous Component: 59%
Pools by Stream Length: 21%
Pools >=3 ft.deep: 25%
Mean Pool Shelter Rtn: 29
Dom. Shelter: Boulders
Occurrence of LOD: 30%
Dry Channel: 0 ft.

STREAM REACH 3

Channel Type: F4
Channel Length: 1979 ft.
Riffle/Flatwater Mean Width: 10 ft.
Total Pool Mean Depth: 1.3 ft.
Base Flow: 0.0 cfs
Water: 56 - 64 °F Air: 59 - 72 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 67%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 14% 2. 48% 3. 24% 4. 14%

Canopy Density: 49%
Coniferous Component: 36%
Deciduous Component: 64%
Pools by Stream Length: 40%
Pools >=3 ft.deep: 14%
Mean Pool Shelter Rtn: 26
Dom. Shelter: Undercut Banks
Occurrence of LOD: 43%
Dry Channel: 0 ft.

STREAM REACH 4

Channel Type: G2
Channel Length: 3092 ft.
Riffle/Flatwater Mean Width: 12 ft.
Total Pool Mean Depth: 1.4 ft.
Base Flow: 0.0 cfs
Water: 53 - 58 °F Air: 58 - 64 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 75%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 4% 2. 21% 3. 54% 4. 21%

Canopy Density: 53%
Coniferous Component: 64%
Deciduous Component: 36%
Pools by Stream Length: 33%
Pools >=3 ft.deep: 14%
Mean Pool Shelter Rtn: 37
Dom. Shelter: Undercut Banks
Occurrence of LOD: 50%
Dry Channel: 0 ft.

STREAM REACH 5

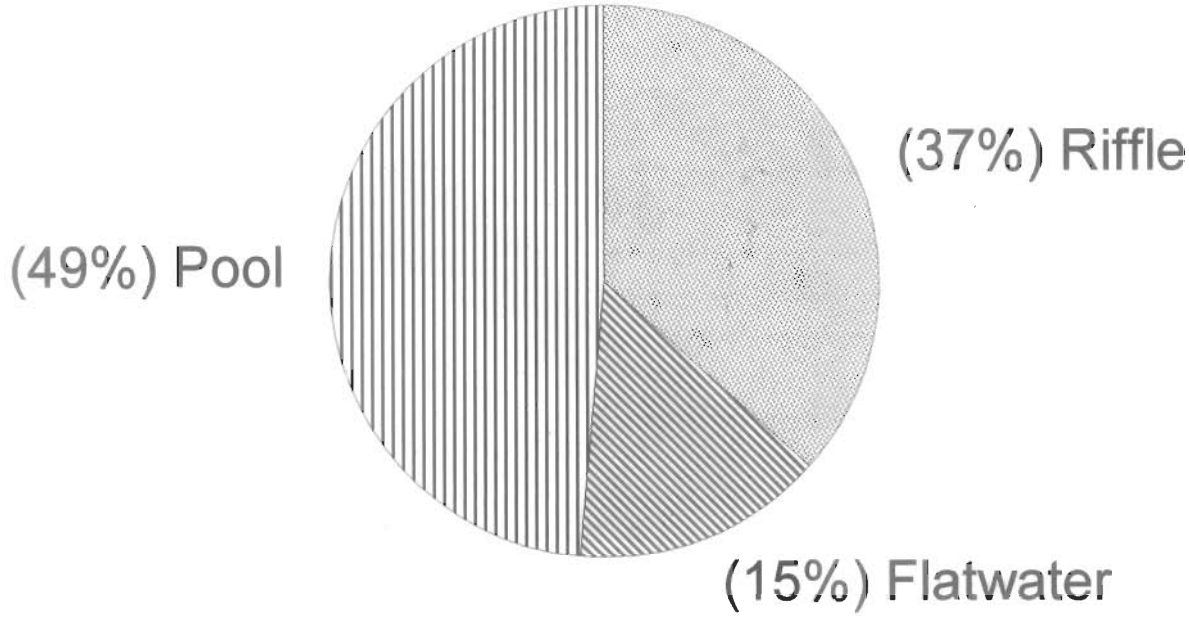
Channel Type: F6	Canopy Density: 57%
Channel Length: 6568 ft.	Coniferous Component: 66%
Riffle/Flatwater Mean Width: 8 ft.	Deciduous Component: 34%
Total Pool Mean Depth: 0.9 ft.	Pools by Stream Length: 36%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 1%
Water: 53 - 78 °F Air: 64 - 89 °F	Mean Pool Shelter Rtn: 24
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 65%	Occurrence of LOD: 58%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 7% 2. 28% 3. 36% 4. 29%	

