CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
McDonnell Creek
Report revised April 14, 2006
Report Completed 1998
Assessment Completed 1996

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on McDonnell Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in McDonnell Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

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.

WATERSHED OVERVIEW

McDonnell Creek is a tributary to Maacama Creek, a tributary of the Russian River, located in Sonoma County, California (see McDonnell Creek map, page 2). The legal description at the confluence with Maacama Creek is T10N, R8W, S27. Its location is 38°41'10" N. latitude and 122°44'29" W. longitude. Seasonal vehicle access exists from private roads via HWY 128 between Calistoga and Healdsburg.

McDonnell Creek and its tributaries drain a basin of approximately 9 square miles. McDonnell Creek is a third order stream and has approximately 3 miles of blue line stream, according to the USGS Mt. St. Helena, and Jimtown 7.5 minute quadrangles. Major tributaries include Ingalls Creek, Bear Creek and Bluegum Creek, and each are described in separate stream reports. Elevations range from about 360 feet at the mouth of the creek to 3060 feet in the headwaters. The lower watershed is dominated by open oak woodland and grassland while the upper portion is well shaded with some conifers and is entirely privately owned. The Mt. Saint Helena Morning-glory (Calystegia collina ssp. oxyphylla) is listed in DFG's Natural Diversity Database as occurring within McDonnell Creek watershed.

METHODS

The habitat inventory conducted in McDonnell Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flossi et al., 1998). The AmeriCorps Volunteers that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two person team and was supervised by Bob Coey, Russian River Basin Planner (DFG).

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in McDonnell Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

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

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1996). 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:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Temperatures are also recorded using remote Temperature recorders which log temperature every two hours, 24 hours/day.

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". McDonnell Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements 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 McDonnell Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In McDonnell Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully measured habitat units, dominant and sub-dominant substrate elements were visually

estimated using a list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In McDonnell 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 visually into percentages of evergreen 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 McDonnell Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured 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. 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 Habitat, a dBASE IV 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 tables and appendices:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types

- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

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

- Level II Habitat Types by % Occurrence and % Total Length
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Pool Shelter Types by % Area
- Substrate Composition in Low Gradient Riffles
- Percent Cobble Embeddedness by Reach
- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 14-26, 1996 was conducted by Sarah Nossaman (AmeriCorps), Elaine Hards (Intern), and data analyzed by Ken Bunzel (DFG). The survey began at the confluence with the Russian River and extended up McDonnell Creek to the bedrock sheet. The total length of the stream surveyed was 17,465 feet (3.3 miles), with an additional 660 feet of side channel. A flow of 0.31 cfs was measured on August 29, 1996 at the road crossing just above the confluence with Bear Creek (habitat unit 85) using a Marsh-McBirney Model 2000 flowmeter.

This section of McDonnell Creek has three channel types: from the mouth to 10,411 feet an F4; next 6,170 feet an F3 and the upper 884 feet an A2.

F4 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly gravel substrate. F3 channel types are similar, except with a cobble substrate.

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

Water temperatures ranged from 60-76°F. Air temperatures ranged from 65-98°F. Summer temperatures were also measured using a remote temperature recorder placed in a pool located 50 feet upstream of the confluence with Bluegum Creek (Reach 1, habitat unit 49). The recorder logged temperatures every 2 hours from June 7 - October 4, 1996. The highest temperature recorded was 82°F in July and the lowest was 60°F in October. The mean of the daily highs was 75°F for the month of July, 70°F for August, 69°F for September, and 65°F for October (see Temperature Summary graph at end of report).

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 36% flatwater units, 34% pool units, 29% riffle units, and 2% dry streambed units. Based on total **length** there were 40% riffle units, 38% flatwater units, 18% pool units, and 4% dry streambed units (Graph 1).

One hundred, seventy-eight habitat units were measured and 16% were completely sampled. Fourteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles at 28%, runs 25%, boulder scour pools 12% and bedrock scour pools 11% (Graph 2). By percent total **length**, low gradient riffles made up 40%, runs 26%, and glides 9%.

Sixty pools were identified (Table 3). Scour pools were most often encountered at 77%, and comprised 64% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty-three percent of the pools had a depth of three feet or greater (Graph 4). These deeper pools comprised only 7% of the total length of stream habitat.

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 had the highest shelter rating at 16. Riffle had the lowest rating with 2 and flatwater rated 6 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 40, scour pools rated 17, and main channel pools rated 8 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area,

the dominant pool shelter types were boulders at 64%, root masses 15%, and undercut banks 10%. Graph 5 describes the pool shelter in McDonnell Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in three of the nine low gradient riffles measured. Small cobble was dominant in one of the low gradient riffles (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 59 pool tail-outs measured, 13 had a value of 1 (22%); 25 had a value of 2 (42%); 16 had a value of 3 (27%); and 5 had a value of 4 (8%). On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 50%. The mean percentages of deciduous and evergreen trees were 59% and 41%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 73% and the mean percent left bank vegetated was 64%. For the habitat units measured, the dominant vegetation types for the stream banks were: 40% deciduous trees, 31% grass, and 29% evergreen trees. The dominant substrate for the stream banks were: 68% silt/clay/sand, 22% cobble/gravel, and 10% bedrock (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On October 22, 1996 a biological inventory was conducted in two sites of Mcdonnell Creek to document fish species composition and distribution. 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 air temperature was 64-72°F and the water temperature ranged from 49-59°F. The observers were Nossaman (AmeriCorps), Carey (AmeriCorps), Campo (AmeriCorps) and Coey (DFG).

The inventory of Reach 1 started 300 feet upstream of the mouth at a cattle cross-fencing in habitat unit 1 and ended in habitat unit 18. In pool and riffle habitat types, three 0+ steelhead were observed along with many thousands of California Roach, 19 Sacramento Suckers, 58 juvenile Sacramento Pikeminnow, 1 juvenile lamprey, 2 unidentified frogs, 5 Yellow-legged frogs, 1 toad, and 1 sculpin (Cottus Sp.). This section of stream is characterized by open canopy, little shelter, wide, long glide and run habitats, and

had an approximate length of 1329 feet.

The inventory of Reach 1 was continued starting 600 feet upstream from the confluence with Bear Creek (habitat unit 83) and ended 300 feet upstream in habitat unit 87. In pool and riffle habitat types twenty 0+ steelhead and ten 1+ steelhead were observed along with 46 Sacramento Pikeminnow (15/100'), 9 sculpin, 15 California Roach, 1 Sacramento Sucker, and 1 Yellow-legged frog. Fecal matter from livestock and algae blooms were noted through the survey. Few steelhead were observed in most of reach 1 throughout the survey, but hundreds of Sacramento Squaw were observed. During the habitat survey, dead YOY and 1+ steelhead were observed in this section during a hot spell in August.

The inventory of Reach 2 started at the old summer camp in habitat units 117-130 with an approximate length of 1153 feet. In pool and riffle habitat types 35 0+, 14 1+ and 2 2+ steelhead were observed along with 250 California Roach, 19 sculpin, 1 adult Sacramento Pikeminnow, 1 Sacramento Sucker, 2 unidentified frogs, 1 Yellow-legged frog, and 1 crayfish.

The inventory of Reach 3 was conducted in habitat units 159-164 with an approximate length of 407 feet. In pool and riffle habitat types twenty four 0+ and six 1+ steelhead were observed along with 13 sculpin and 1 Yellow-legged frog.

A summary of 1996 data collected by DFG appears in the table below.

SPECIES	NATIVE/INTRODUCED
Steelhead Trout	N
Sacramento Pikeminnow	N
California Roach	N
Sacramento Sucker	N
Sculpin (Cottus Sp.)	N
Lamprey	N
Yellow-legged	N

SPECIES	NATIVE/INTRODUCED
Frog	
Crayfish	N

No introduced species were observed during the survey and historical records indicate no hatchery stocking, transfers or fish rescue operations have occurred in the stream.

ADULT SURVEYS:

A spawning/carcass survey was conducted on March 15, 1996 on McDonnell Creek, beginning at the mouth and extending upstream to 1/2 mile above the confluence with Ingalls Creek. The total distance covered was 2 1/2 miles. Three adult steelhead were observed that were estimated to be 4 lbs., 5 lbs., and 10 lbs.

