STREAM INVENTORY REPORT

Johnson Creek

INTRODUCTION

A stream inventory was conducted beginning July 30 and ending August 19, 2002 on Johnson Creek. The survey began at the confluence with South Fork Big River and extended upstream 1.27 miles.

The Johnson Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Johnson Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for 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

Johnson Creek is a tributary to the South Fork Big River, tributary to Big River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Johnson Creek's legal description at the confluence with South Fork Big River is T16N R14W S20. Its location is 39°23′58″ North latitude and 123°44′16″ West longitude. Johnson Creek is a first order stream and has approximately 2.0 miles of solid blue line stream according to the USGS Bailey Ridge 7.5 minute quadrangle. Johnson Creek drains a watershed of approximately 1.8 square miles. Elevations range from about 560 feet at the mouth of the creek to 1,360 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is used for timber management and residential. Vehicle access exists via Comptche Ukiah Road at the confluence with South Fork Big River near the town of Comptche.

A reconnaissance survey was conducted on Johnson Creek by California Department of Fish and Game (CDFG) in 1959 (California Department of Fish and Game 1958). Steelhead were observed during the 1958 survey.

Electrofishing sampling was conducted on Johnson Creek by CDFG on September 26, 2002; steelhead were found (CDFG file data).

METHODS

The habitat inventory conducted in Johnson Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Game scientific aides (DFG) and Watershed Stewards

Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

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

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Johnson 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 a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

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

3. Temperatures:

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

Johnson Creek

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". Johnson 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 measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Johnson 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) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, bedrock, or other considerations.

6. Shelter Rating:

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

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Johnson Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-

sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

9. Bank Composition and Vegetation:

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

BIOLOGICAL INVENTORY

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

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

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

Graphics are produced from the tables using Excel. Graphics developed for Johnson Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles

- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 30 through August 19, 2002, was conducted by K. Grossman, B. Woods (Americorp), and S. Monday and K. Knecthle (DFG). The total length of the stream surveyed was 4,946 feet. A 1,760 foot section of Johnson Creek was not surveyed due to lack of landowner access.

Stream flow was not measured on Johnson Creek.

Johnson Creek is an F4 channel type for the entire 4,946 feet of the stream surveyed. F4 channels are entrenched meandering riffle/pool channels on low gradients with high width/depth ratio, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 63 degrees Fahrenheit. Air temperatures ranged from 57 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% pool units, 35% flatwater units, 12% riffle units, and 9% dry units (Graph 1). Based on total length of Level II habitat types there were 65% flatwater units, 20% pool units, 8% riffle units, and 7% dry units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 32%; step run units, 23%; low gradient riffle units, 12%; and run units, 10% (Graph 3). Based on percent total length, step run units made up 43%; mid-channel pool units 11%; and low gradient riffle units 6%.

A total of 49 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 73%, and comprised 75% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Seventeen of the 49 pools (35%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 49 pool tail-outs measured, 18 had a value of 1 (37%); 16 had a value of 2 (33%); 1 had a value of 3 (2%); 1 had a value of 4 (2%); and 13 had a value of 5 (27%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log

sills, boulders, or other considerations.

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 habitats had a mean shelter rating of 51, flatwater habitat types had a mean shelter rating of 13, and riffle habitat types had a mean shelter rating of 3 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 56. Scour pools had a mean shelter rating of 40 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Johnson Creek. Graph 7 describes the pool cover in Johnson Creek. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Small cobble was the dominant substrate observed in 35% of the pool tail-outs. Gravel was the next most frequently observed substrate type and occurred in 29% of pool tail-outs.

The mean percent canopy density for the surveyed length of Johnson Creek was 71%. Twenty-nine percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 7% and 93%, respectively. Graph 9 describes the mean percent canopy in Johnson Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 70%. The mean percent left bank vegetated was 70%. The dominant elements composing the structure of the stream banks consisted of 55% sand/silt/clay, 24% cobble/gravel, 19% bedrock, and 2% boulder (Graph 10). Coniferous trees were the dominant vegetation type observed in 64% of the units surveyed. Additionally, 29% of the units surveyed had brush as the dominant vegetation type, and 7% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished for species composition and distribution in Johnson Creek on September 26, 2002. Water temperatures taken during the electrofishing period (10:00-13:00) ranged from 54 to 56 degrees Fahrenheit. Air temperature was 69 degrees Fahrenheit. The sites were sampled by S. Monday and K. Knechtle (DFG).