STREAM REACH 6

Channel Type: G4	Canopy Density: 62%
Channel Length: 1228 ft.	Coniferous Component: 55%
Riffle/Flatwater Mean Width: 7 ft.	Deciduous Component: 45%
Total Pool Mean Depth: 1.3 ft.	Pools by Stream Length: 51%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 5%
Water: 64 - 69 °F Air: 77 - 82 °F	Mean Pool Shelter Rtn: 15
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 89%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 0% 2. 40% 3. 20% 4. 40%	

Alder Creek

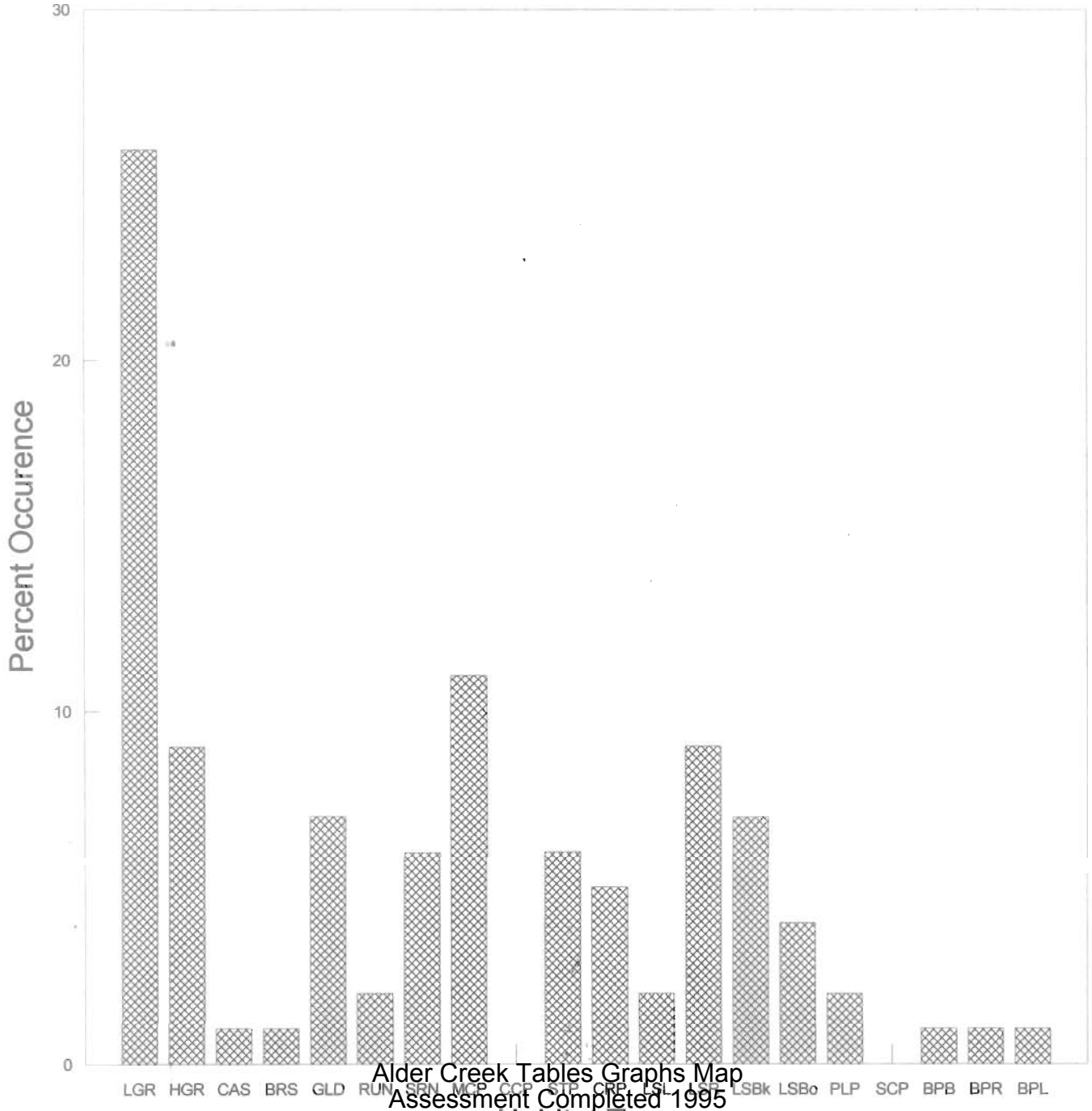
Level II Habitat Types by % Occurrence



Graph 1

Alder Creek

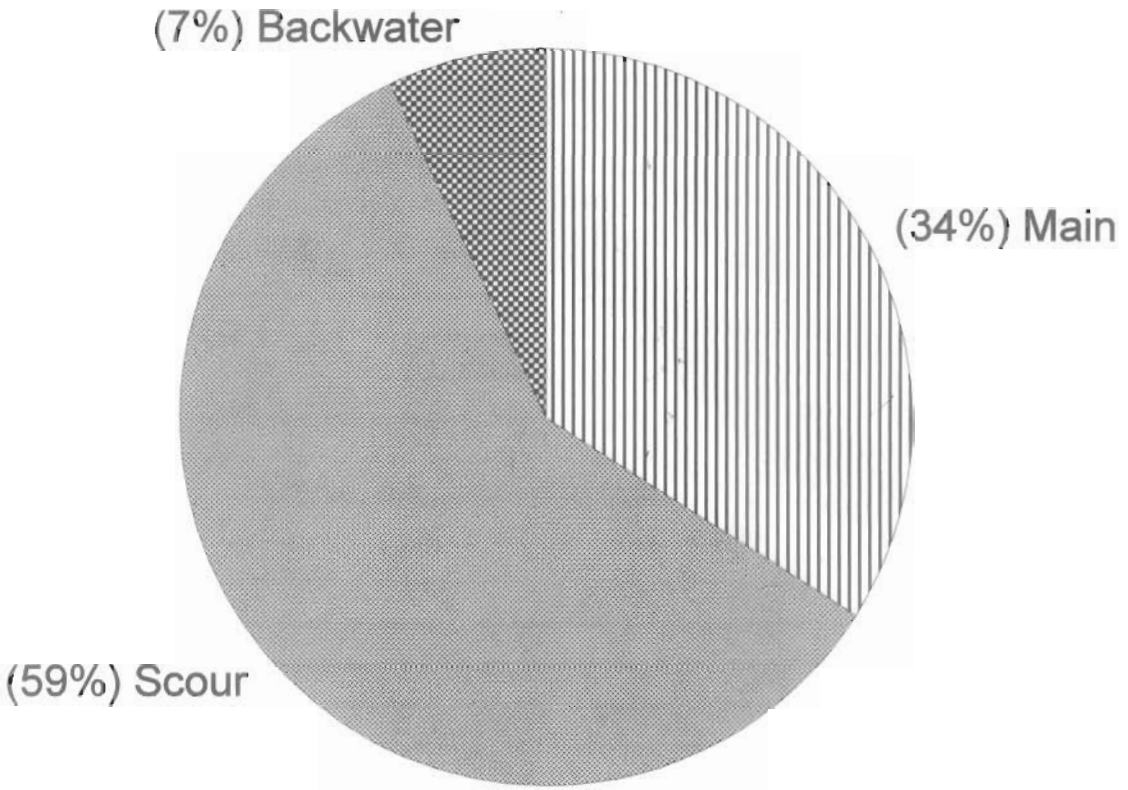
Level IV Habitat Types by Percent Occurrence