DISCUSSION

McDonnell Creek has three channel types: F4, F3 and A2. There are 10,411 feet of F4 channel type in Reach 1.

According to the DFG Salmonid Stream Habitat Restoration Manual, fishery enhancement opportunities in F4 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover.

There are 6,170 feet of F3 channel type in Reach 2. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover. Suitable gradients and stable stream banks are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

There are 884 feet of A2 channel type in Reach 3. The high energy, steep gradient A2 channel types have stable stream banks but poor gravel retention capabilities, thus are generally not suitable for instream enhancement structures.

The water temperatures recorded on the survey days August 14-26, 1996 ranged from 60-76°F. Air temperatures ranged from 65-98°F. Summer temperatures measured using a remote temperature recorder

placed in a pool in Reach 1 ranged from 60-82°F. These higher temperatures, are above the threshold stress level (65°F) for salmonids. From July through September the lower watershed exhibited temperatures above the optimal and at lethal levels in August for salmonids. Dead steelhead were observed within one open, hot section of Reach 1. Algae blooms created by solar radiation and fecal matter from livestock likely limit oxygen availability. Temperatures decrease upstream where livestock are absent and riparian canopy and pool structure improves.

Pools comprised 18% of the total **length** of this survey. In third and fourth order streams a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. In McDonnell Creek, the pools are relatively shallow with 23% having a maximum depth of at least 3 feet. These pools comprised only 7% of the total length of stream habitat.

The mean shelter rating for pools was only 16. The relatively small amount of pool shelter that now exists is being provided primarily by boulders. Vegetative and log cover provides rearing fry with protection from predation, rest from water velocity, and a food source for stream insects which juvenile steelhead feed on. In Reach 1 and 2 of McDonnell Creek these elements are mostly lacking.

Forty-four percent of the low gradient riffles measured had either gravel or small cobble as the dominant substrate. Thirty-six percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Twenty-two percent had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In a reach comparison, Reach 3 had the best ratings with all of the pool tail-outs having a value of 1. However, this reach has low utilization for spawning due to the steep gradient and predominance of boulders. Reach 2 had the poorest ratings with 43% having either a 3 or 4 value (>50% silted).

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. There are 6 major sites along the creek in which potential or existing erosion has been documented (see problem sites and landmarks at the end of this report). In addition, unrestricted cattle access impedes annual riparian re-sprouting and has lead to general bank instability along much of the stream.

The mean percent canopy for the entire survey was only 50%. This is a low percentage of canopy, since 80 percent is generally considered desirable. Although opportunities to improve canopy are limited where the stream is wide, reach 1 has an extremely low canopy of 37%. Cooler water temperatures are desirable in McDonnell Creek. Elevated water temperatures could be reduced by increasing riparian canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream structure and bank stability.

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. During the summer 1996 survey, low numbers of steelhead were documented in both Reaches 1 and 2. Steelhead numbers in Reach 3 are higher where cattle and warm water predator species are absent and riparian improves. Overall, relatively few salmonids and many warm water species were observed during the survey.

Stream shade canopy is very low, especially in Reach 1, and water temperatures are extremely high throughout. Juvenile rearing conditions are very poor with relatively few deep pools and low shelter ratings. Spawning conditions are better, with an adequate amount of gravel, though fine sediment levels are somewhat high in lower reaches.

GENERAL RECOMMENDATIONS

McDonnell Creek should be **returned** to a anadromous, natural production steelhead stream. Major refugia streams, the Brigss Creek Watershed, and all tributaries to McDonnel, exists upstream of the mainstem of McDonnel Creek. Currently, McDonnel Creek mainly serves as a migration corridor to better habitat upstream. McDonnell Creek could be restored to provide better habitat throughout

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

SPECIFIC FISHERY ENHANCEMENT RECOMMENDATIONS

1) Without riparian improvements, steelhead nursery conditions in Reaches 1 and 2 are severely impacted. Since a livestock corridor exclusion limits use of adjoining pastures, a single wire electric fence or a fenced 'riparian pasture' with seasonal rotation should be explored with landowners. Funding to develop off-stream water sources (through the Natural Resources Conservation Service) is also available and could be pursued through a cooperative effort.

2) Increase the canopy on McDonnell Creek by planting willow, alder, oaks, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (all reaches, but especially Reach 1) and to provide a buffering against grazing runoff. 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 would need to be coordinated to follow bank stabilization projects (identified below). Seedlings would require browse guards and in some areas, watering. A solar-operated irrigation system developed by the Sonoma County Water Agency could be available for use.

3) Armor, stabilize, and revegetate bank erosion occurring in habitat units 57, 99, 101, 139, and 144.

4) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from boulders. Adding high quality complexity with larger woody cover is desirable, or where possible design and engineer pool enhancement structures to increase the number of pools. 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.This must only be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

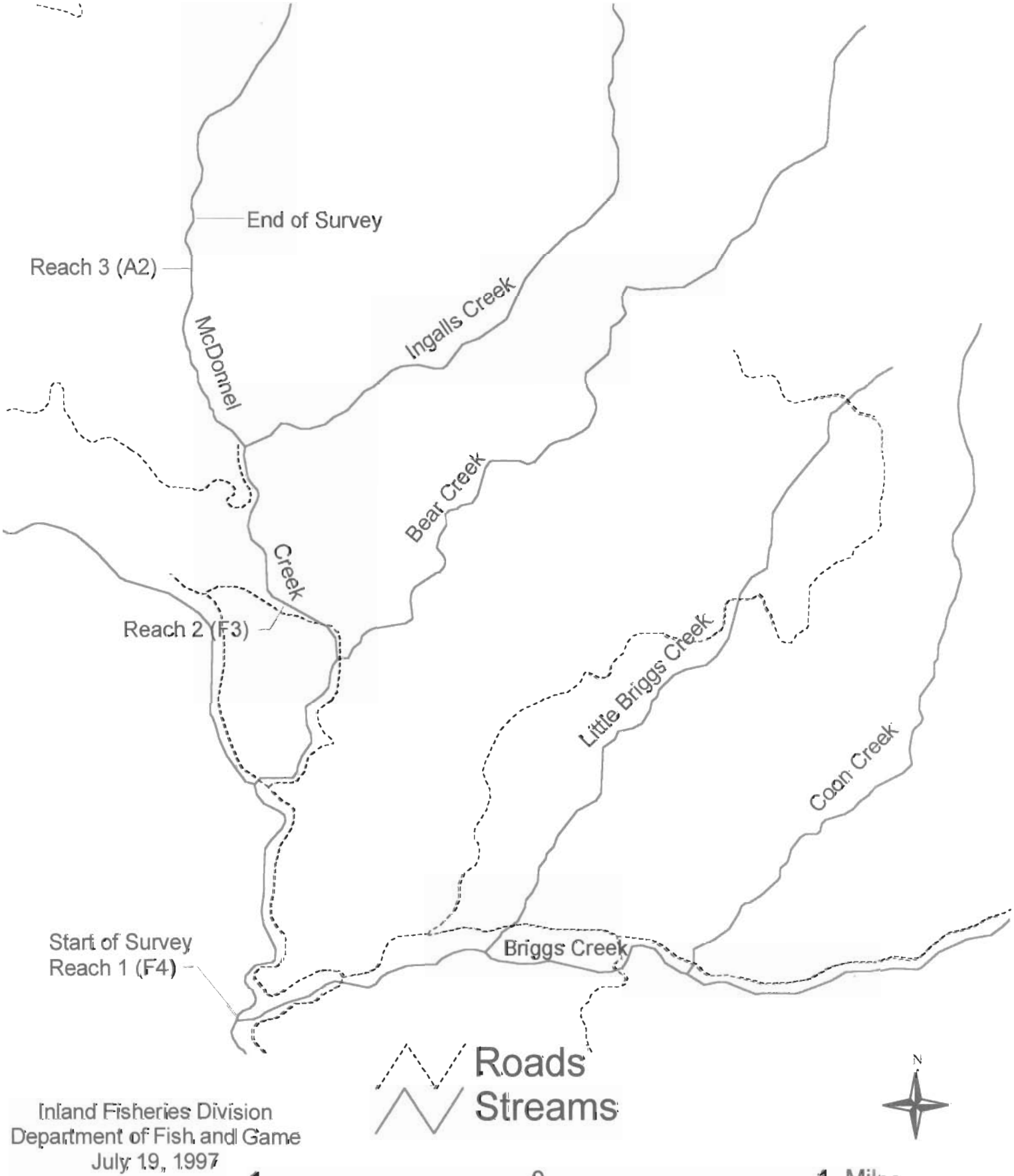
PROBLEM SITES AND LANDMARKS - McDonnell CREEK SURVEY COMMENTS