The first site sampled included habitat unit 002, a mid-channel pool approximately 120 feet from the confluence with South Fork Big River. The site yielded no salmonids.

The second site included habitat unit 008, a mid-channel pool located approximately 280 feet above the creek mouth. The site yielded two, 1+ steelhead.
The third site sampled included habitat unit 011, a bedrock-formed lateral scour pool located approximately 370 feet above the creek mouth. The site yielded one, 1+ steelhead.

Johnson Creek

The following chart displays the information yielded from these sites:

2002 Johnson Creek electrofishing observations.

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
Reach 1: F4 Channel Type									
09/26/02	1	002	4.2	120	0	0	0	0	0
09/26/02	2	008	4.2	280	0	0	0	1	0
09/26/02	3	011	5.4	370	0	0	0	1	0

DISCUSSION

Johnson Creek is an F4 channel type for the entire 4,946 feet of the stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors and log cover.

The water temperatures recorded on the survey days July 30 through August 19, 2002 ranged from 54 to 63 degrees Fahrenheit. Air temperatures ranged from 57 to 72 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 65% of the total length of this survey, pools 20%, riffles 8%, and dry channels 7%. The pools are relatively shallow, with 17 of the 49 (35%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Thirty-four of the 49 pool tail-outs measured had embeddedness ratings of 1 or 2. Two of the pool tail-outs had embeddedness ratings of 3 or 4. Thirteen of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Johnson Creek should be mapped and rated according to their

potential sediment yields, and control measures should be taken.

Thirty-one of the 49 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 51. The shelter rating in the flatwater habitats was 13. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, large woody debris contributes a small amount. Increased log and root wad cover structures in the pool and flatwater habitats would enhance 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.

The mean percent canopy density for the stream was 77%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 70% and 70%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) The limited water temperature data available suggest that maximum temperatures are within the suitable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

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

4) Increase woody cover in the pools and flatwater habitat units. Much of the existing cover is from small woody debris. Adding high quality complexity with log and root wad cover is desirable.

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

6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its

tributaries.

7) Increase the canopy on Johnson Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

8) There are several log debris accumulations present on Johnson Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

9) Due to the perched stream culvert at the confluence of South Fork Big River, access for migrating salmonids is an ongoing potential problem. Good water temperature exists in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

COMMENTS AND LANDMARKS

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

Position (ft):	Comments:
0'	Begin survey 71 feet from the confluence with the South Fork of Big River. Channel type is an F4. There is a culvert at the confluence with South Fork. Big River 10.5 feet high and 9.5 feet wide. Culvert is about 47 feet long under Orrs Springs Road.
85'	Concrete storage tank on left bank 21 feet long, 3.6 feet deep, 3.8 feet wide, currently empty. Wooden retaining wall from surface of water. Two foot tall undercut under panel.
114'	White pump pipe on the left bank going to the storage tank. More pumping pipes in the stream. Black tubes and green garden hose in stream. Does not appear to be activly pumping.
149'	Small pumphouse made of corragated sheet metal is on right bank. steps leading down to water. Pump on the left bank is connected to white three-inch PVC pipe.
212'	One piece of large woody debris (LWD) across channel with many pieces of small woody debris (SWD) causing possible down stream barrier. Retaining gravel above the log jam. LWD and SWD is 4.5 feet high above surface of water.

