CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

McNab Creek

Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1997

INTRODUCTION

A stream inventory was conducted during the summer of 1997 on McNab Creek starting at the mouth. 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 McNab 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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

McNab Creek is a tributary to Russian River, located in Mendocino County, California (see McNab Creek map, page 2). The legal description at the confluence with the Russian River is T14N, R12S, Section 36. Its location is 39°01'50" N. latitude and 123°07'53" W. longitude. Year round vehicle access exists from Highway 101 near Hopland via private Ranch Roads.

McNab Creek and its tributaries drain a basin of approximately 13 square miles. McNab Creek is a second order stream and has approximately 7.9 miles of blue line stream, according to the USGS Ellidge Peak 7.5 minute quadrangle. No major tributaries exist. Summer flow was measured as approximately .545 cfs in unit #049 on June 6,1997. Elevations range from about 505 feet at the mouth of the creek to 2,600 feet in the headwaters. Oak Woodland forest dominates the watershed, but there are zones of grassland and conifers in the upper watershed. The watershed is owned primarily by small individual landowners and Fetzer Wine Company and is primarily managed for agriculture production.

There are no sensitive plants listed from the CNPS Inventory or DFG's Natural Diversity Database within McNab watershed.

METHODS

The habitat inventory conducted in McNab Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al, 1997). 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 McNab 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 (1985 rev. 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". McNab 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 McNab 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 McNab 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, 1997. Canopy density relates to the amount of stream shaded from the sun. In McNab 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 McNab 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 McNab 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

HISTORICAL STREAM SURVEYS:

No historical stream surveys exist.

HABITAT INVENTORY RESULTS

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

The habitat inventory of 06/17/97 to 07/09/97 was conducted by Jon Campo, Stephanie Carey, Sarah Nossaman and Marc Miller (AmeriCorps). The survey began at the confluence with the Russian River and extended up McNab Creek to the dam. The total length of the stream surveyed was 23053 feet, with an additional 105 feet of side channel.

A flow of 0.545 cfs was measured in unit #049 on June 6, 1997.

McNab Creek has two channel types: the surveyed section from the mouth to 23053 feet is a F4 type, and above that is 7,920 feet of un-surveyed A4 type.

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

A4 channel types entrenched high gradient (>4%) with a low width/depth ratio and a predominantly gravel substrate.

Water temperatures ranged from 61°F to 75°F. Air temperatures ranged from 66°F to 94°F. Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs at end of report). A recorder in Reach 1 (immediately upstream of Bridge 1) logged temperatures every 2 hours from July 8 - September 18, 1997. The highest temperature recorded was 76 °F in August and the lowest was 61°F in September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 46% pool units, 32% flatwater units, 18% riffle units, and 4% dry streambed units. Based on total **length** there were 45% dry streambed units, 28% pool units, 20% flatwater units, and 7% riffle units (Graph 1).

Two hundred and five habitat units were measured and 11% were completely sampled. Thirteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were root wad scour pools at 22%, runs 21%, low gradient riffles 18% and mid-channel pools 17% (Graph 2). By percent total **length**, dry streambed made up 45%, runs 12%, root wad scour pools 10%, and mid-channel pools 9%.

Ninety four pools were identified (Table 3). Scour pools were most often encountered at 59%, and comprised 46% 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. Seventy five of the 94 pools (80%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 24% 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 40. Flatwater had the lowest rating with 15 and riffle rated 28 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 58, scour pools rated 43, and main channel pools rated 33 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were small woody debris at 27%, root masses 22%, terrestrial vegetation 21%, and large woody debris 16%. Graph 5 describes the pool shelter in McNab Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in all of the five low gradient riffles measured. Small cobble was dominant in 0 of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1997 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 93 pool tail-outs measured, eight had a value of 1 (9%); 47 had a value of 2 (51%); 21 had a value of 3 (23%); and 17 had a value of 4 (18%). On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 71%. The mean percentages of deciduous and evergreen trees were 74% and 26%, 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 67%. For the habitat units measured, the dominant vegetation types for the stream banks were: 45% deciduous trees, 36% brush, 13% evergreen trees, 6% grass and 0% bare soil. The dominant substrate for the stream banks were: 91% silt/clay/sand, 6% boulder, 3% bedrock and 0% cobble/gravel (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

No historical surveys of McNab Creek exist.

On 10/29/97 a biological inventory was conducted in three sites of McNab 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 ranged from 64°-66°F and the water temperature from 51°F.-53°F. The observers were Todd Parlato, and Marc Miller (AmeriCorps*).

The inventory of Reach 1 started 805' downstream from Bridge #3 and ended approximately 986'

feet upstream. In riffle and pool habitat types five 0+ steelhead were observed along with fifty Sacramento Squawfish, three sculpin, nine Sacramento Sucker, and one unidentified frog.

The inventory of Reach 1 was continued starting at 396' feet downstream of dam #1 and continued for approximately 875 feet. In riffle and pool habitat types three 0+ steelhead were observed along with forty-five Sacramento Squawfish, and sixty Sacramento Suckers.

The inventory of Reach 1 was continued starting 20' below dam #2 and ending approximately 20 feet upstream at dam #2. In riffle and pool habitat types no steelhead and eighteen Sacramento Squawfish were observed.

The inventory was continued upstream of at Dam #2 and ended approximately 536 feet upstream. In riffle and pool habitat types three 0+ steelhead were observed along with sixty-seven Sacramento Squawfish, and one Sacramento Sucker.

Many pools, especially those located behind dams were too deep to sample. Based on habitat observed these pools could hold 1+ and resident trout through the summer if temperatures permit. However, these pools also harbor large predatory Squawfish. Numerous were observed.

Notably, juvenile steelhead were found above the two dams, indicating that they are not complete migration barriers to adult fish, at least at high flows. Dam #2 was modified recently (summer 1996) by the landowner to permit upstream adult migration. It is believed that for some time, (since downcutting had occurred at the sill) this dam was a complete migration barrier. Dam #3 while not surveyed, is not believed to be a migration barrier. Landowners indicate that resident trout inhabit this reservoir. However, landowners indicate that the stream is dry most years above Dam #2. A rock falls in an A channel type, which is a complete barrier to migration, exists approximately 1/4 mile above Dam #3.
A summary of historical and recent data collected appears in the table below.

Table 1. Species Observed in Historical and Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1997	Steelhead	DFG	N
1997	Sacramento Sucker	DFG	N
1997	Sacramento Squawfish	DFG	N

Historical hatchery records reflect steelhead fingerlings were transferred within McNab Creek in 1958 and 1959 during (Table 2) fish rescue operations. Historical records reflect steelhead fingerlings were transferred from McNab Creek to various sources from 1955-1965 during (Table 3) fish rescue operations.

Table 2. Summary of fish hatchery-stocking/transfers/rescues

YEAR	SPECIES	SOURCE	#	SIZE
1958	SH	Crawford Crk	1,625	FING
1959	SH	McNab Crk	2,400	FING

Table 3. Plants/Transfers from McNab Creeks

YEAR	SPECIES	LOCATION	#	SIZE
1955	SH	Russian River	4108	FING
1956	SH	Russian River	4272	FING
1958	SH	Ackerman Creek	1840	FING
1958	SH	Canyon Creek	1600	FING
1958	SH	Robinson Creek	6668	FING
1959	SH	Robinson Creek	1920	FING
1959	SH	Russian River	8550	FING
1960	SH	Russian River	9443	FING
1961	SH	Russian River	9280	FING
1962	SH	Russian River	12188	FING
1963	SH	Russian River	3320	FING
1964	SH	Russian River	840	FING
1965	SH	Russian River	768	FING

ADULT SURVEYS:

A spawning survey was conducted in McNab Creek on 3/10/1998, beginning at habitat unit #113 and extending 1000' above habitat unit #200. No Chinook, coho, or steelhead were observed. Three redds and two possible redds were observed.

DISCUSSION

McNab Creek has two channel types: an F4 (23053 ft.), and an un-surveyed A4 section (7,920 ft.).

There are 23,053 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, 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. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks. A4 channel types are not suitable for habitat improvement structures, and are generally not fish bearing channels. This A4 reach goes dry in the summer.