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

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
7.00	502	FROGS, PIKEMINNOW
10.00	734	3 DEAD STEELHEAD -6IN, 1+
17.00	1192	CANOPY OF BEDROCK
22.00	1525	CRAYFISH SHELL, COOL UPWELLING
26.00	2340	UNDERCUT BANK
29.00	2871	TADPOLES LARGE
39.00	3575	0+ SHD
40.00	3843	HUNDREDS OF PIKEMINNOW SEEN SINCE UNIT #001
48.00	5231	2 ROAD X'S, CONFLUENCE W/ BLUE GUM
49.00	5278	TEMP MENTOR
53.00	5463	100'S OF PIKEMINNOW!
57.00	5878	ERODIBLE RIGHT BANK
57.10	5878	SPRING FED POOL W/ GOOD CANOPY
66.00	6518	TRIBS BOTH BANKS
70.00	7012	DRY TRIB LEFT BANK
73.00	7454	OLD FENCE WEAR OAK LF BANK
74.00	7858	DRY TRIB RT BANK
75.00	8068	ROAD LF BANK, DRY TRIB ON LEFT BANK NEXT TO ROAD
78.00	8476	TRIB DRY RT BANK, SWITCH BACK IN ROAD AND DRY TRIB LF BK
81.00	8914	CONFLUENCE BEAR CREEK
85.00	9789	ROAD CROSSED CREEK + STARTS UP HILL, DRY TRIB RT BANK
87.00	9863	DOZENS OF PIKEMINNOW
88.00	10297	DRY TRIB RT BANK POSS CHANNEL CHANGE
89.00	10420	DRY TRIB LF BANK
90.00	10491	CHANNEL CHANGE
91.00	10707	DRY TRIB RT., DRY TRIB RT.
99.00	11457	ERODIBLE LF BANK (COULD USE STABILIZATION)
100.00	11565	MORE ENTRENCHED, BEDROCK
101.00	11585	HIGHLY ERODIBLE LF BANK
106.10	11815	DRY TRIB RT BANK
111.00	12287	FENCE ACROSS CREEK, MODINI/MCMICKING
113.00	12499	SUBSIDENCE RT BANK, PARALLELING ROAD RT BANK
117.00	12824	CAMP ON RT BANK, BEDROCK BLUFF ON

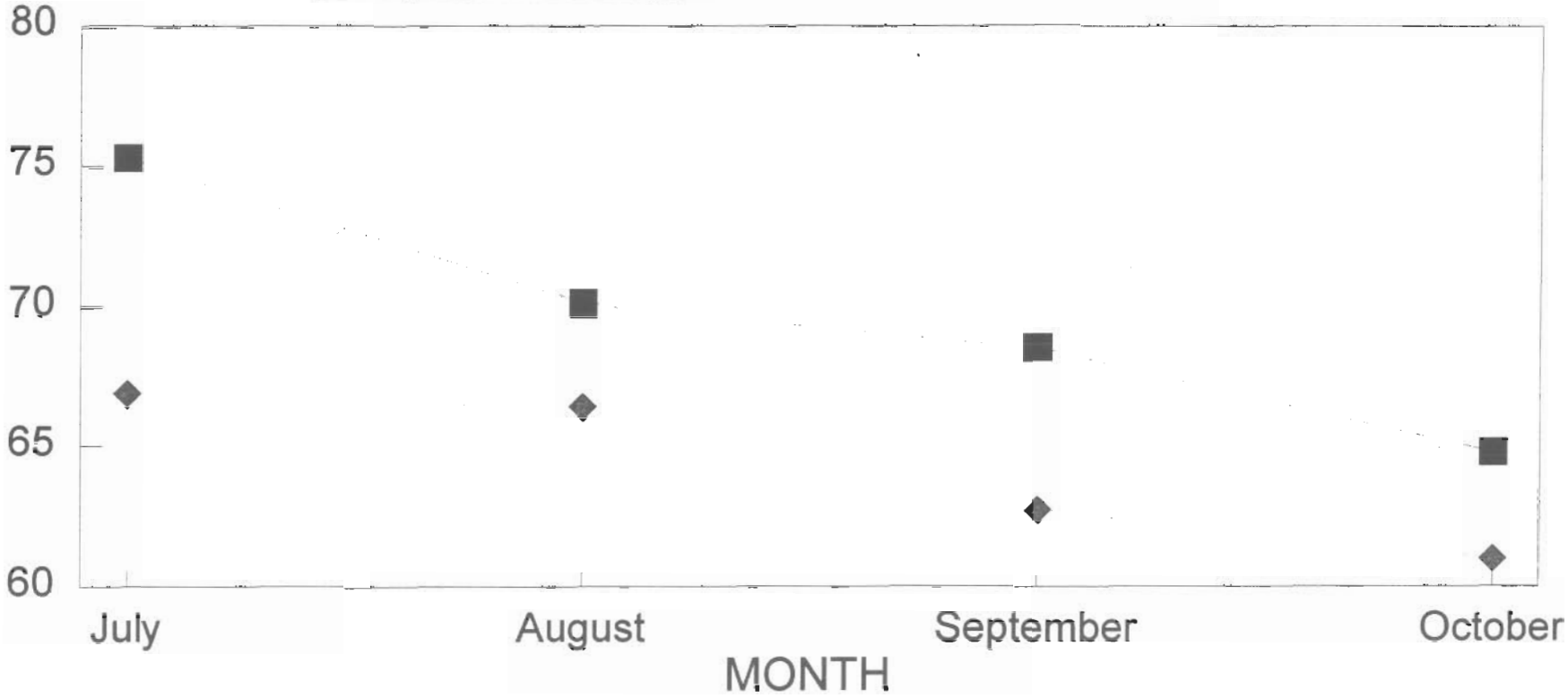
		LEFT
119.00	12957	HOUSE ON RT BANK
120.00	13030	GREAT POOL, 1-2+ SH, EF!!
129.00	13702	2.2 FT CULVERT/DRY TRIB RT BK, NO DOWNCUTTING
130.00	13886	CONFLUENCE W/ INGALLS
131.00	13925	ROAD X'S CREEK
139.00	14641	60'H X 50'L X 25'W ERODED RT BANK, LARGE TREES X ABOVE CREEK
140.00	14678	SMALL TRIB RT BANK
142.00	14772	GOOD SHELTER
143.00	14871	TRIB (DRY) RT BANK
144.00	15004	6 FT OF DRY GRAVEL DUE TO ERODING RT BK?
147.00	15137	SMALL DRY TRIB LEFT BANK
150.00	15514	ROAD X'S CREEK
151.00	15596	DRY TRIB RT BANK
152.00	15630	DRY TRIB LF BANK
156.00	16033	DRY SIDE CHANNEL SUBSIDENCE LF BANK
157.00	16127	BIG DRY TRIB RT BANK, ROAD X'S DRY TRIB
161.00	16498	WET TRIB LEFT BANK 64'
163.00	16599	TRIB RT BANK
164.00	16660	CHANNEL CHANGE TO A2
167.00	16787	BEDROCK SHEET
168.00	16831	1'ST 7' ARE DRY
171.00	17471	BIG DRY TRIB RT BANK, 100' POSSIBLE CHANNEL CHANGE

McDonnel Creek



Tempmentor Summary

Mcdonnel creek



Sample Period: Jul 10 - Oct 4, 1996
Location: 50' upstream of bluegum confl.