Graph 2

Alder Creek

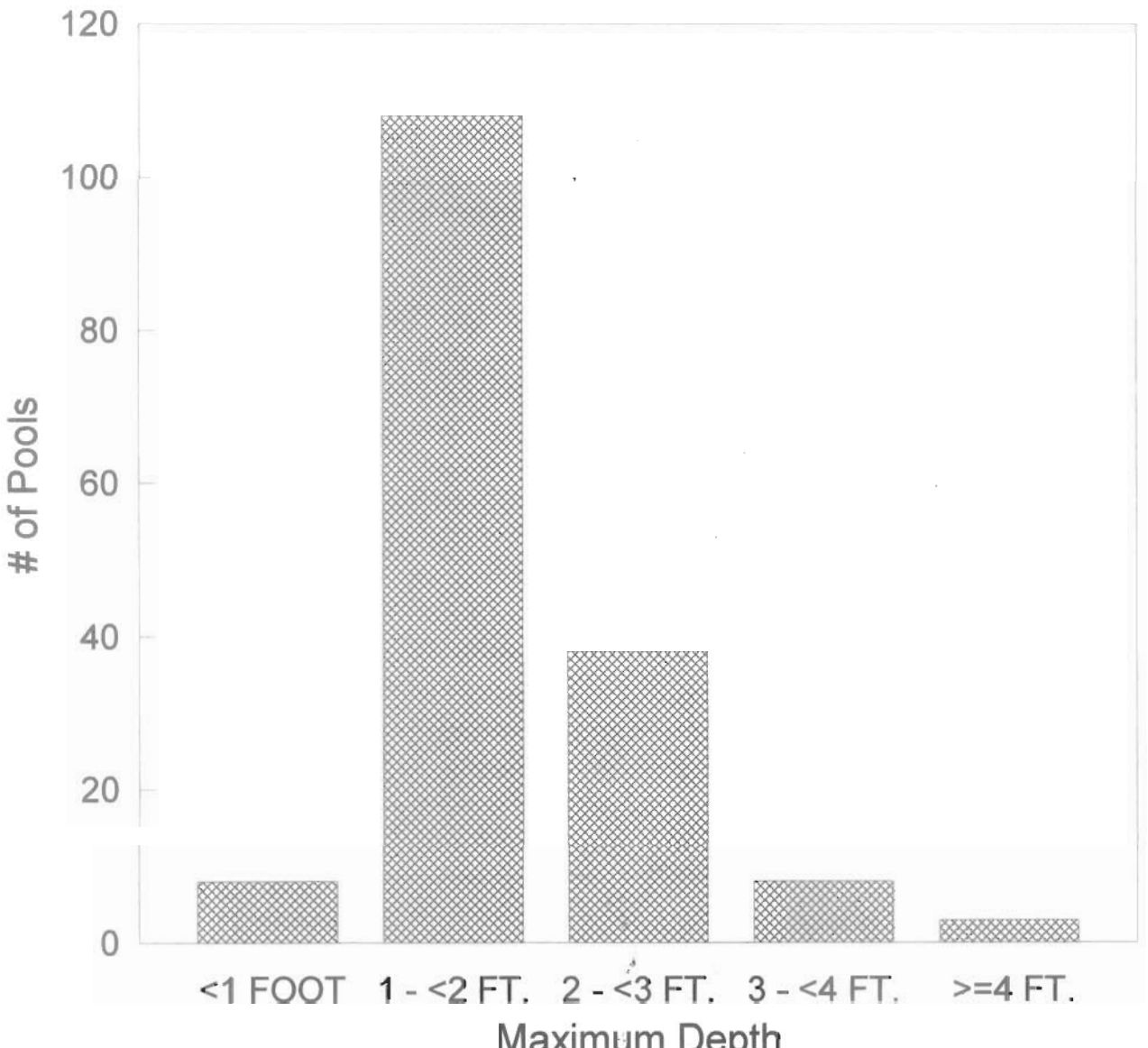
Pool Habitat Types by % Occurrence



Graph 3

Alder Creek

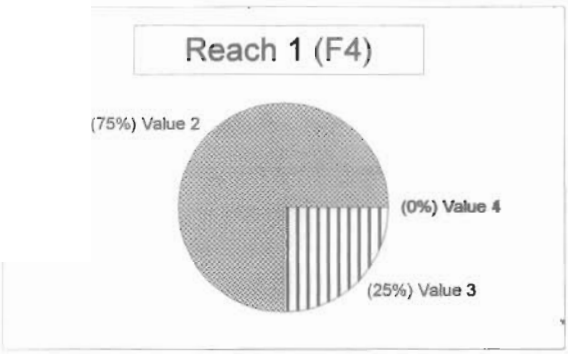
Maximum Depth in Pools