The water temperatures recorded on the survey days 06/17/97 to 07/09/97 ranged from 61°F to 75°F. Air temperatures ranged from 66°F to 94°F. The warmer water temperatures were recorded in Reach 1. These temperatures, if sustained, are above the threshold stress level (65°F) for salmonids.

Summer temperatures measured using remote temperature recorders placed in pools ranged from 61° to 76°F for Reach 1. The Temperature Summary graph shows that for much of the summer (July through August) the lower watershed exhibited temperatures above the optimal (<65) for salmonids. Through September the extreme temperatures were also above optimal.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the cooler 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.

Pools comprised 28% of the total **length** of this survey. 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. In McNab Creek, the pools are relatively deep with 80% having a maximum depth of at least 2 feet. These pools comprised 24% of the total length of stream habitat. However, data collected on pool depths is skewed high due to existing flashboard dams which artificially impound water for much of the stream length. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 40. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by small woody debris (27%), root masses (22%), terr. vegetation (21%), and large woody debris

(16%). Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

All of the five low gradient riffles measured (100%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Forty-one of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 9% 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.

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 McNab Creek sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the entire survey was 71 %. This is fair, since 80 percent is generally considered desirable. However, the riparian buffer is thin or nearly absent in areas with agriculture. Elevated water temperatures could be reduced by increasing stream canopy. Cooler water temperatures are desirable in McNab Creek. Riparian removal, or increased vineyard development within the riparian corridor could all lead to less stream canopy, channel incision causing bank erosion and higher water temperatures. Large trees required to contribute shade also provide a long term source of large woody debris needed for instream structure and bank stability.

GENERAL RECOMMENDATIONS

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

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

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) Numerous roads with inadequate erosion protection were observed in the headwaters of McNab 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.(Road Survey Proposed)

2) Sources of upslope and in-channel erosion should be treated to reduce the amount of fine

sediments entering the stream, utilizing biotechnical erosion control. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.

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

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

RESTORATION IMPLEMENTED

1) Recent storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought years. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Some signs of recent and historic tree and log removal were evident in the active channel during our survey. Efforts to increase flood protection or improve fish access in the short run, may have led to long term problems in the system. Landowners are encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

2) Access for migrating salmonids is an ongoing potential problem in Reach 1, therefore, fish passage should be monitored, and improved where possible. The road culvert at the Pacific rail crossing is extremely long (77'), and may be a barrier at high flows. This culvert should be monitored. Additionally, a deer fence inhibits adult migration at unit 108, until high flows remove the barrier. A floating fence should be installed here.

3) Spawning gravels on McNab Creek are limited to relatively few areas. Structures to decrease channel incision and recruit spawning gravel (using gravel retention structures), should be installed to trap, sort and expand redd distribution in the stream; particularly on McNab Creek below summer dams.

PROBLEM SITES AND LANDMARKS - MCNAB CREEK SURVEY COMMENTS

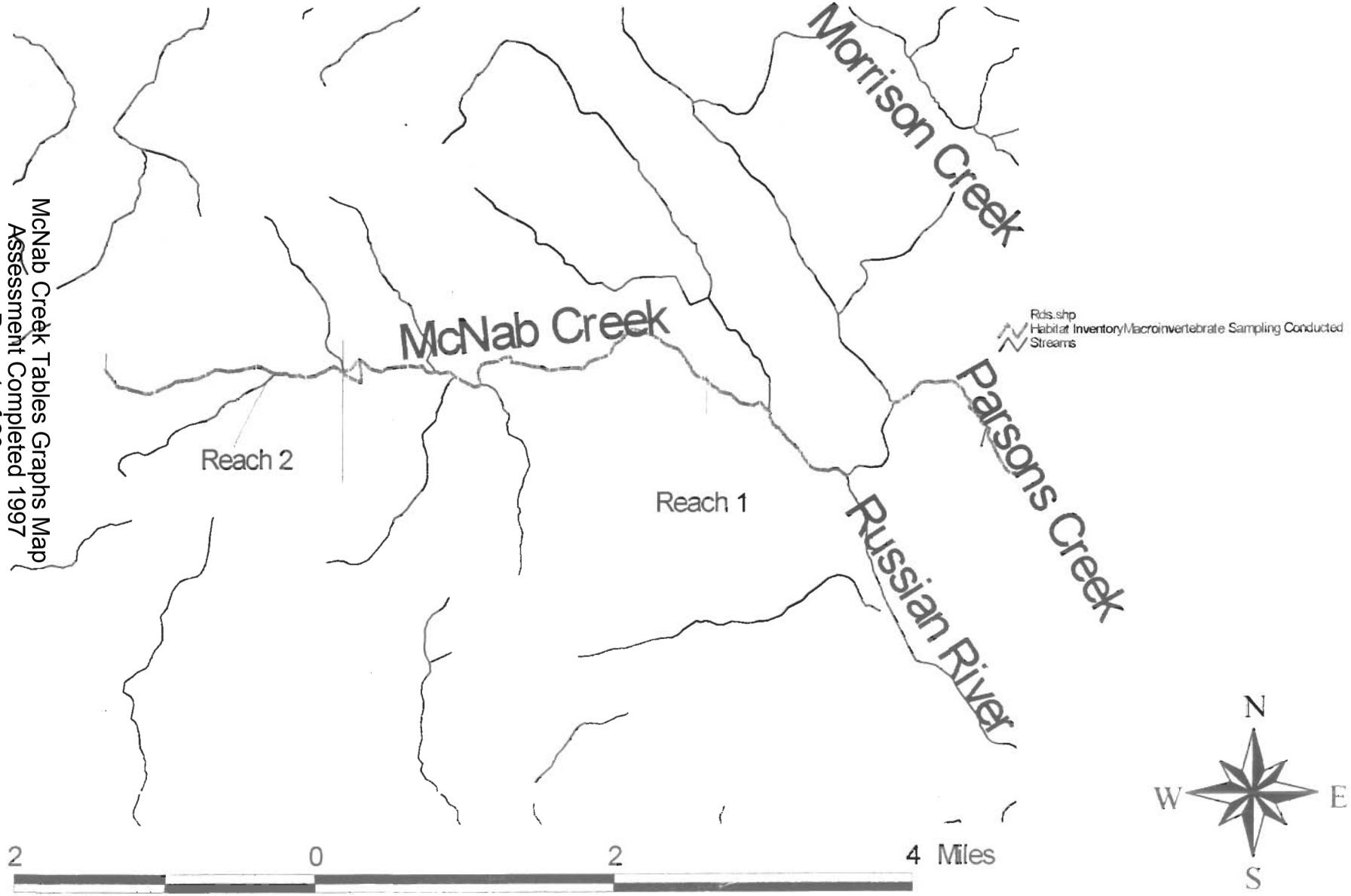
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