McDonnel Creek

Drainage: Maacama Creek, Russian River

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

Survey Dates: 08/14/96 to 08/26/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°44'29"

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
51	8	RIFFLE	29	144	7324	40	14.4	0.3	1308	66697	434	22123	0	2
64	8	FLATWATER	36	107	6849	38	15.3	0.6	1362	87179	887	56752	0	6
60	13	POOL	34	54	3267	18	17.2	1.2	1429	85767	2847	170797	2228	16
3	0	DRY	2	228	684	4	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.)
178	29	18125	239643	249672

McDonnell Creek

Drainage: Maacama Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/14/96 to 08/26/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°44'29"

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 %
50	7	LGR	28	145	7274	40	16	0.3	1.3	1462	73094	487	24354	0	2	52
1	1	BRS	1	50	50	0	2	0.1	0.2	75	75	8	8	0	0	50
14	4	GLD	8	120	1678	9	19	0.7	1.5	1574	22037	1223	17125	0	3	43
44	2	RUN	25	106	4650	26	13	0.6	1.8	1350	59381	742	32667	0	10	31
6	2	SRN	3	87	521	3	12	0.4	1.3	957	5744	430	2582	0	5	78
11	3	MCP	6	63	698	4	17	1.4	4.3	999	10994	1543	16975	1184	7	60
1	1	STP	1	60	60	0	10	1.0	1.6	480	480	480	480	384	20	80
1	1	LSL	1	47	47	0	22	1.1	2.9	1011	1011	1112	1112	707	30	85
4	1	LSR	2	26	102	1	9	1.0	2.2	240	961	224	896	124	20	93
19	2	LSBk	11	52	997	5	17	1.2	5.5	1010	19196	1246	23682	861	10	41
22	4	LSBo	12	43	944	5	16	1.2	4.2	761	16745	906	19940	683	21	55
1	0	SCP	1	18	18	0	0	2.2	3.0	0	0	0	0	0	80	75
1	1	DPL	1	401	401	2	86	3.0	6.4	34520	34520	*****	103561	82849	0	5
3	0	DRY	2	228	684	4	0	0.0	0.0	0	0	0	0	0	0	60

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
178	29	18125	244238	243382

McDonnel Creek

Drainage: Maacama Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/14/96 to 08/26/96

Confluence **Location:** QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°44'29"

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
12	4	MAIN	20	63	758	23	16.3	1.4	952	11426	1447	17358	1112	8
46	8	SCOUR	77	45	2090	64	16.0	1.1	824	37913	992	45631	709	17
2	1	BACKWATER	3	209	419	13	86.0	2.6	34520	69041	*****	207122	82849	40

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
60	13	3267	118380	270111

McDonnel Creek — Drainage: Maacama Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 08/14/96 to 08/26/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°44'29"

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
11	MCP	18	1	9	2	18	4	36	2	18	2	18
1	STP	2	0	0	1	100	0	0	0	0	0	0
1	LSL	2	0	0	0	0	1	100	0	0	0	0
4	LSR	7	0	0	2	50	2	50	0	0	0	0
19	LSBk	32	0	0	4	21	10	53	4	21	1	5
22	LSBo	37	0	0	8	36	11	50	2	9	1	5
1	SCP	2	0	0	0	0	0	0	1	100	0	0
1	DPL	2	0	0	0	0	0	0	0	0	1	100

TOTAL UNITS 60

McDonnel Creek — Drainage: Maacama Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type — Survey Dates: 08/14/96 to 08/26/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°44'29"

	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
	50	9	LGR	0	0	0	0	0	0	0	804	0
	1	1	BRS	0	0	0	0	0	0	0	0	0
	14	4	GLD	0	0	0	172	0	0	0	82	0
	44	3	RUN	0	0	0	0	0	27	0	197	0
	6	2	SRN	0	0	0	0	0	32	0	110	0
	11	10	MCP	74	0	0	56	6	0	0	416	11
	1	1	STP	0	0	0	0	0	0	0	60	0
	1	1	LSL	38	23	45	38	8	0	0	0	0
	4	4	LSR	0	0	8	130	0	0	0	0	0
	19	19	LSBk	92	35	0	205	7	5	0	389	163
	22	22	LSBo	136	0	75	122	9	0	0	1416	0
	1	1	SCP	0	0	0	0	0	0	0	0	0
	1	1	DPL	0	0	0	0	0	0	0	0	0
	3	1	DRY	0	0	0	0	0	0	0	0	0
TOTAL	178	79		340	58	128	723	30	64	0	3474	174
				7%	1%	3%	14%	1%	1%	0%	70%	3%
TOTAL FOR POOLS	60	59		340	58	128	551	30	5	0	2281	174
				10%	2%	4%	15%	1%	0%	0%	64%	5%

McDonnel Creek | Drainage: Maacama Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE | Survey Dates: 08/14/96 to 08/26/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 | LATITUDE: 38°41'10" | LONGITUDE: 122°44'29"

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
50	9	LGR	0	0	33	11	33	22	0
1	1	BRS	0	0	0	0	0	0	100
4	4	GLD	25	50	0	25	0	0	0
4	3	RUN	0	0	100	0	0	0	0
6	2	SRN	0	0	50	0	50	0	0
1	3	MCP	0	33	33	33	0	0	0
1	1	STP	0	0	0	0	100	0	0
1	1	LSL	0	0	0	100	0	0	0
4	1	LSR	0	0	100	0	0	0	0
9	4	LSBk	0	25	50	0	0	0	25
2	4	LSBo	0	50	50	0	0	0	0
1	1	SCP	0	0	100	0	0	0	0
1	1	DPL	100	0	0	0	0	0	0
3	1	DRY	0	0	0	0	0	100	0

McDonnel Creek

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Decidous	Mean Right bank % Cover	Mean Left Bank % Cover
49.83	40.92	59.03	73.33	63.75

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	3	4	9.72
Boulder	0	0	0
Cobble/Gravel	11	5	22.22
Silt/clay	22	27	68.06

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	10	12	30.56
Brush	0	0	0
Deciduous Trees	13	16	40.28
Evergreen Trees	13	8	29.17
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: McDonnel Creek
SAMPLE DATES: 08/14/96 to 08/26/96
STREAM LENGTH: 17465 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: MOUNT ST H — Latitude: 38°41'10"
Legal Description: T10NR8WS27 — Longitude: 122°44'29"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: F4	Canopy Density: 37%
Channel Length: 10411 ft.	Evergreen Component: 21%
Riffle/Flatwater Mean Width: 16 ft.	Deciduous Component: 79%
Total Pool Mean Depth: 1.2 ft.	Pools by Stream Length: 21%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 24%
Water: 63 - 76 °F Air: 65 - 98 °F	Mean Pool Shelter Rtn: 12
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 67%	Occurrence of LOD: 28%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 21% 2. 47% 3. 29% 4. 3%

STREAM REACH 02

Channel Type: F3	Canopy Density: 66%
Channel Length: 6170 ft.	Evergreen Component: 62%
Riffle/Flatwater Mean Width: 15 ft.	Deciduous Component: 39%
Total Pool Mean Depth: 1.2 ft.	Pools by Stream Length: 16%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 22%
Water: 60 - 76 °F Air: 66 - 90 °F	Mean Pool Shelter Rtn: 15
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 70%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 17% 2. 39% 3. 26% 4. 17%