286'	White PVC ends at end of unit. Has run along left bank since 85 feet into the survey. End is sticking out of water and is clogged with sediment so no water is flowing through. Unit ends at old concrete notched weir, presumably to hold water for pumps.
306'	Old road leading to pool.
319'	Old slide on right bank mid unit. Now vegetated.
354'	Survey temporarily ended due to lack of access. 1760 feet of no access was measured off of ArcView - not a completely accurate measurement.
2114'	Begin survey again. There is a pool on private side with a 7-8 inch resident trout.
2165'	One piece of LWD lying horizontally in channel. More than five pieces of LWD and SWD clogging channel. Potential as an out migrant barrier.
2183'	Two pieces of LWD in channel blocking some water 1/3 to 2/3 through unit, but not breaking up pool.
2347'	More than six pieces of LWD, most are old redwoods greater than 5 feet in diameter, cutting off channel. SWD piling up 6-7 feet above surface of water. Retaining gravel at top of unit. Potential barrier for outmigrating YOY.
2379'	Channel type taken in this unit.
2468'	Five pieces of LWD associated with SWD backing up in channel. Three to four feet high from water surface spanning width of channel. Not retaining sediment.
2493'	Salamander larva. Dry tributary entering on left bank.
2623'	Both right and left banks contributing fines. Small dry tributary on right bank.
2877'	Two pieces of LWD providing shelter with a small amount of SWD.
3137'	Left bank is bedrock.
3238'	Crayfish in pool. Right bank is being scoured away and is contributing fines.
3255'	Dry right bank tributary.
3556'	Dry right bank tributary.
3769'	LWD pile with some SWD 25 feet wide, 4 feet high, and 5 feet long. Sediment piled at the top.

3911'	LWD pile 4 feet high, 20 feet wide, and 10 feet long. Trapping substrate at the top of the pool.
3936'	Five pieces of LWD with some SWD is the shelter for this stagnant pool.
4031'	Channel has turned into a marsh and the water has become very cloudy.
4156'	Four foot plunge. Six pieces of LWD with substrate piled at the top.
4278'	Channel overgrown and marsh like.
4406'	Large log damming the pool.
4483'	Wet crossing. Dry left bank tributary. Channel very overgrown
5398'	Five pieces of LWD with some SWD at the top of the pool.
5439'	Six pieces of LWD with some SWD.
5516'	Right bank contributing fines into stream
5665'	LWD pile at top of unit, 5 feet high, 18 feet wide, and 10 feet long with some SWD.
5793'	Right bank tributary. Little water flow.
5964'	Three foot plunge into pool below. Substrate pile at top of pool, water seeping through the substrate.
6414'	LWD pile with seven pieces of LWD with some SWD and two rootwads.
6454'	Left bank erosion contributing fines, 10 feet high and 15 feet long.
6535'	Five pieces of LWD with rootwad trapping fines.
6602'	Two foot plunge into pool. Four pacific giant salamander larva.
6616'	End of survey due to diminished habitat - no fish have been seen since 354 foot mark of survey (just before no access section). Crossed over multiple log jams that could be potential fish barriers.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California*

Salmonid Stream Habitat Restoration Manual, 3rd edition. California Department of Fish and Game, Sacramento, California.

Johnson Creek

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

JOHNSON CREEK — Drainage: SF BIG RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/30/02 to 08/19/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS20 LATITUDE:39°23'58" LONGITUDE:123°44'16"

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
13	2	RIFFLE	12	32	420	8	3.8	0.1	55	720	6	72	0	3
38	8	FLATWATER	35	84	3194	65	5.8	0.4	209	7932	69	2610	0	13
49	49	POOL	45	20	994	20	7.0	0.8	140	6849	123	6012	98	51
10	1	DRY	9	34	338	7	4.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
110	60	4946	15500	8694

JOHNSON CREEK — Drainage: SF BIG RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 07/30/02 to 08/19/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS20 LATITUDE:39°23'58" LONGITUDE:123°44'16"

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 %
13	2	LGR	12	32	420	6	4	0.1	0.4	55	720	6	72	0	3	60
1	1	GLD	1	29	29	0	10	0.3	0.6	276	276	83	83	0	0	76
11	4	RUN	10	24	260	4	5	0.5	1.1	160	1764	63	689	0	19	64
26	3	SRN	23	112	2905	43	5	0.3	1.0	251	6526	72	1872	0	10	76
35	35	MCP	32	21	730	11	7	0.8	3.2	142	4978	123	4322	98	50	74
1	1	CCP	1	13	13	0	8	0.5	1.2	104	104	52	52	31	270	79
2	2	CRP	2	17	33	0	10	1.2	2.8	150	300	144	288	129	45	58
2	2	LSL	2	24	48	1	6	0.9	1.6	132	264	118	235	98	50	29
2	2	LSR	2	23	45	1	10	1.0	2.4	224	447	215	431	171	50	85
2	2	LSBk	2	18	35	1	5	0.6	2.6	74	149	47	94	15	5	83
4	4	PLP	4	13	51	1	9	1.0	2.1	113	451	109	435	90	45	88
1	1	DPL	1	39	39	1	4	1.0	1.6	156	156	156	156	140	30	55
10	1	DRY	9	34	338	5	4	0.0	0.0	0	0	0	0	0	0	69