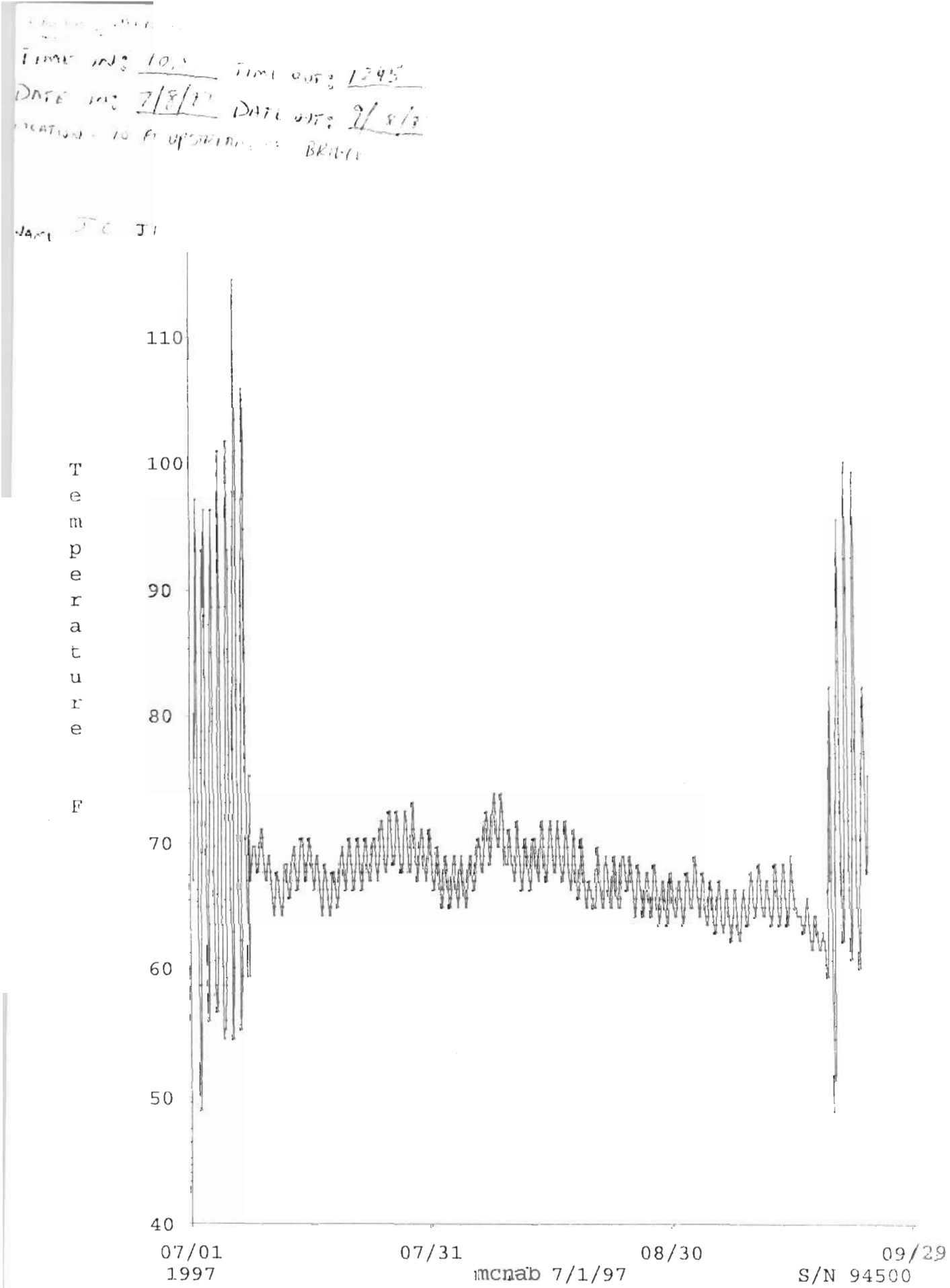
HABITAT UNIT #	DISTANCE UPSTREAM	COMMENTS
1	246	MEETS R.R AT SIDE CHANNEL; TEMP IN R.R 62 6 LG. TREES FALLEN OVER IN CHANNEL. Temp 75 degrees in McNab
7	425	100'S OF BULLFROG POLLIWOGS
9	556	GOOD POOL TO ADD SHELTER. 100'S OF BULLFROG TADPOLES CULVERT UNDER RAILROAD XING RIPRAP BOTH SIDES
11	734	EUTROPHICATION . RD LB
12	801	OLD CRIBBING LOGS. OLD XING
18	1148	DRY TRIB ON RB
23	1363	CHANNEL TYPED NO ALGAE
24	1462	2 ROOT WAD POOLS W/2' RIFFLE IN BETWEEN
28	1683	R.S. NEWT
35	2289	MANY SQUAWS OBSERVED (ADU. & JUV.) DRY TRIB LB
37	2373	R.S NEWT
42	2682	DRY TRIB W/ RATTLESNAKE ON LB
49	3044	FLOW WAS RECORDED IN THIS UNIT 5' DOWNSTREAM OF **BRIDGE #1**
55	3373	2 CONCRETE BOXES ON RB. CAUSING SCOUR 5X4X3
56	3417	DRY TRIB RB . 1.5' OF GRAVEL BELOW TRIB-STREAM DEGRADING
57	3532	FENCE ALONG CR. LB DRY TRIB RB
62	3833	SCULPIN
65	3955	**BRIDGE #2**
66	4048	MANY ADULT SQUAWS
69	4163	TRIB #1 LB. DRY STRETCHES W/SMALL POOLS
70	4313	1ST POOL IN TRIB 64 degrees CONFLUENCE W/ MCNAB 64 degrees
71	4343	DRY SIDE CHANNEL LB
73	4387	1ST DRY UNIT OF MCNAB WATER LEVEL DROPPED 8" SINCE 6/23/97
79.10	4609	NON WOODY VEG. GRAVEL BAR SEPARATES SECONDARY POOL
87	4887	DRY TRIB ON LB
90	5064	FENCE ON RB NOT MAINTAINED

93 5229 MANY SQUAWS ADU & JUV EST 300. 10' METAL FENCE DEBRIS IN POOL
94 5365 4 PIECES OF BROKEN CULVERT
96 5508 65 % OF BOTH BANKS RIP RAPPED LOTS OF METAL DEBRIS DRY TRIB LB **BRIDGE #3**
97 5624 TIRE, 3 PIECES OF CONCRETE CULVERT
98 5667 RIP RAP RB, DRY TRIB#2 RB . ATTEMPTED BOULDER DAM @ END OF RUN
99 5705 OLD PUMP SYSTEM RB. HORSESHOE PRINTS RB
108 6037 15' FETZER PROPERTY/DEER FENCE IN CR. AND UP BOTH BANKS.
113 6327 ADU. AND JUV SQUAWS
115 6387 OLD CONCRETE FORM ON LB
116 6423 MORE CONCRETE THROUGH THALWAG
117 6454 GOOD HABITAT FROM 8' DEBRIS JAM
118 6519 23' MORE OF SAME DEBRIS JAM
119 6560 LG. ROOTWAD SLIPPED INTO CR. FROM LB ACTIVE EROSION FROM RD. DIRECTLY ON LB VINEYARDS 15' FROM BANK.
125 6824 6" crayfish
129 7109 HOUSE ON RB W/ HEAVY MACHINERY. 3 MIDCHANNEL POOLS LUMPED TOGETHER 146 7817 CHAIN LINK FENCE RB. FENCE W/ 15 YR. OLD BANK STABILIZATION JUNK THROWN BEHIND IT. 1 DEAD CRAYFISH
147 7860 RB RUSTING CARS AND TIRES BEHIND FENCE
149 7953 LG. SQUAWFISH **DAM #1**
150 8493 MANY LG. SQUAW; 6" DIVERSION PIPE SCREENED. 3X3X25 OLD BROKEN DAM- 6' OPENING; **BRIDGE #4** AT 300'
151 8913 DRY TRIB R/B @ 420' INTO UNIT
185 10576 DAM W/FLASHBOARDS ON NELSON PROP.**Dam #2** 186 11406 10" DIV. PIPE LB W/SCREEN. UNIT LENGTH IS A RAMIFICATION OF DAM
191 11810 NUMEROUS AREAS OF VINEYARD DEBRIS DUMPED OVER BANKS
193 12003 LG. BANK Failure 100L X 25H X 15D
197 12586 ERODING DRY TRIB RB (FLOWS FROM VINEYARD)
202 23053 OLD XING LB NEW FLAT CAR BRIDGE (NELSON PROP) UNDER CONST.

survey stopped at dry streambed. from here to dam #3 the channel is a well canopied jungle of vines, which goes dry in most years. Landowners indicate dam #3 is passable but that a rock falls exist 1/4 mile above.