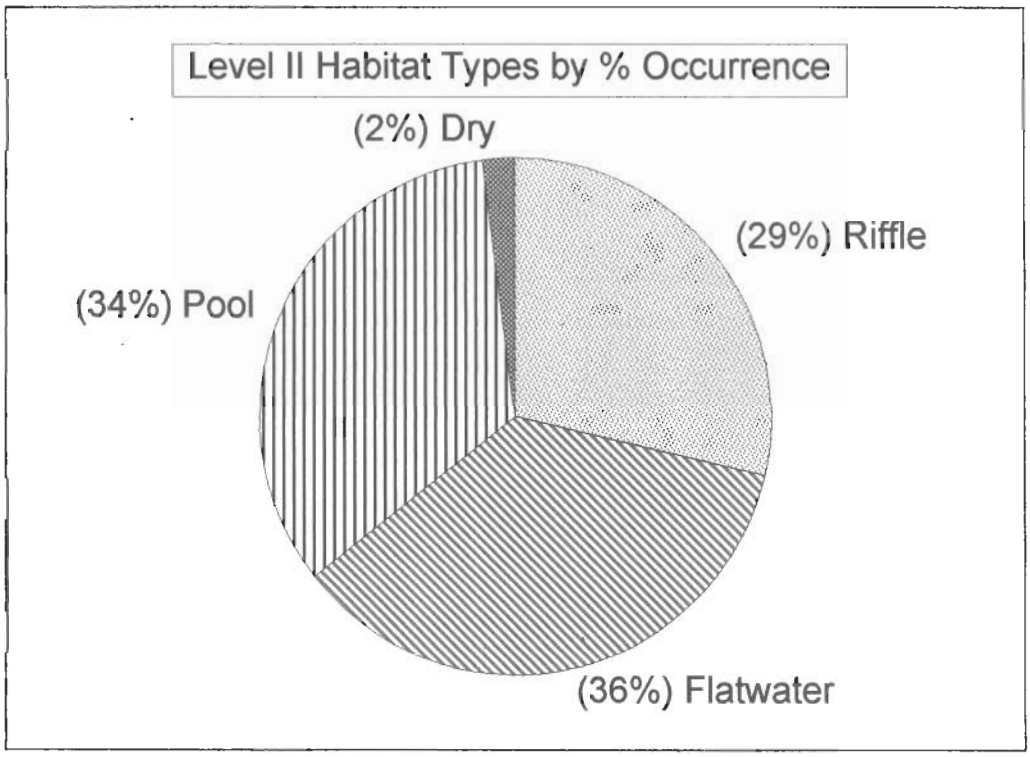
STREAM REACH 03

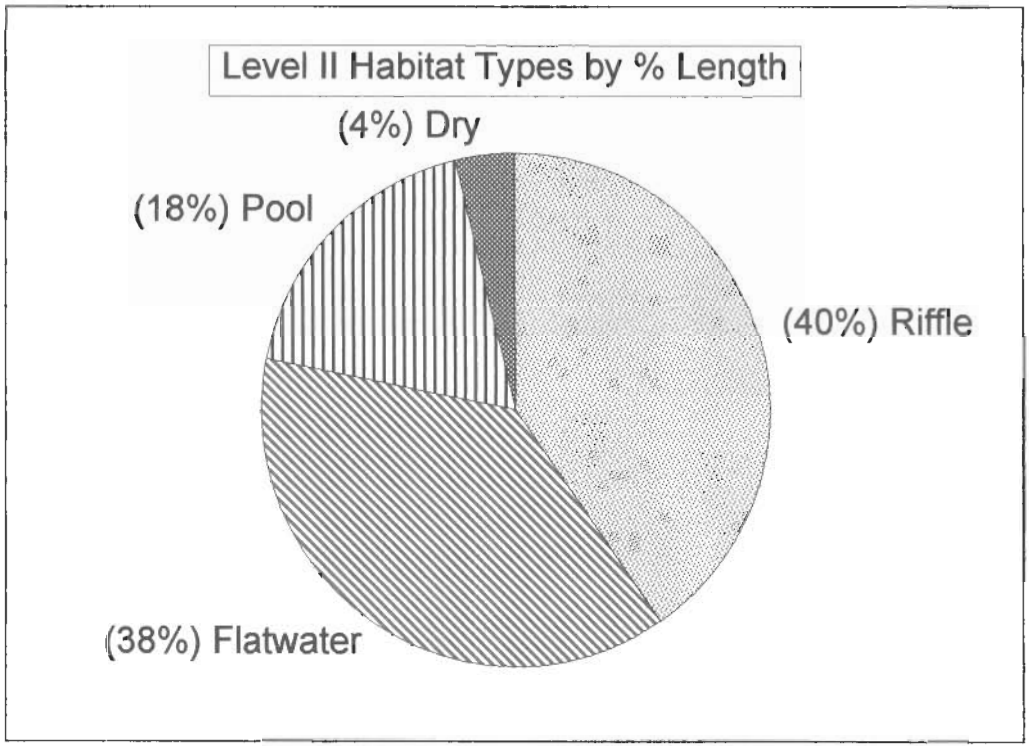
Channel Type: A2	Canopy Density: 64%
Channel Length: 884 ft.	Evergreen Component: 88%
Riffle/Flatwater Mean Width: 2 ft.	Deciduous Component: 13%
Total Pool Mean Depth: 1.3 ft.	Pools by Stream Length: 4%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 0%
Water: 61 - 61 °F Air: 68 - 70 °F	Mean Pool Shelter Rtn: 40
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 69%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 684 ft.