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
110	60	4946	16134	8728

JOHNSON CREEK — Drainage: SF BIG RIVER

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 07/30/02 to 08/19/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS20 LATITUDE:39°23'58" LONGITUDE:123°44'16"

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
36	36	MAIN	73	21	743	75	6.8	0.8	141	5082	121	4374	96	56
12	12	SCOUR	24	18	212	21	7.9	0.9	134	1610	124	1482	99	40
1	1	BACKWATER	2	39	39	4	4.0	1.0	156	156	156	156	140	30

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
49	49	994	6849	6012

JOHNSON CREEK — Drainage: SF BIG RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/30/02 to 08/19/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS20 LATITUDE:39°23'58" LONGITUDE:123°44'16"

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
35	MCP	71	4	11	20	57	10	29	1	3	0	0
1	CCP	2	0	0	1	100	0	0	0	0	0	0
2	CRP	4	0	0	1	50	1	50	0	0	0	0
2	LSL	4	0	0	2	100	0	0	0	0	0	0
2	LSR	4	0	0	0	0	2	100	0	0	0	0
2	LSBk	4	1	50	0	0	1	50	0	0	0	0
4	PLP	8	0	0	2	50	2	50	0	0	0	0
1	DPL	2	0	0	1	100	0	0	0	0	0	0

TOTAL UNITS
49

JOHNSON CREEK — Drainage: SF BIG RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 07/30/02 to 08/19/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS20 LATITUDE:39°23'58" LONGITUDE:123°44'16"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
13	1	LGR	50	0	0	0	50	0	0	0	0
1	0	GLD	0	0	0	0	0	0	0	0	0
11	4	RUN	28	25	3	5	34	0	0	6	0
26	3	SRN	0	43	33	0	13	0	0	10	0
35	33	MCP	16	33	35	2	6	1	2	5	2
1	1	CCP	0	10	0	0	0	90	0	0	0
2	2	CRP	40	20	35	0	5	0	0	0	0
2	2	LSL	0	25	65	0	5	0	0	5	0
2	2	LSR	30	25	20	25	0	0	0	0	0
2	2	LSBk	0	45	0	0	0	0	0	25	30
4	4	PLP	5	39	33	0	3	0	0	15	6
1	1	DPL	60	20	10	0	10	0	0	0	0
10	0	DRY	0	0	0	0	0	0	0	0	0

JOHNSON CREEK — Drainage: SF BIG RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 07/30/02 to 08/19/02

Confluence Location: QUAD: BAILEY RID LEGAL DESCRIPTION: T16NR14WS20 LATITUDE:39°23'58" LONGITUDE:123°44'16"

TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
13	2	LGR	0	0	100	0	0	0	0
1	1	GLD	0	0	100	0	0	0	0
11	4	RUN	0	0	100	0	0	0	0
26	3	SRN	0	0	67	33	0	0	0
35	5	MCP	0	0	60	0	0	20	20
1	1	CCP	0	0	0	0	0	0	100
2	0	CRP	0	0	0	0	0	0	0
2	0	LSL	0	0	0	0	0	0	0
2	1	LSR	0	0	0	100	0	0	0
2	2	LSBk	0	0	0	50	0	0	50
4	1	PLP	0	0	0	100	0	0	0
1	1	DPL	0	0	100	0	0	0	0
10	1	DRY	0	0	100	0	0	0	0

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: JOHNSON CREEK
SAMPLE DATES: 07/30/02 to 08/19/02
STREAM LENGTH: 6706 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: BAILEY RID — Latitude: 39°23'58"
Legal Description: T16NR14WS20 — Longitude: 123°44'16"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