McNab Creek Habitat Inventory




110
100
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Temperature F
07/01
1997
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S/N 94500

MCNAB CREEK

Drainage: Russian River

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

Survey Dates: 06/17/97 to 07/09/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE:39°01'50"LONGITUDE123°07'53"

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
36	3	RIFFLE	17	43	1559	5	5.9	0.2	355	12781	95	3419	0	28
66	3	FLATWATER	32	70	4596	14	11.5	0.5	533	35188	213	14035	0	15
94	17	POOL	46	69	6533	20	12.4	1.5	1077	101276	1586	149106	959	40
10	0	DRY	5	1971	19711	61	14.5	0.0	160	1595	0	0	0	0

TAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
206	23	32398	150840	166560

MCNAB CREEK

Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 06/17/97 to 07/09/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE:39°01'50"LONGITUDE123°07'53"

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 %
36	3	LGR	17	43	1559	5	6	0.2	1.0	355	12781	95	3419	0	28	63
3	0	POW	1	53	158	0	10	0.7	0.9	468	1404	328	983	0	0	93
19	1	GLD	9	76	1452	4	7	0.5	1.0	297	5651	138	2626	0	0	67
43	2	RUN	21	67	2871	9	14	0.5	1.1	598	25711	193	8309	0	15	75
1	0	SRN	0	115	115	0	12	0.4	1.0	811	811	324	324	0	0	95
34	7	MCP	17	61	2084	6	13	1.6	5.5	764	25962	1181	40163	872	33	68
2	2	CRP	1	66	132	0	15	2.4	5.5	918	1835	2311	4622	1910	35	80
7	1	LSL	3	59	416	1	17	1.9	6.4	1142	7991	3041	21287	2679	60	71
45	4	LSR	22	53	2405	7	11	1.3	5.0	609	27398	879	39545	751	41	75
1	1	LSBk	0	42	42	0	12	1.0	2.3	504	504	504	504	151	10	95
2	1	SCP	1	37	74	0	6	1.0	2.0	235	471	229	457	97	5	95
3	1	DPL	1	460	1380	4	20	1.8	6.5	12267	36802	20269	60806	31	85	30
10	0	DRY	5	1971	19711	61	15	0.0	0.0	160	1595	0	0	0	0	69

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
206	23	32398	148914	183044

MCNAB CREEK

Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 06/17/97 to 07/09/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE:39°01'50"LONGITUDE123°07'53"

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
34	7	MAIN	36	61	2084	32	13.3	1.6	764	25962	1181	40163	872	33
55	8	SCOUR	59	54	2995	46	11.7	1.4	686	37728	1199	65958	1043	43
5	2	BACKWATER	5	291	1454	22	14.4	1.4	7455	37273	10249	51243	64	58

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
94	17	6533	100963	157363

MCNAB CREEK Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 06/17/97 to 07/09/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE:39°01'50"LONGITUDE123°07'53"

UNITS MAX DPTH 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
33	MCP	35	0	0	7	21	14	42	6	18	6	18
2	CRP	2	0	0	0	0	1	50	0	0	1	50
7	LSL	7	0	0	0	0	4	57	1	14	2	29
45	LSR	48	1	2	8	18	26	58	8	18	2	4
1	LSBk	1	0	0	0	0	1	100	0	0	0	0
2	SCP	2	0	0	1	50	1	50	0	0	0	0
3	DPL	3	0	0	1	33	0	0	1	33	1	33

TOTAL UNITS
93

MCNAB CREEK

Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 06/17/97 to 07/09/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE:39°01'50"LONGITUDE123°07'53"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
36	3	LGR	0	24	43	3	30	0	0	0	0
3	0	POW	0	0	0	0	0	0	0	0	0
19	0	GLD	0	0	0	0	0	0	0	0	0
43	2	RUN	0	16	19	0	65	0	0	0	0
1	0	SRN	0	0	0	0	0	0	0	0	0
34	27	MCP	11	27	17	24	18	0	0	3	0
2	2	CRP	50	4	0	22	6	0	0	17	0
7	7	LSL	7	27	40	13	8	2	0	0	4
45	42	LSR	14	15	12	46	11	0	0	2	0
1	1	LSBk	0	25	0	75	0	0	0	0	0
2	1	SCP	0	100	0	0	0	0	0	0	0
3	2	DPL	10	40	11	0	40	0	0	0	0
10	0	DRY	0	0	0	0	0	0	0	0	0
206	87	ALL HABITAT TYPES	11	27	17	22	22	0	0	2	0
94	82	POOLS ONLY	12	27	16	22	21	0	0	2	0

MCNAB CREEK

Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 06/17/97 to 07/09/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE:39°01'50"LONGITUDE123°07'53"

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
36	5	LGR	0	0	100	0	0	0	0
	1	POW	0	100	0	0	0	0	0
	2	GLD	0	50	50	0	0	0	0
	4	RUN	0	50	50	0	0	0	0
	1	SRN	0	0	0	100	0	0	0
	8	MCP	50	38	13	0	0	0	0
	2	CRP	100	0	0	0	0	0	0
	1	LSL	0	100	0	0	0	0	0
	5	LSR	20	40	40	0	0	0	0
	1	LSBk	100	0	0	0	0	0	0
	1	SCP	100	0	0	0	0	0	0
	1	DPL	0	100	0	0	0	0	0
	1	DRY	0	0	100	0	0	0	0

MCNAB CREEK

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

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
70.80	26.32	73.68	72.50	67.13

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	1	1	3.13
Boulder	1	3	6.25
Cobble/Gravel	0	0	0
Silt/clay	30	28	90.63

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	1	3	6.25
Brush	12	11	35.94
Deciduous Trees	16	13	45.31
Evergreen Trees	3	5	12.50
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: MCNAB CREEK
SAMPLE DATES: 06/17/97 to 07/09/97
SURVEY LENGTH:
MAIN CHANNEL: 32293 ft. SIDE CHANNEL: 105 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 (Units 1-202)

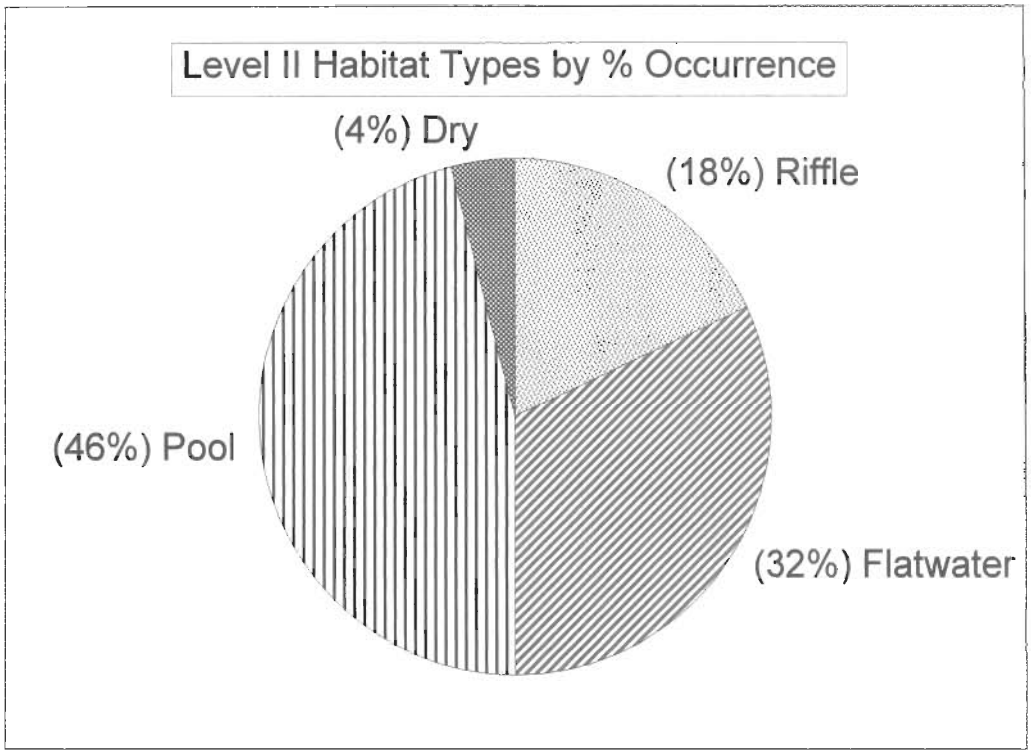
Channel Type: F4	Mean Canopy Density: 71%
Main Channel Length: 24373 ft.	Evergreen Component: 26%
Side Channel Length: 105 ft.	Deciduous Component: 74%
Riffle/Flatwater Mean Width: 9.3 ft.	Pools by Stream Length: 26%
Pool Mean Depth: 1.5 ft.	Pools >=2 ft. Deep: 80%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 30%
Water: 61-75°F Air: 66-94°F	Mean Pool Shelter Rtn: 40
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Root masses
Bank Vegetative Cover: 70%	Occurrence of LOD: 33%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 11791 ft.
Embeddness Value: 1. 9% 2. 51% 3. 23% 4. 18%	