Embeddness Value: 1. 100% 2. 0% 3. 0% 4. 0%

McDonnel Creek

Level II Habitat Types

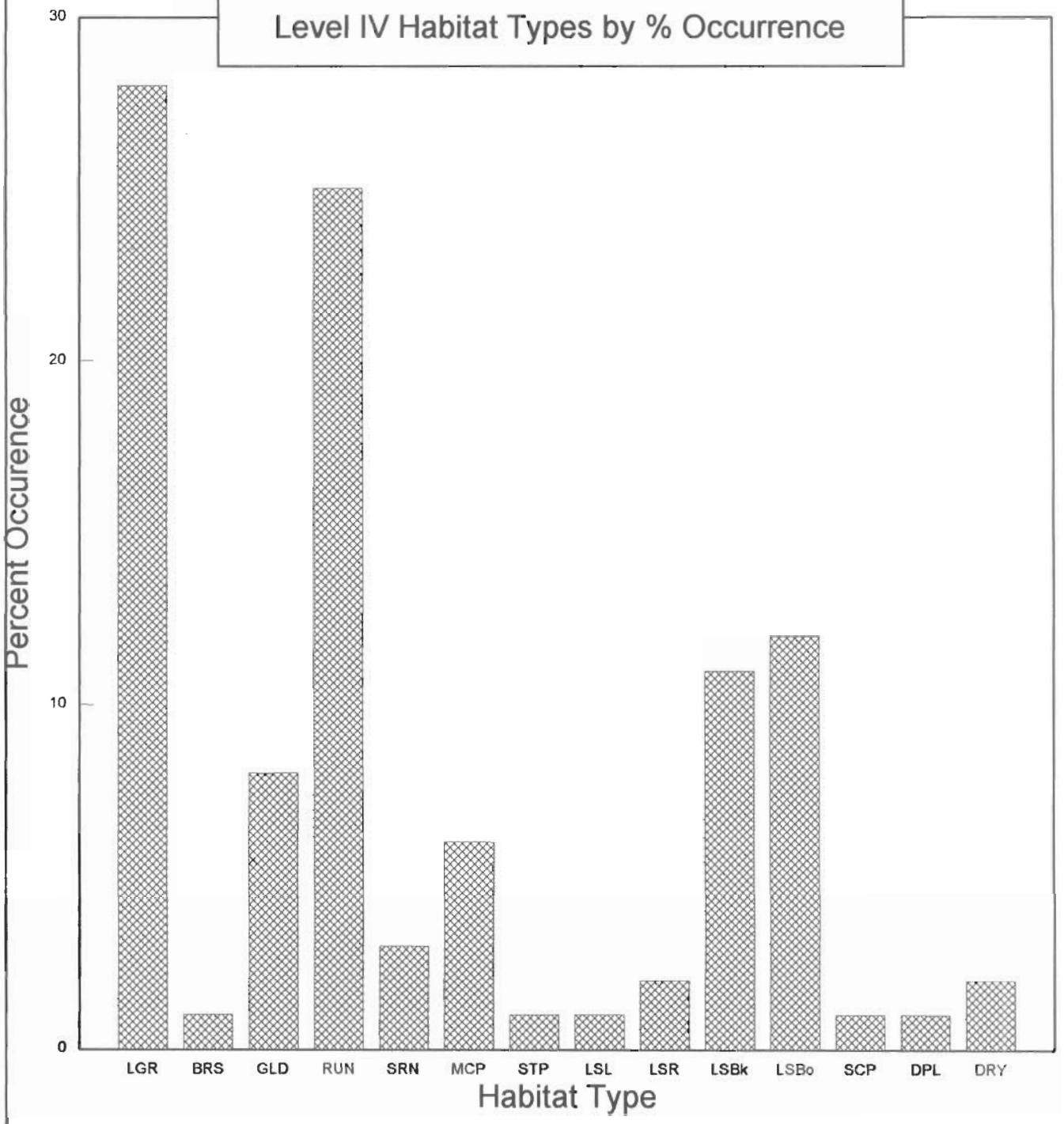




Graph 1

McDonnel Creek

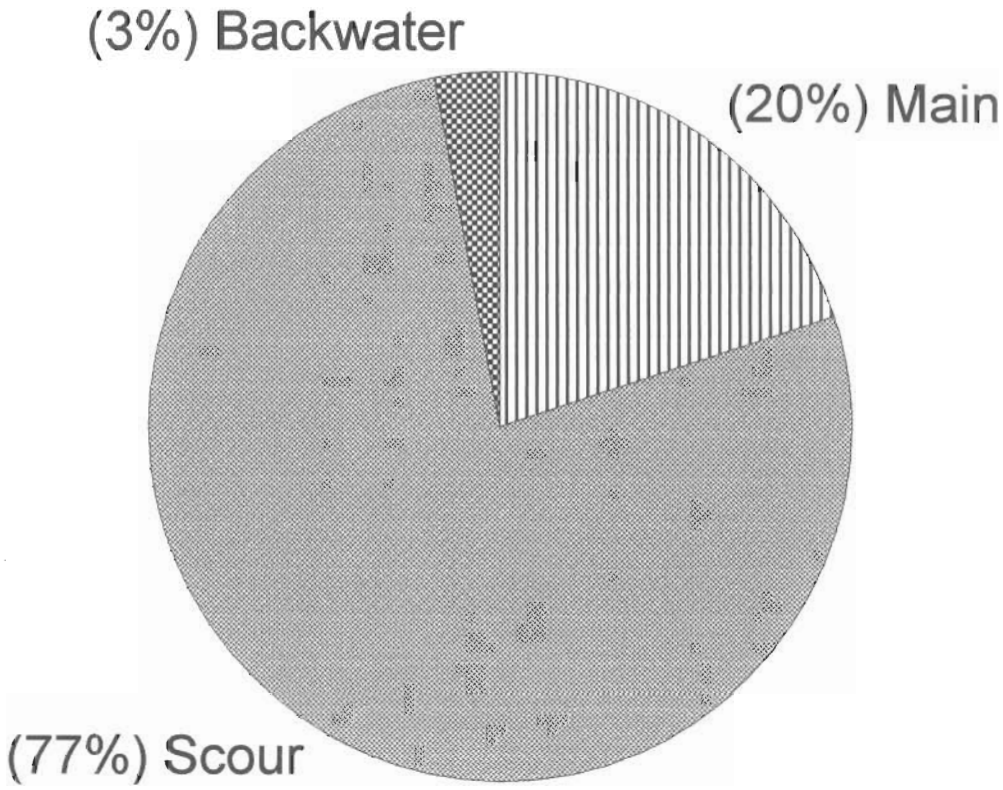
Level IV Habitat Types by % Occurrence



Graph 2

McDonnel Creek

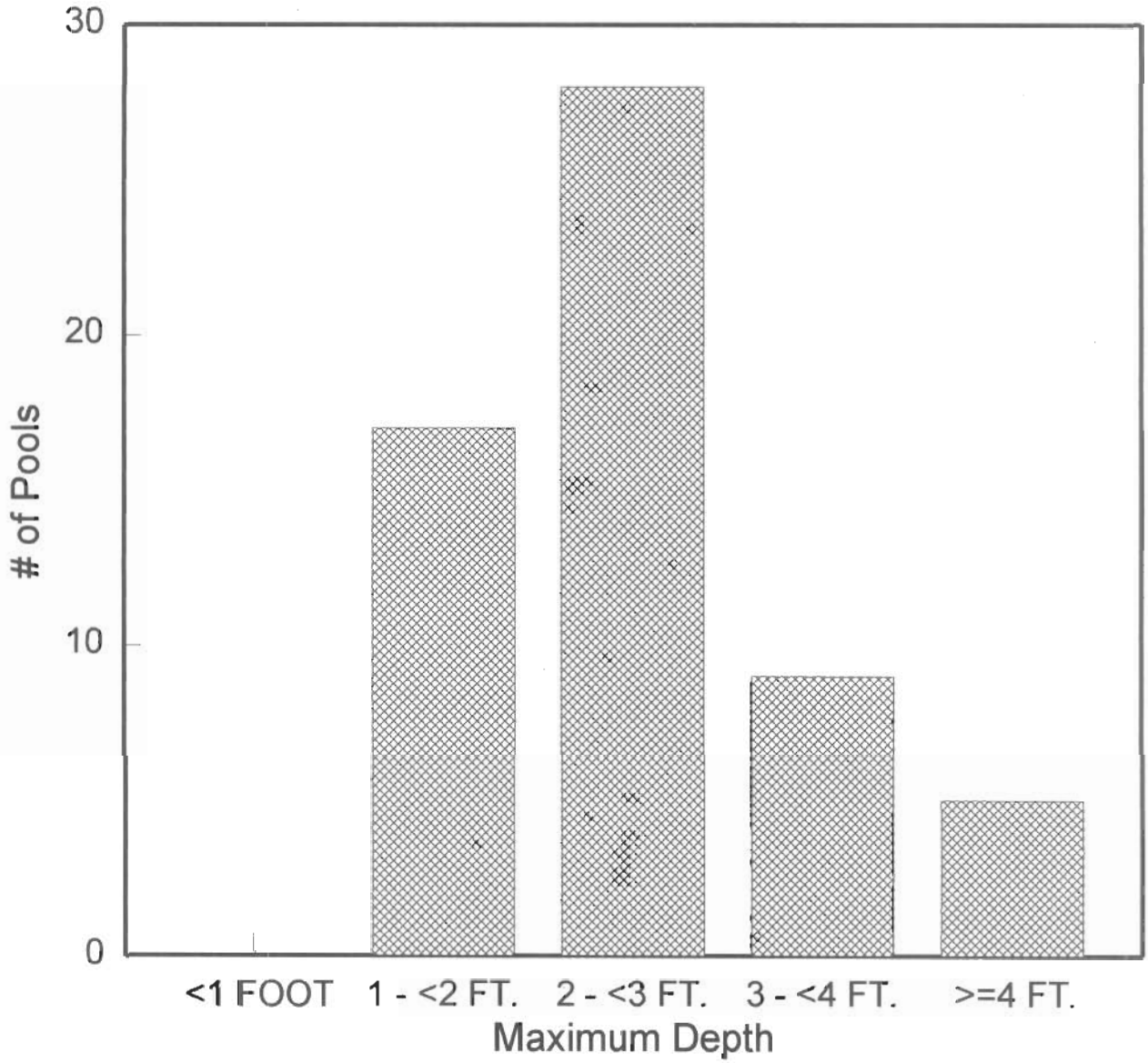