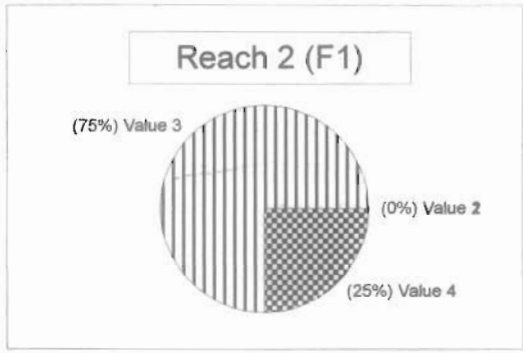


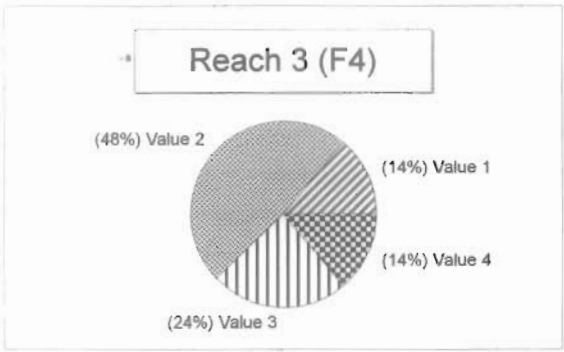
Graph 4

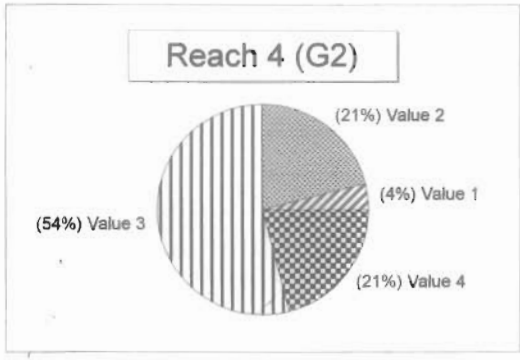
Alder Creek

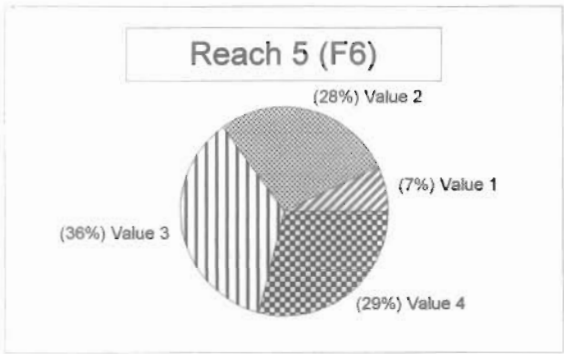