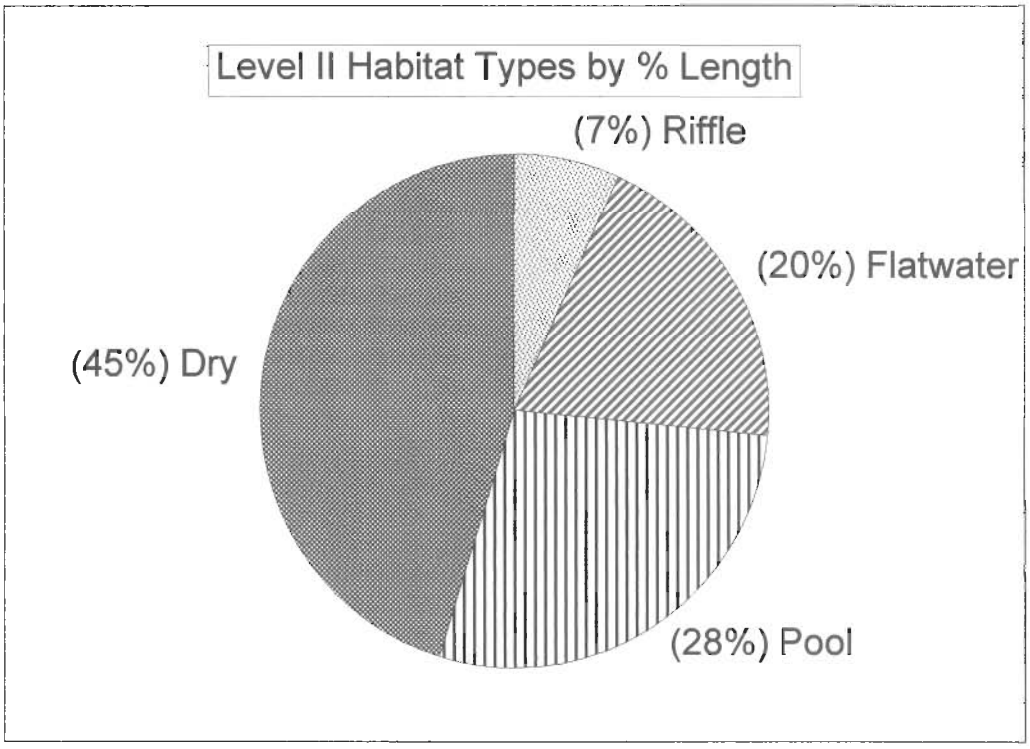
STREAM REACH 2 (Units 203-203)

Channel Type: A4	Mean Canopy Density: 0%
Main Channel Length: 7920 ft.	Evergreen Component: 0%
Side Channel Length: 0 ft.	Deciduous Component: 0%
Riffle/Flatwater Mean Width: 0.0 ft.	Pools by Stream Length: 0%
Pool Mean Depth: 0.0 ft.	Pools >=2 ft. Deep: **********%
Base Flow: 0.5 cfs	Pools >=3 ft. Deep: **********%
Water: 63-63°F Air: 83-83°F	Mean Pool Shelter Rtn: 0
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 0%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 7920 ft.
Embeddness Value: 1. 2. 3. 4.	