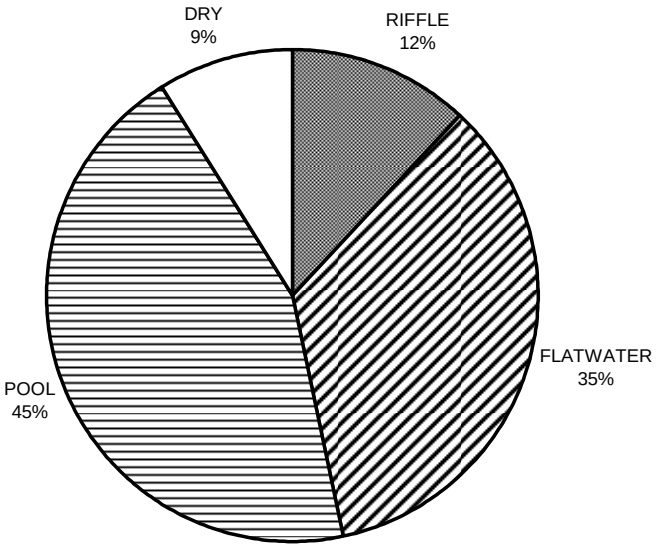
Channel Type: F4	Canopy Density: 71%
Channel Length: 4946 ft.	Coniferous Component: 93%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 7%
Total Pool Mean Depth: 0.8 ft.	Pools by Stream Length: 20%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 2%
Water: 054- 063°F Air: 057-072°F	Mean Pool Shelter Rtn: 51
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Small Woody Debris
Vegetative Cover: 66%	Occurrence of LOD: 30%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 338 ft.

Embeddness Value: 1. 37% 2.33% 3. 2% 4. 2% 5. 27%

Length of stream section not surveyed within survey reach and not included in above totals or calculations: 1760 ft.