Percent Embeddedness by Reach

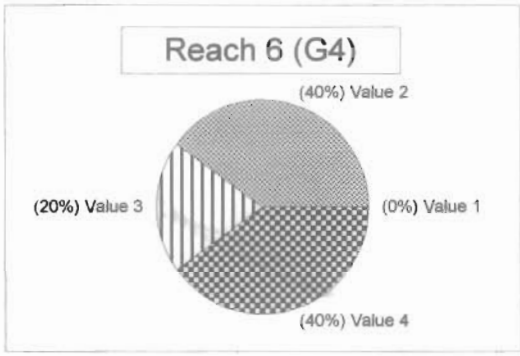










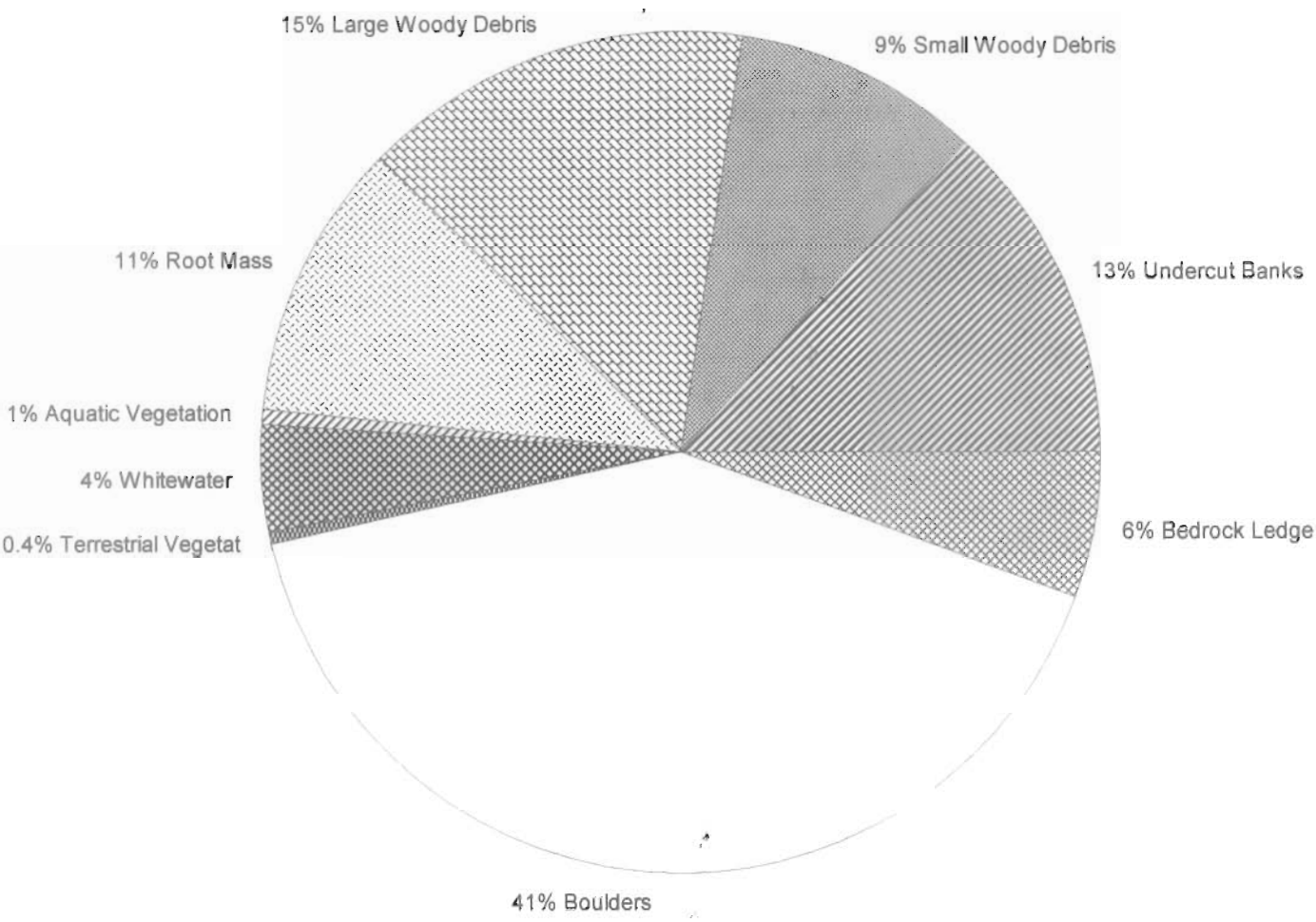


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 5

Alder Creek