McNab Creek

Level II Habitat Types

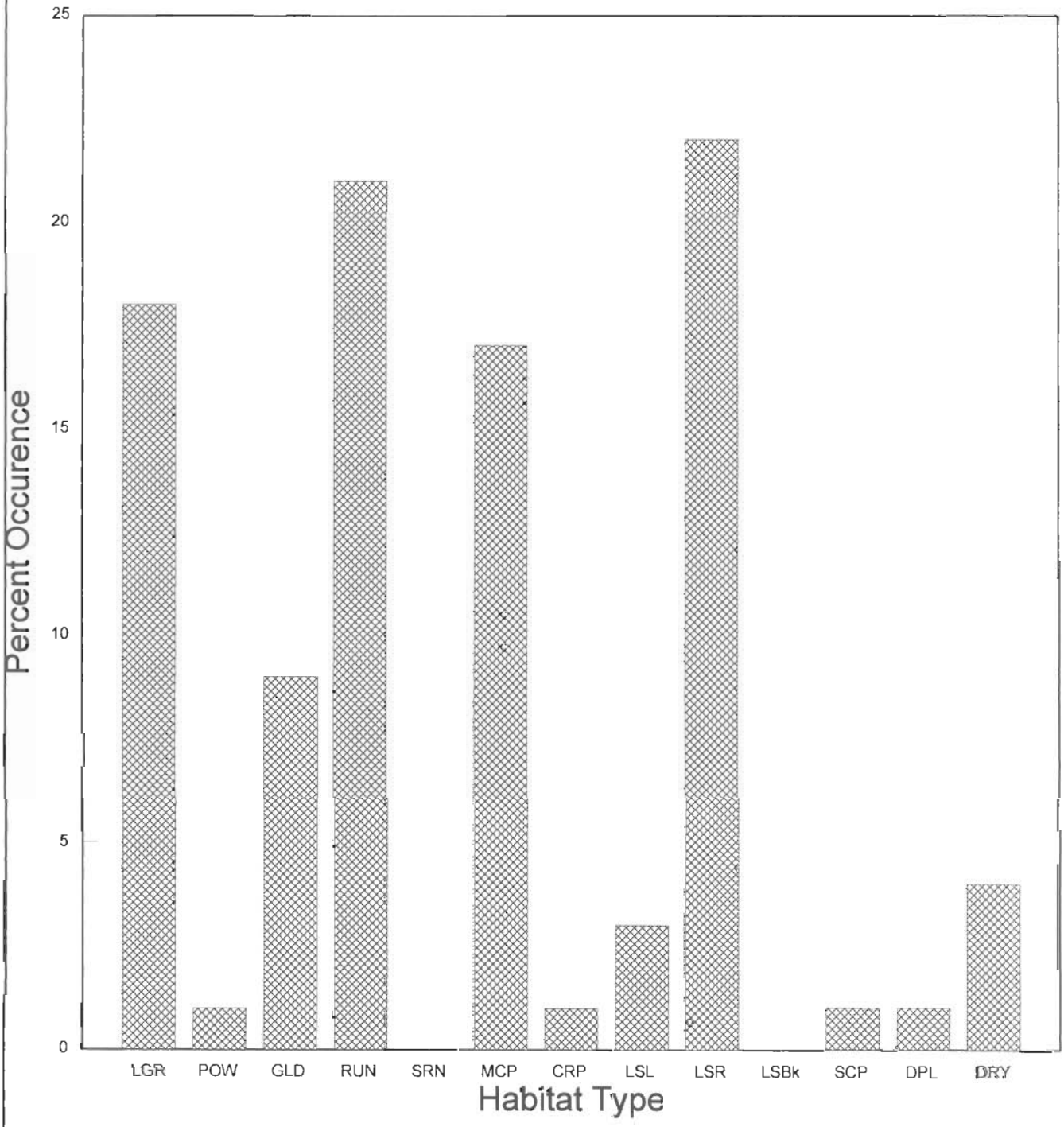




Graph 1

McNab Creek

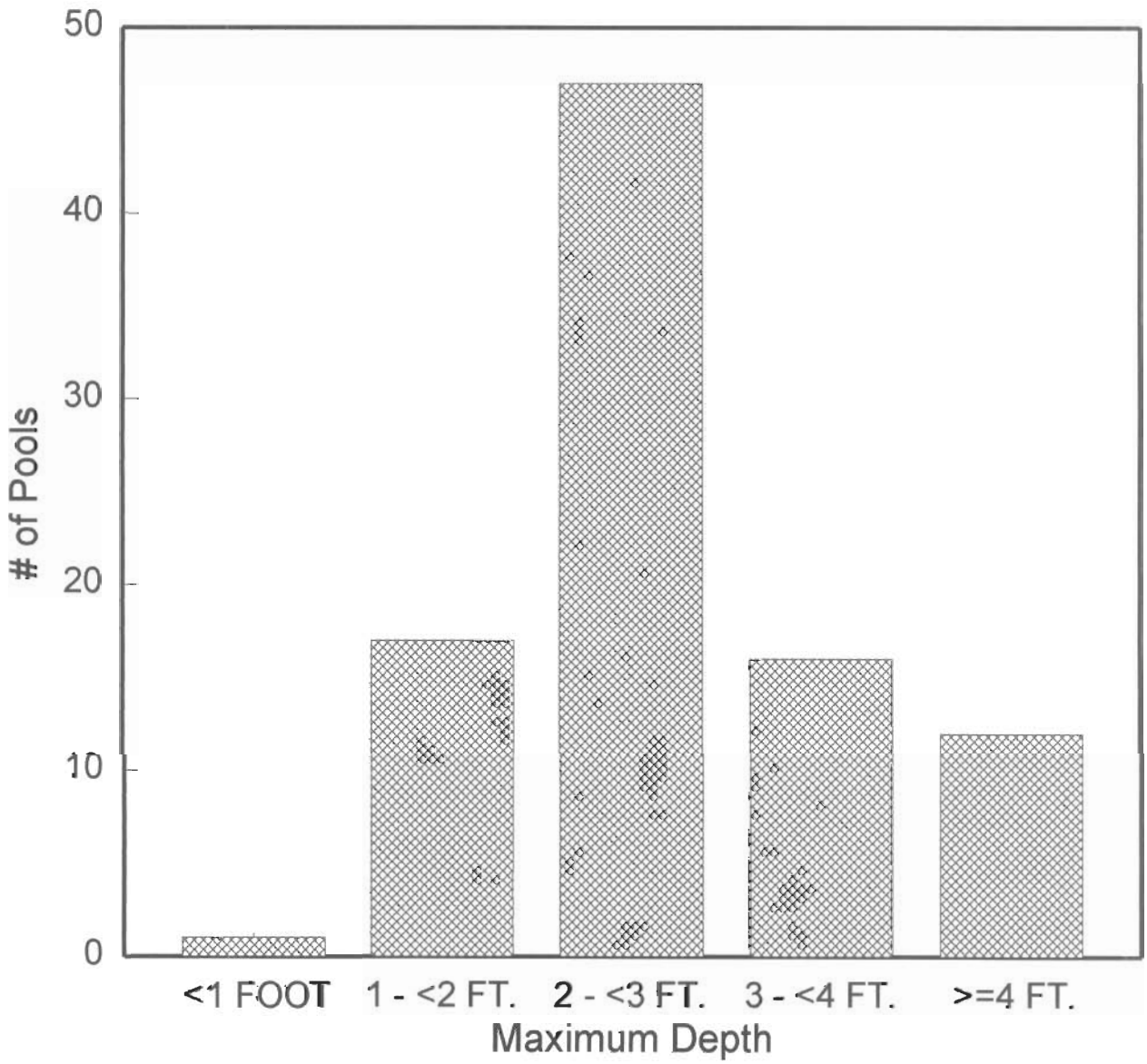
Level IV Habitat Types by % Occurrence



Graph 2

McNab Creek

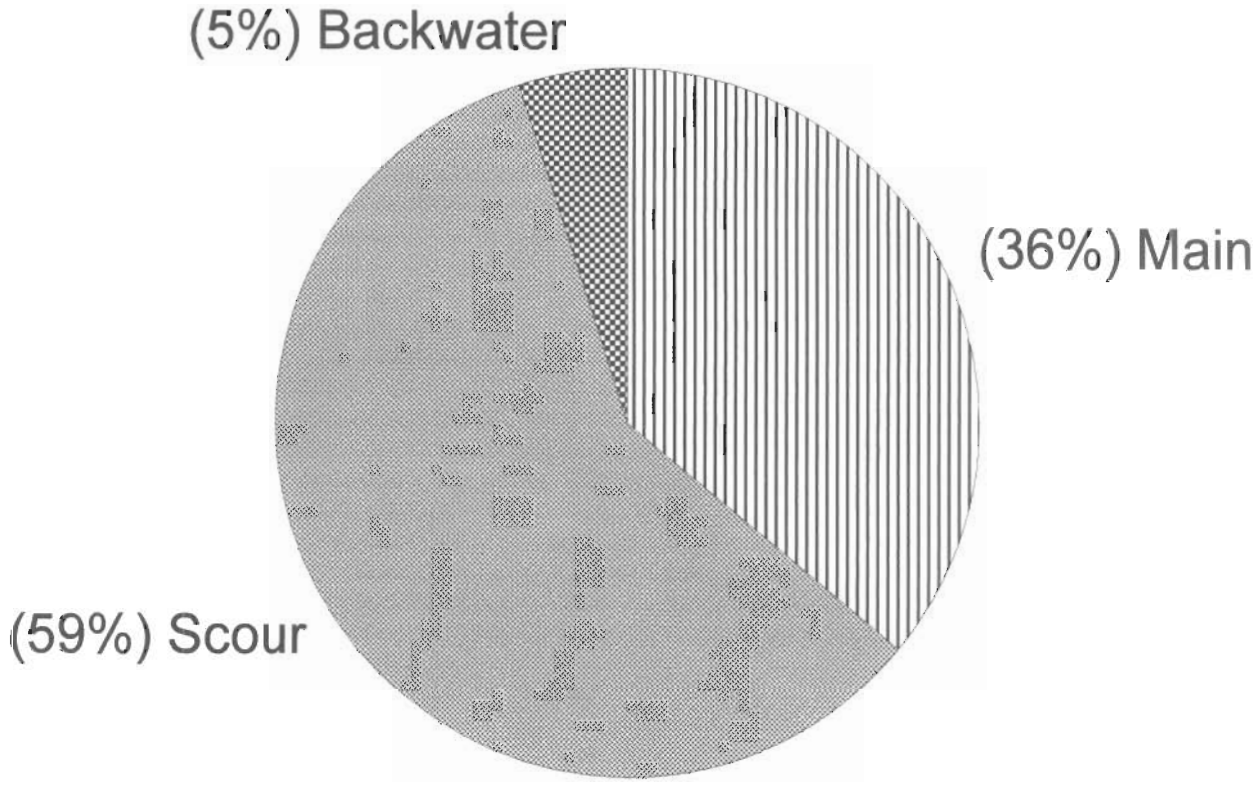
Maximum Depth in Pools



Graph 4

McNab Creek