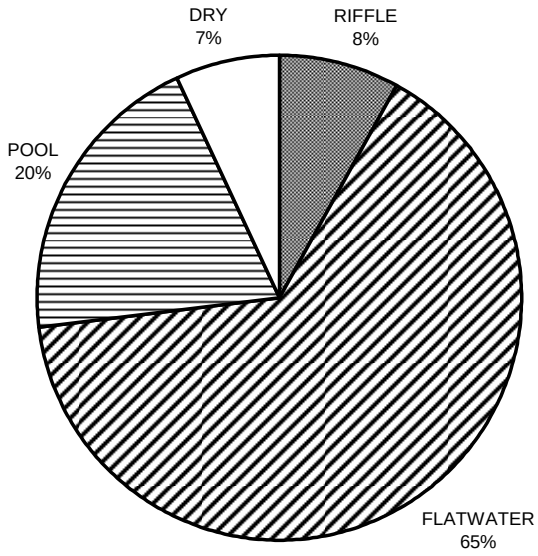
JOHNSON CREEK

HABITAT TYPES BY PERCENT OCCURENCE



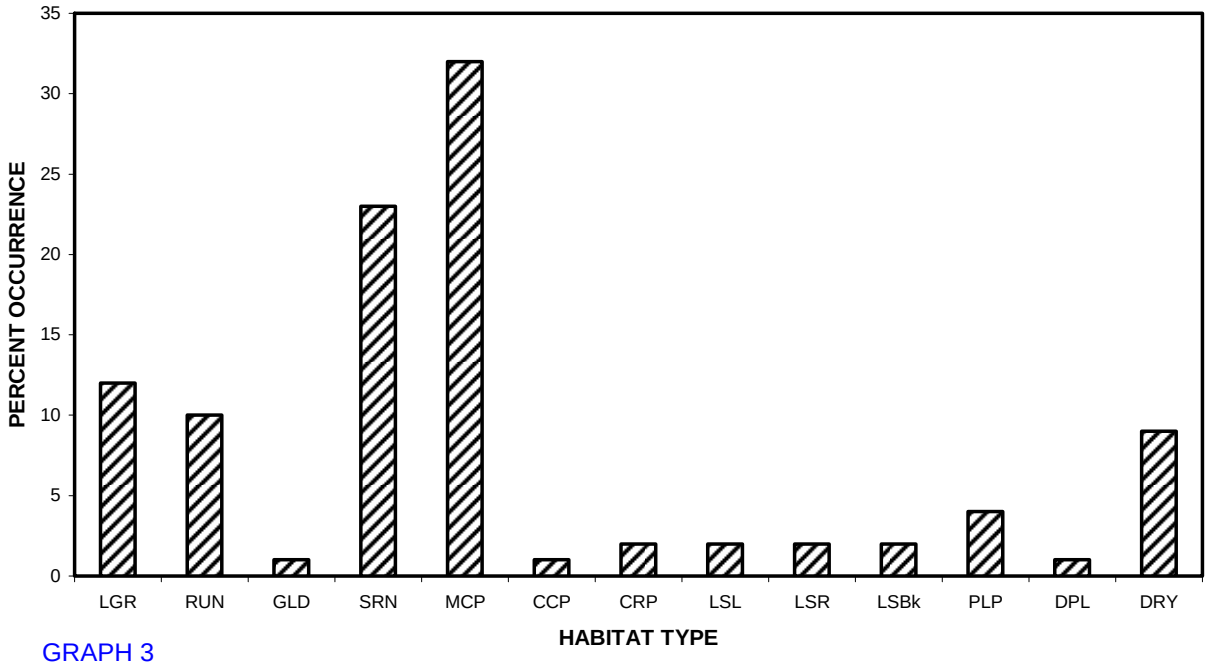
GRAPH 1

JOHNSON CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH



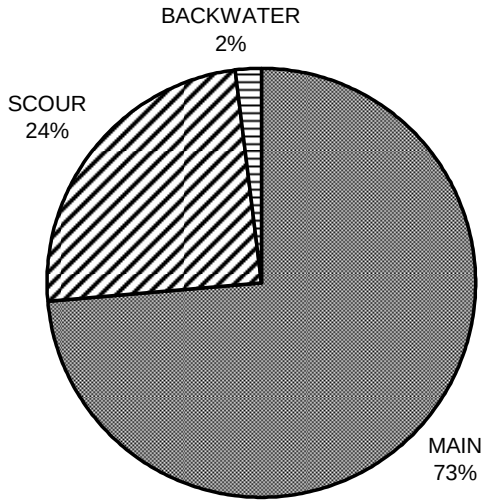
GRAPH 2