Pool Habitat Types by % Occurrence



Graph 3

McDonnel Creek

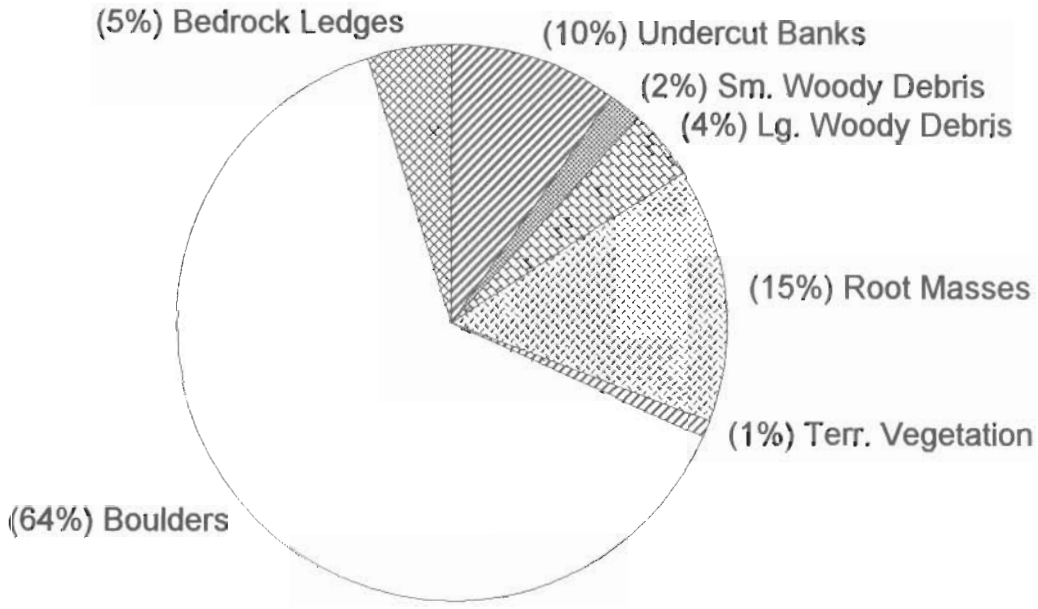
Maximum Depth in Pools



Graph 4

McDonnel Creek

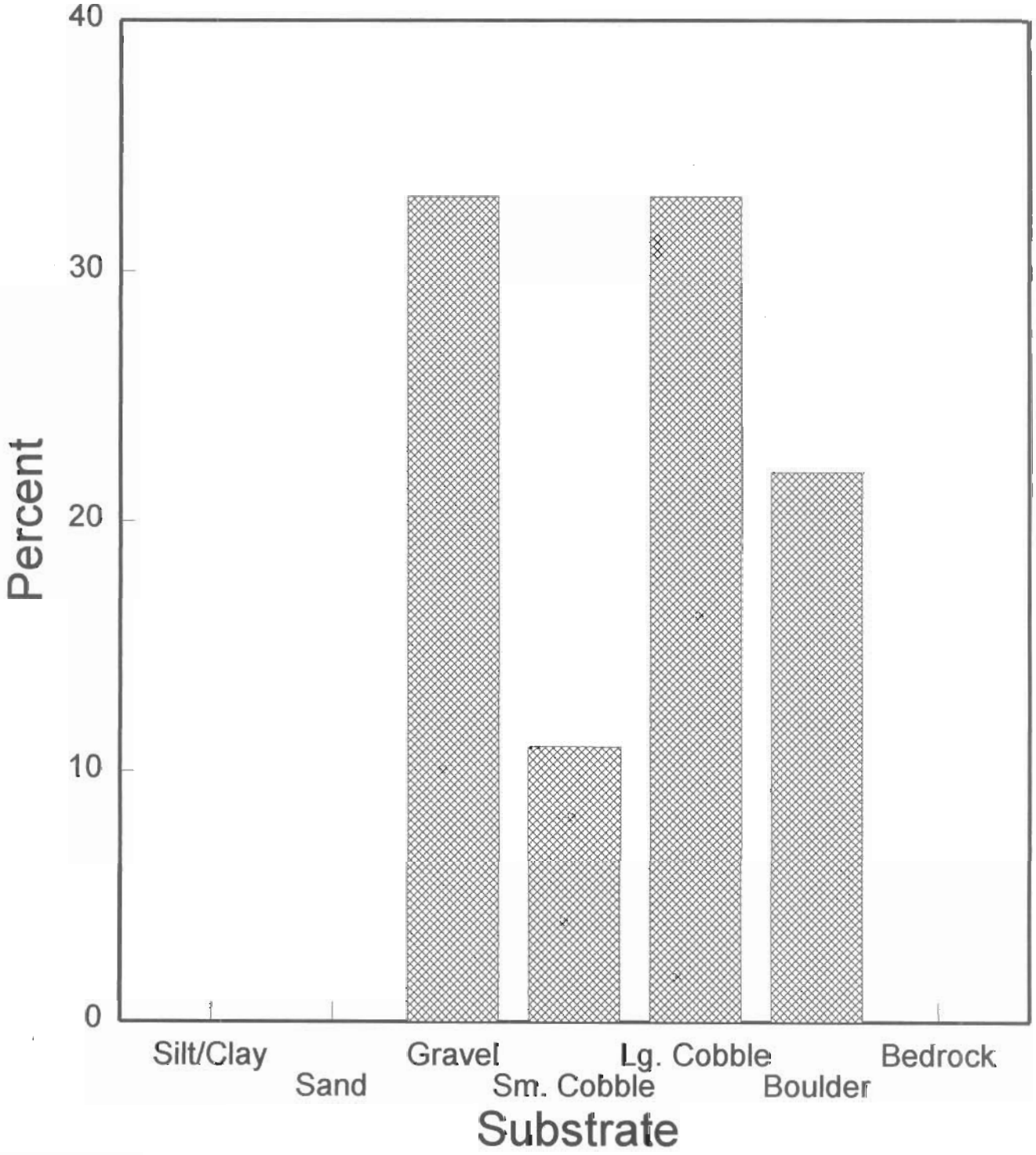
Pool Shelter Types by % Area



Graph 5

McDonnel Creek

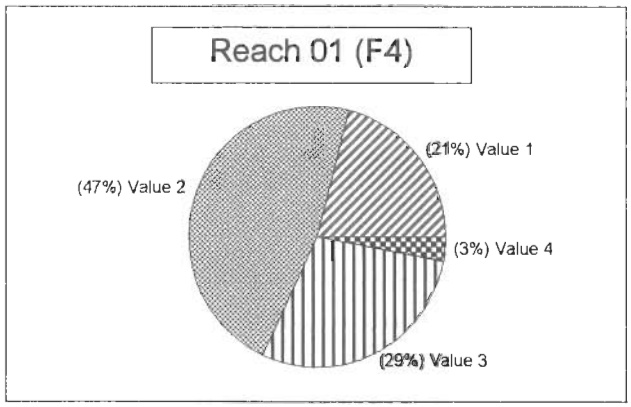
Substrate Composition in Low Gradient Riffles