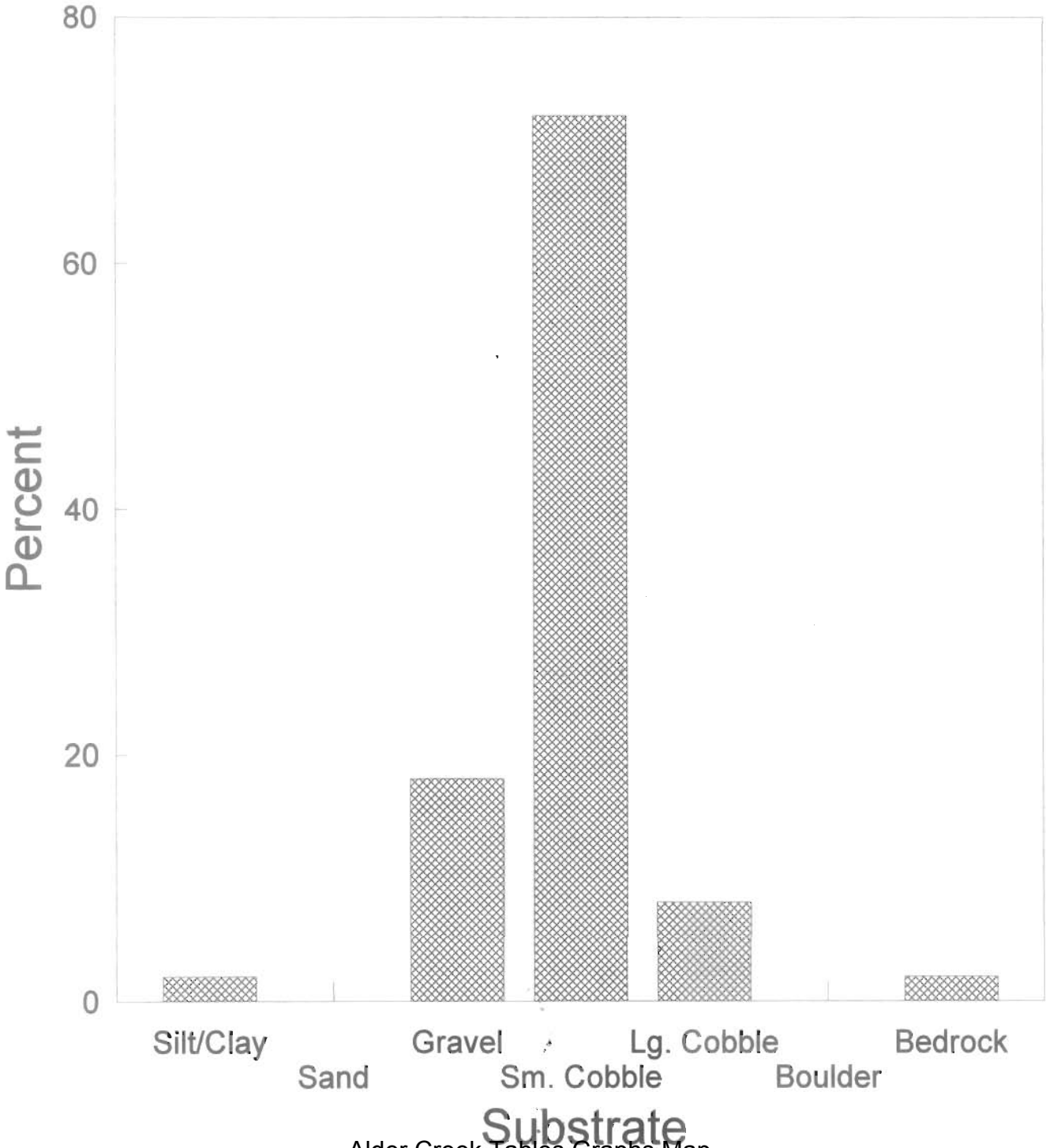
Percent Cover Types in Pools



Graph 6

Alder Creek

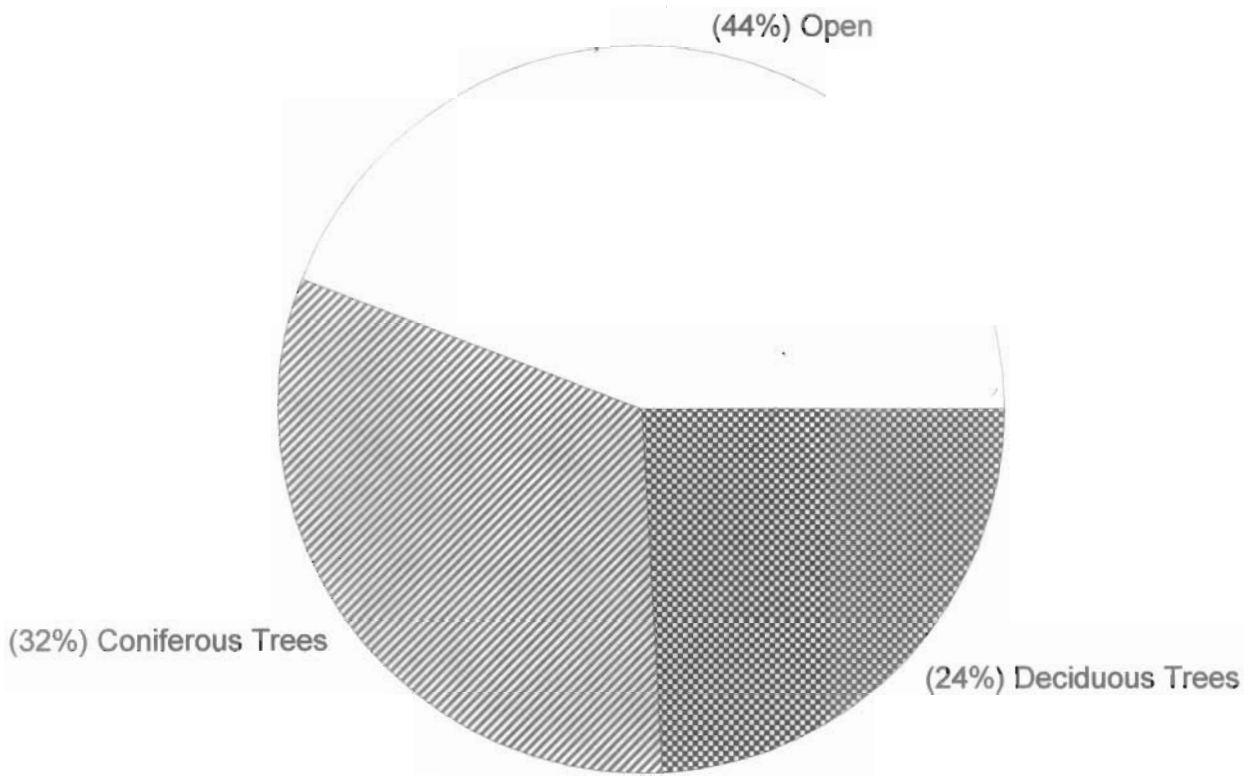
Substrate Composition in Low Gradient Riffles