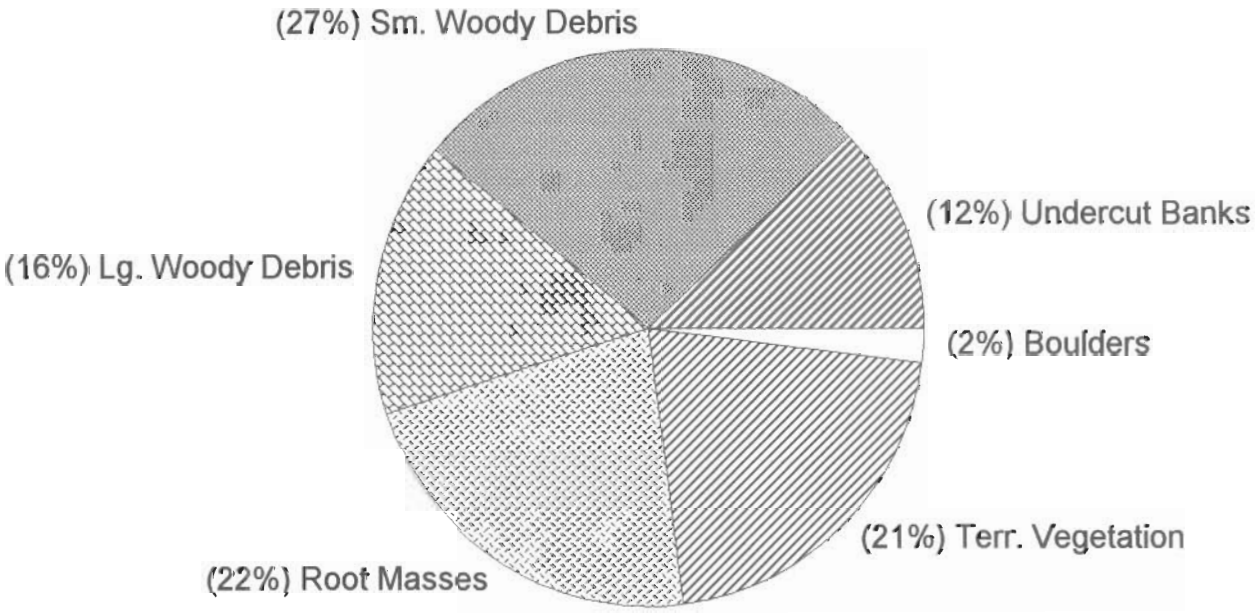
Pool Habitat Types by % Occurrence



Graph 3

McNab Creek

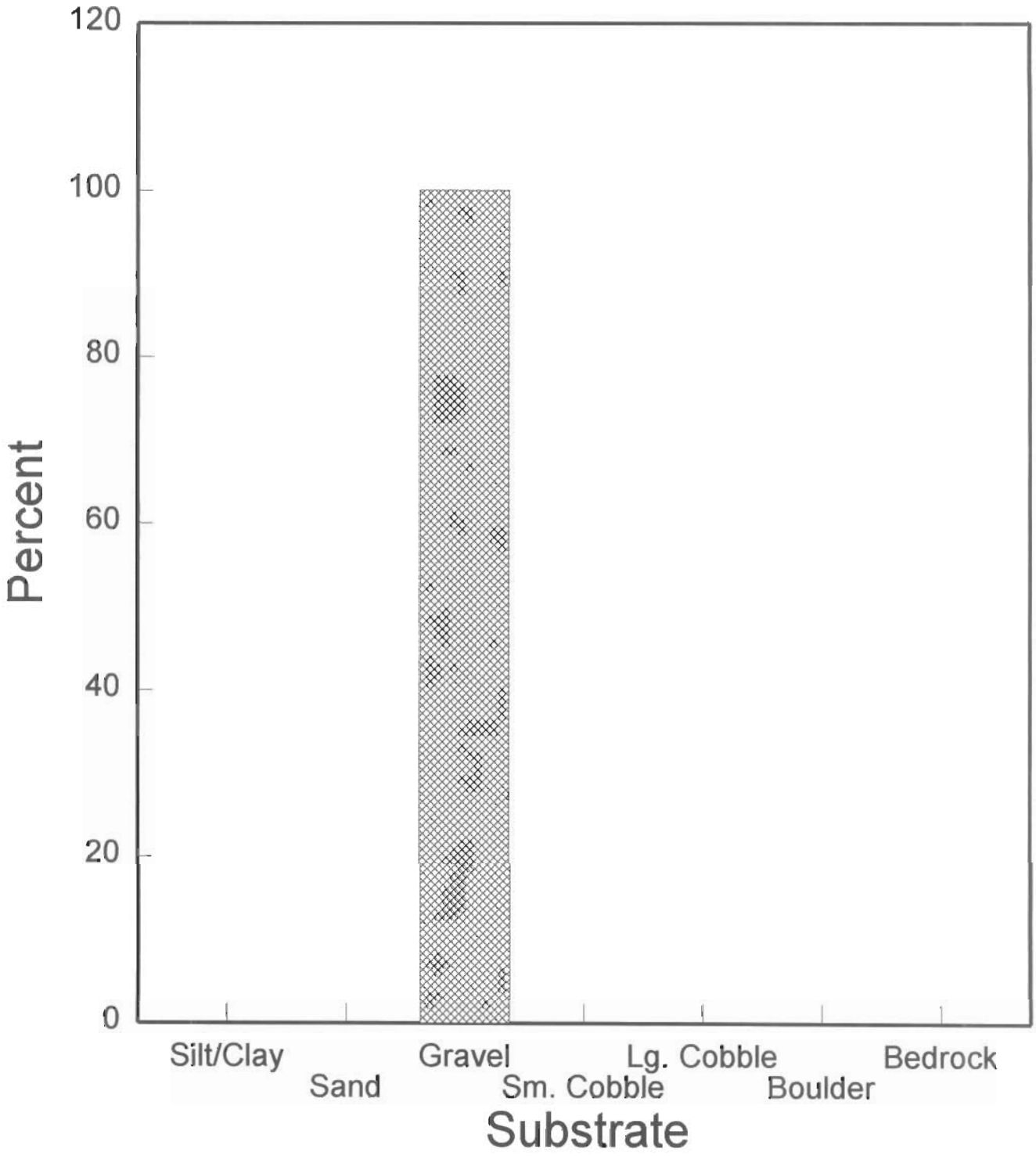
Pool Shelter Types by % Area



Graph 5

McNab Creek

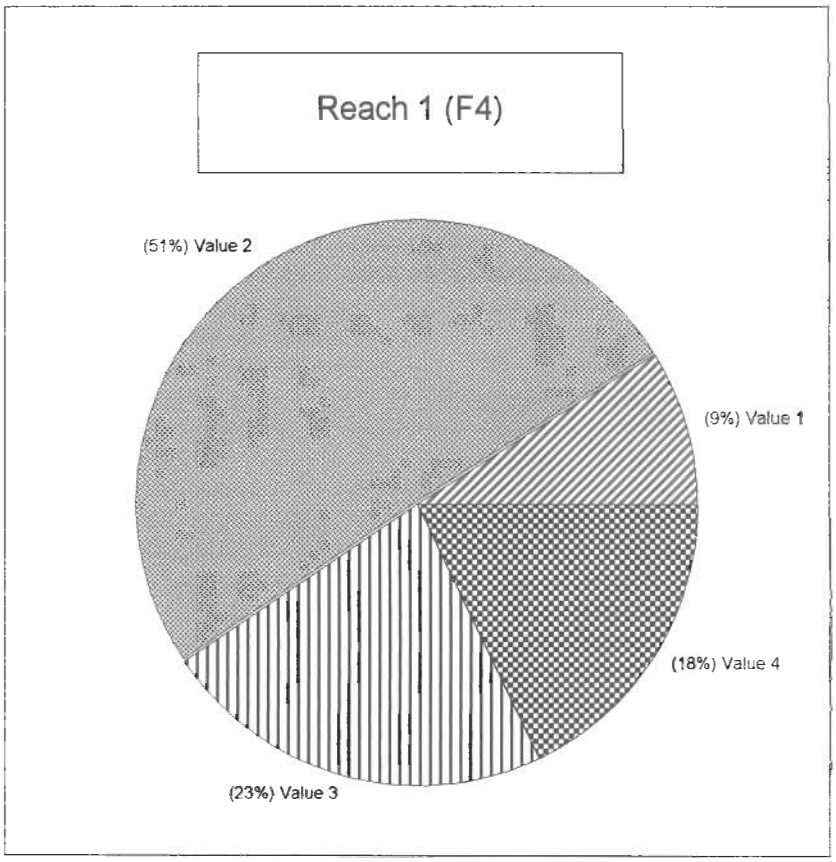
Substrate Composition in Low Gradient Riffles