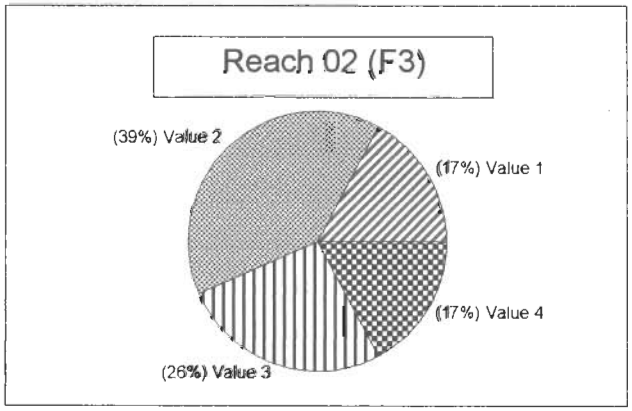


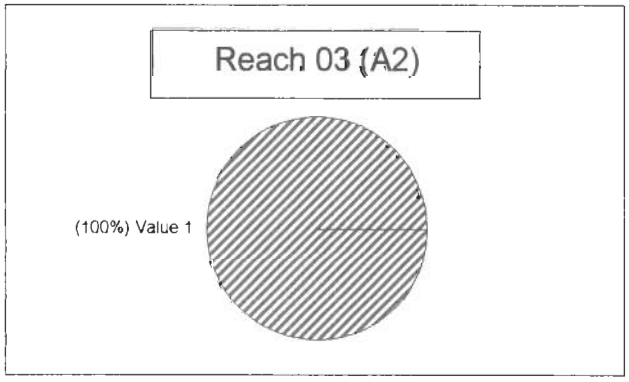
Graph 6

McDonnel Creek

Percent Cobble Embeddedness by Reach





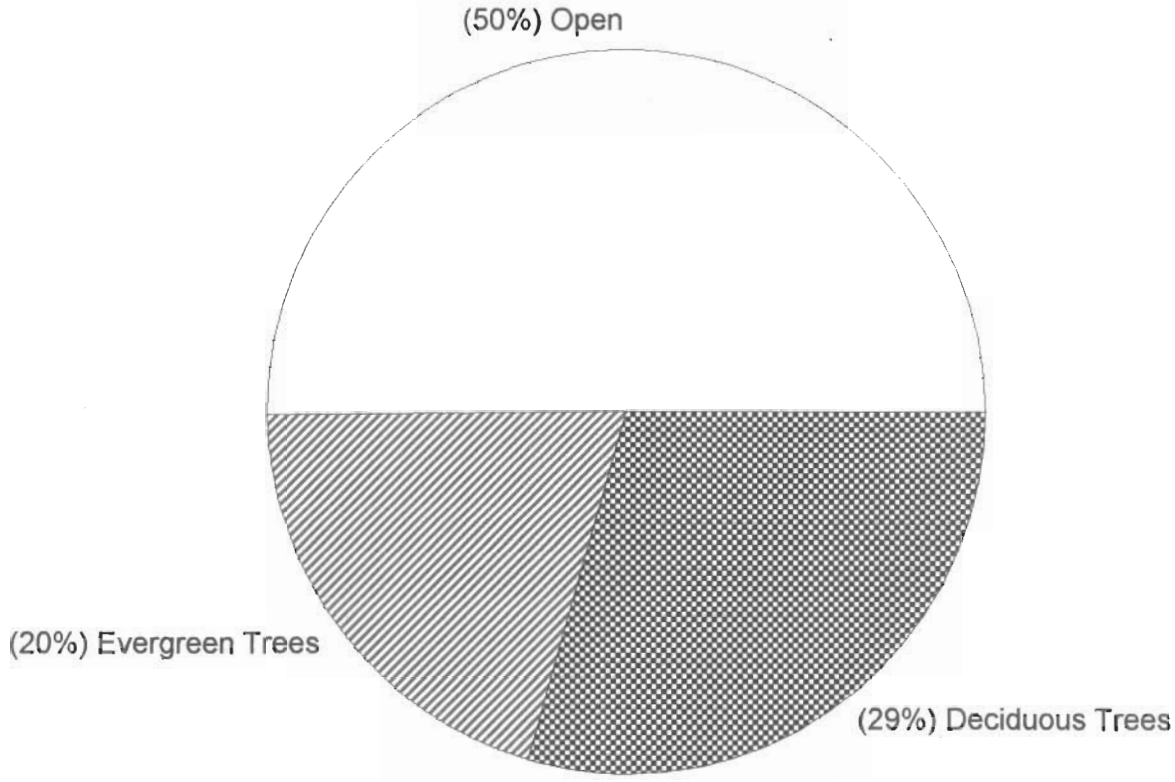


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

Mcdonnel Creek

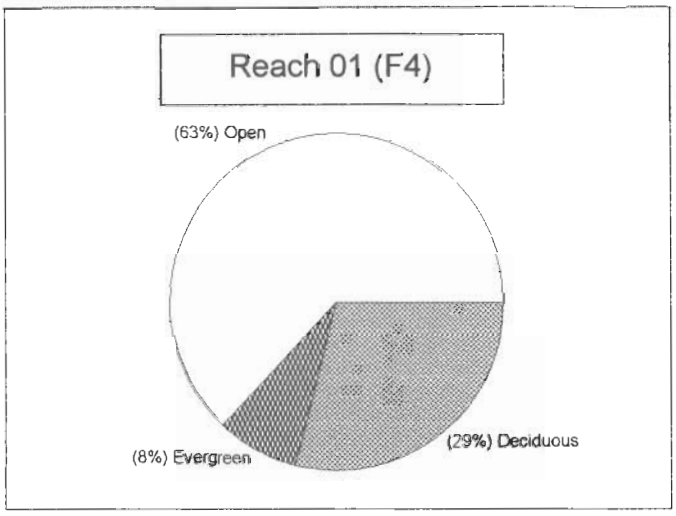
Mean Percent Canopy

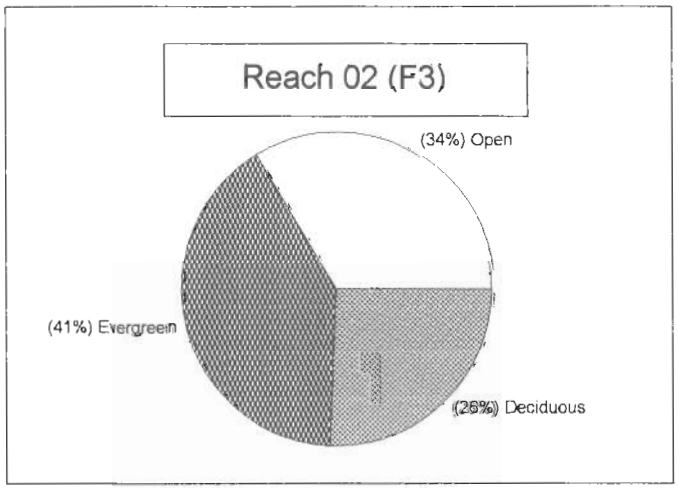


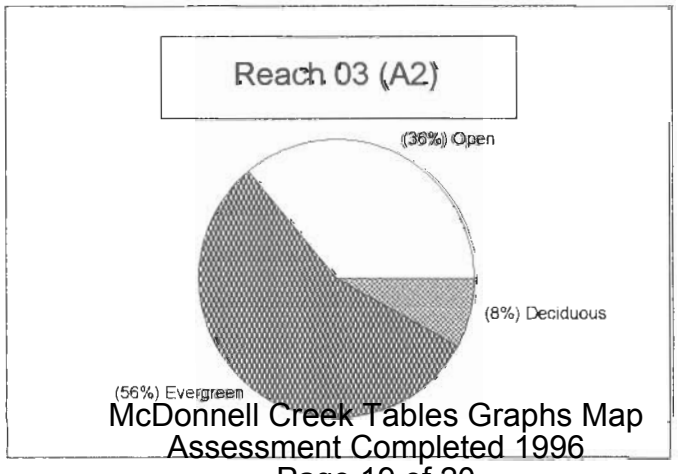
Graph 8

McDonnel Creek

Percent Canopy By Reach



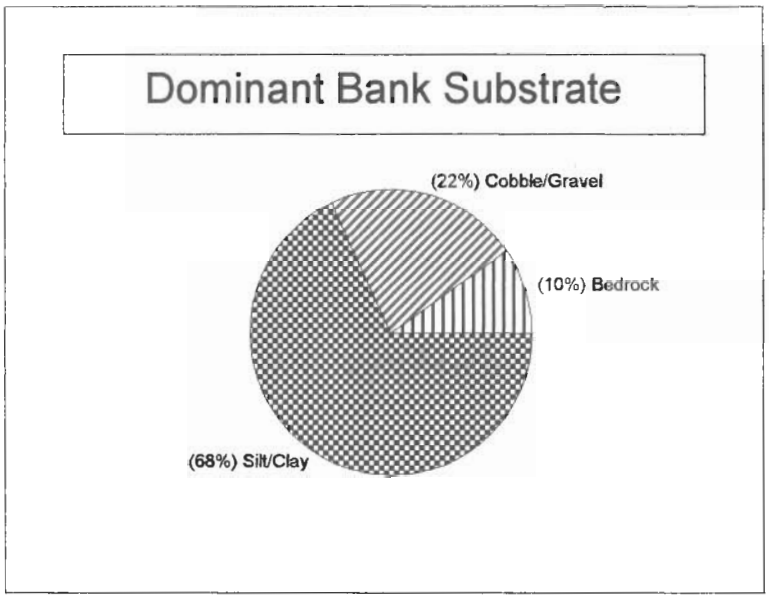


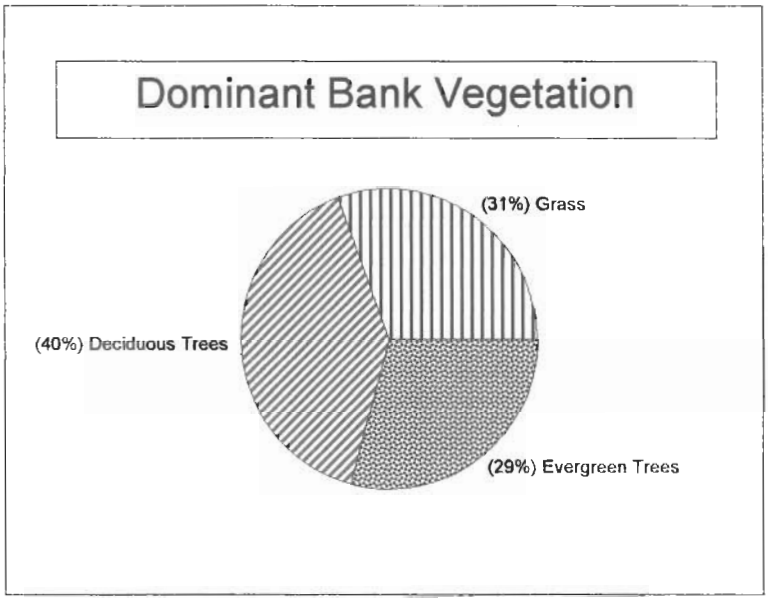


Graph 9

McDonnel Creek

Percent Bank Composition





Graph 10