Graph 7

Alder Creek

Mean Percent Canopy

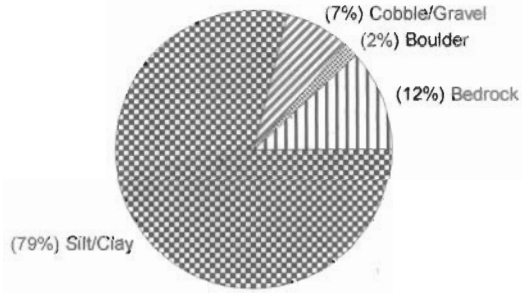


Graph 8

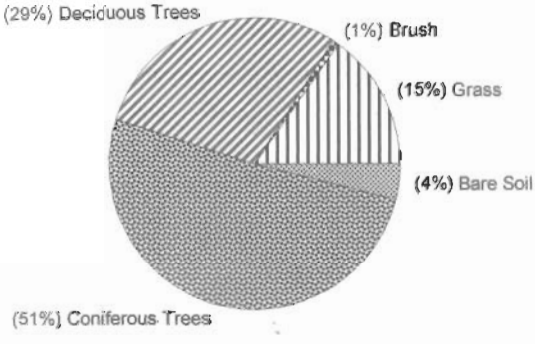
Alder Creek

Percent Bank Composition

Dominant Bank Substrate



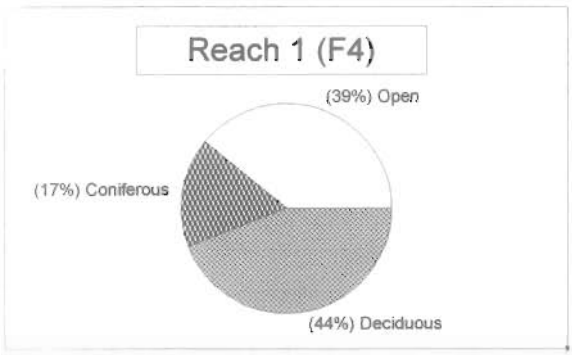
Dominant Bank Vegetation

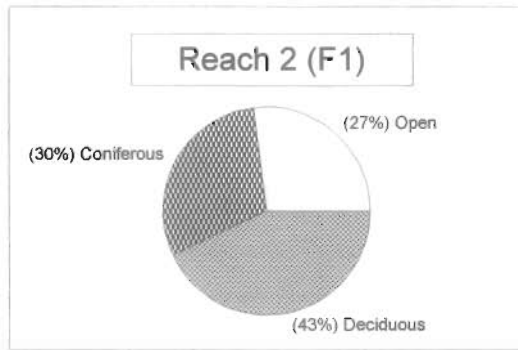


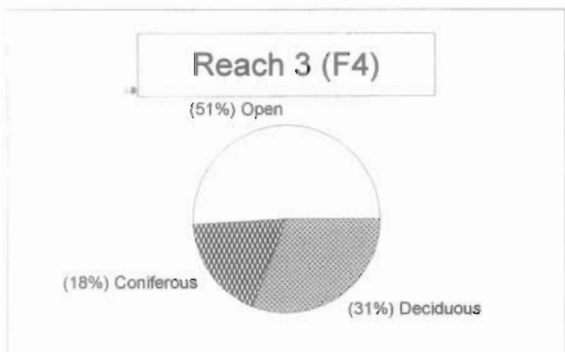
Graph 9

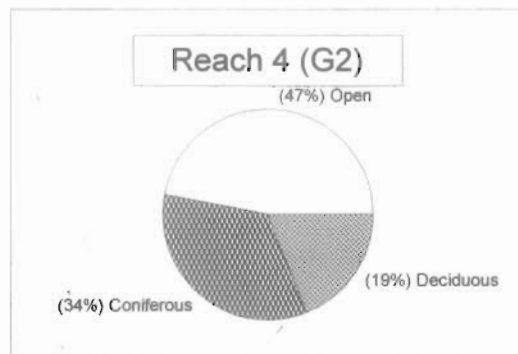
Alder Creek

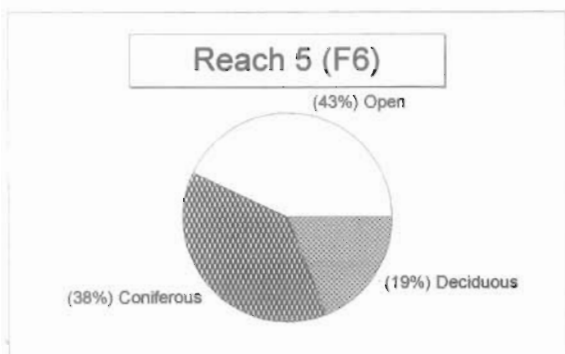
Percent Canopy by Reach

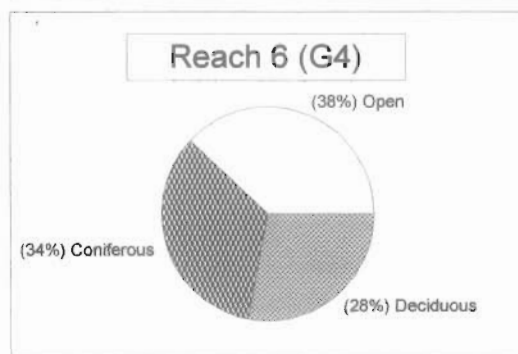












Graph 11