Graph 6

MCNAB CREEK

Percent Cobble Embeddedness by Reach

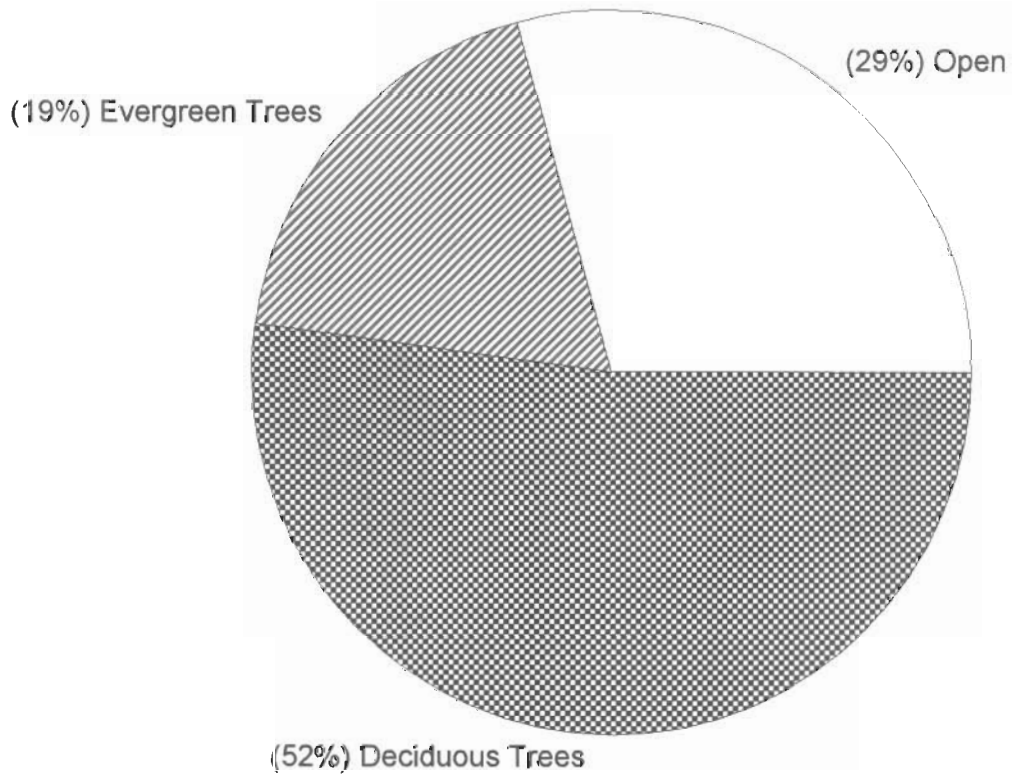


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

McNab Creek

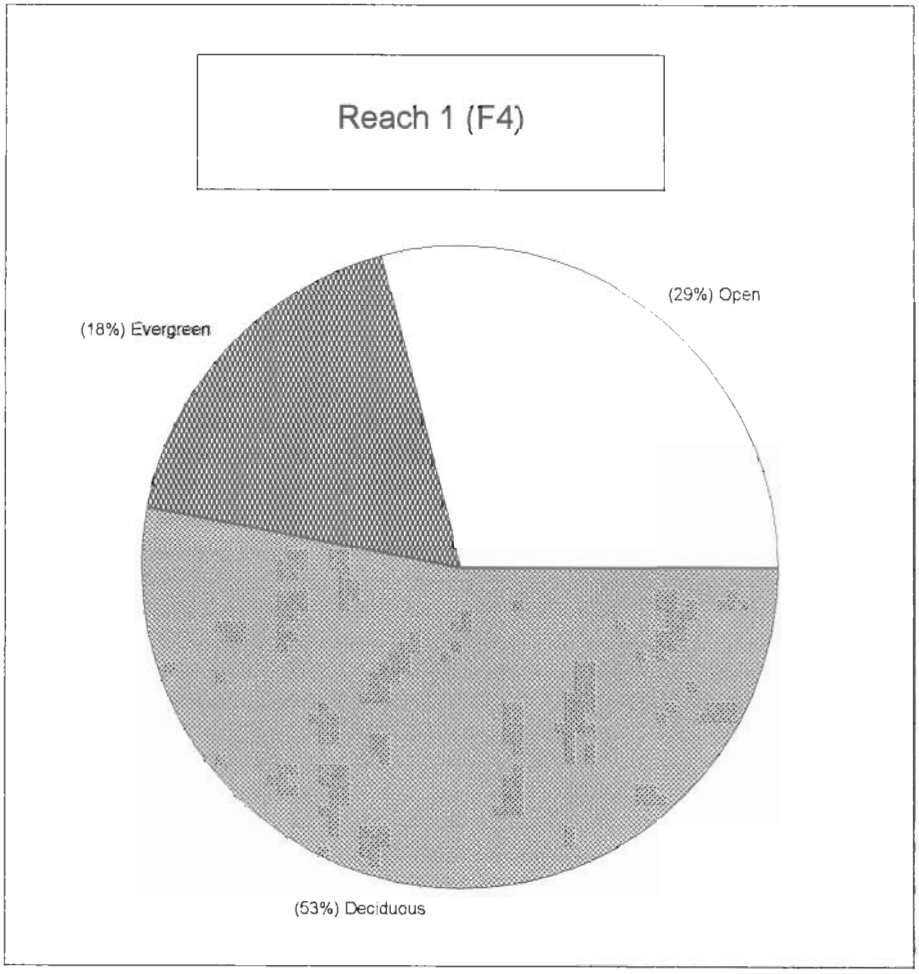
Mean Percent Canopy



Graph 8

MCNAB CREEK

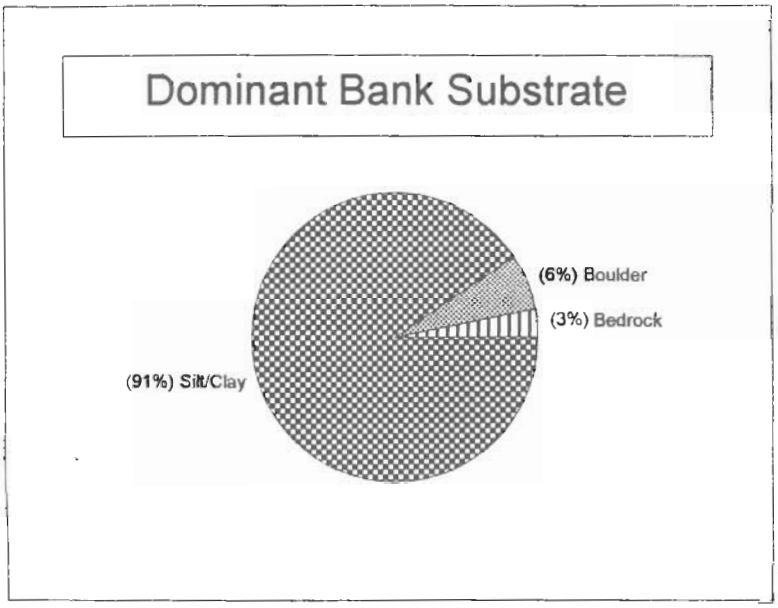
Percent Canopy By Reach

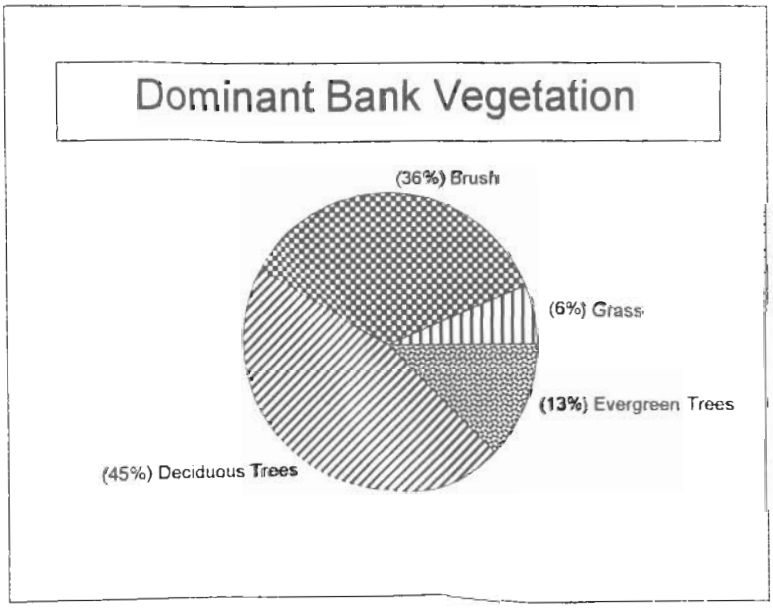


Graph 9

McNab Creek

Percent Bank Composition





Graph 10