JOHNSON CREEK
HABITAT TYPES BY PERCENT OCCURRENCE

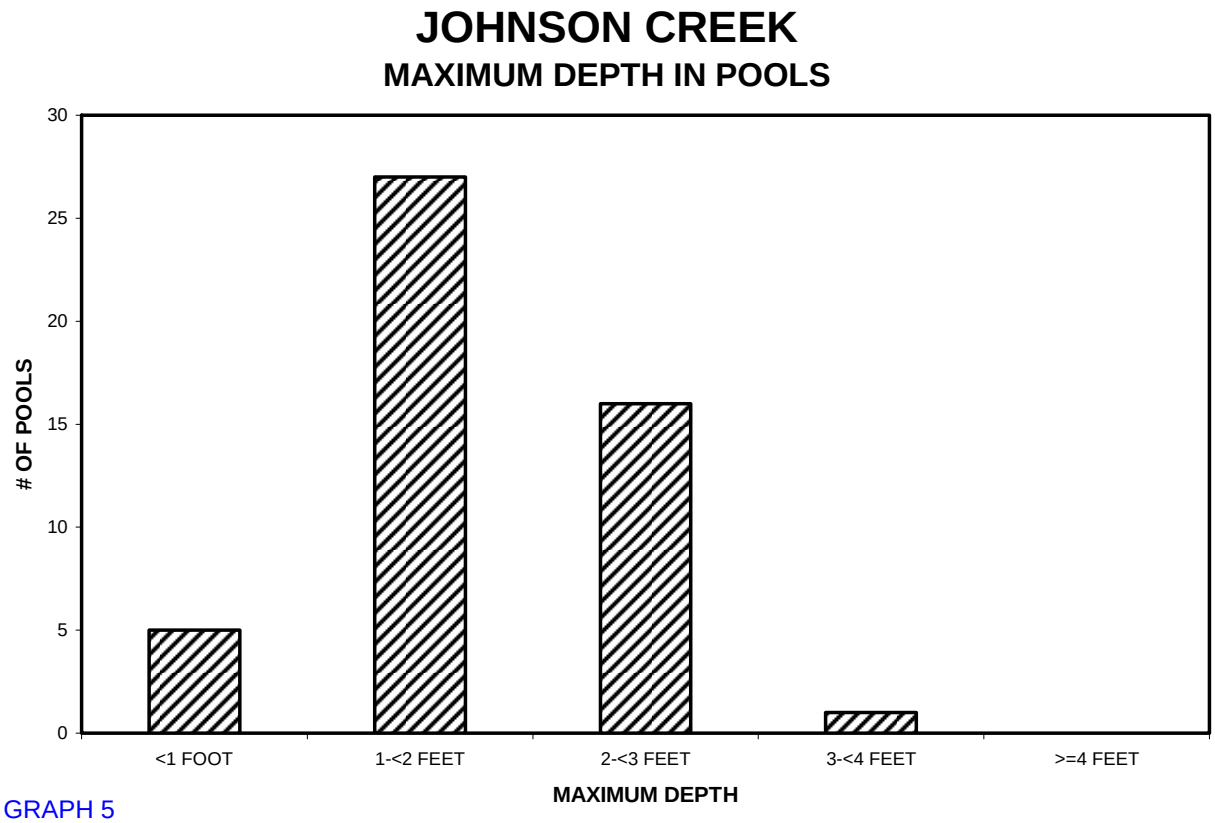


GRAPH 3

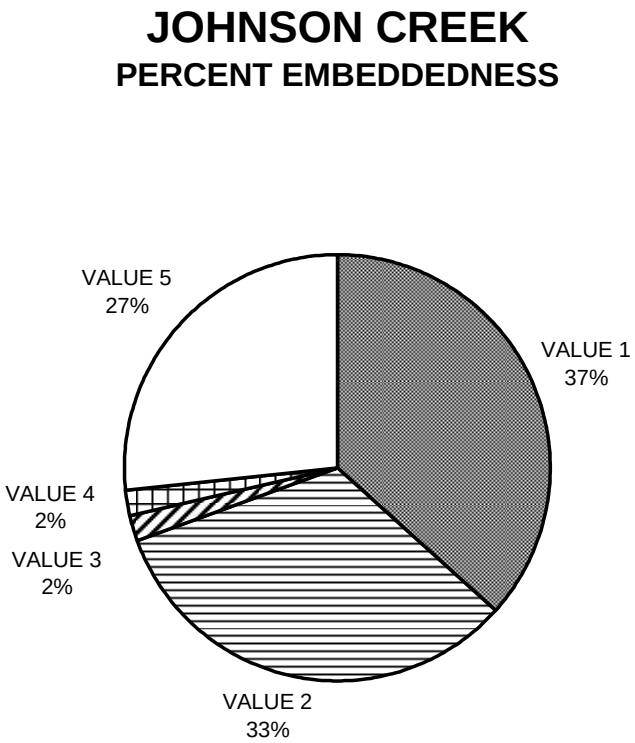
JOHNSON CREEK
POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

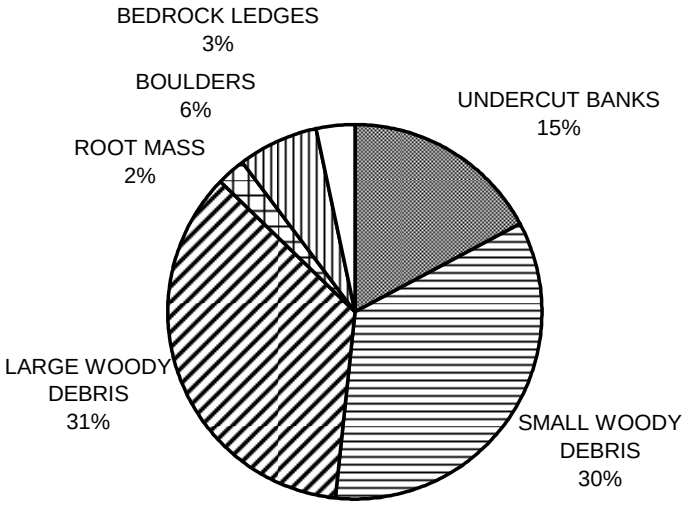


GRAPH 5



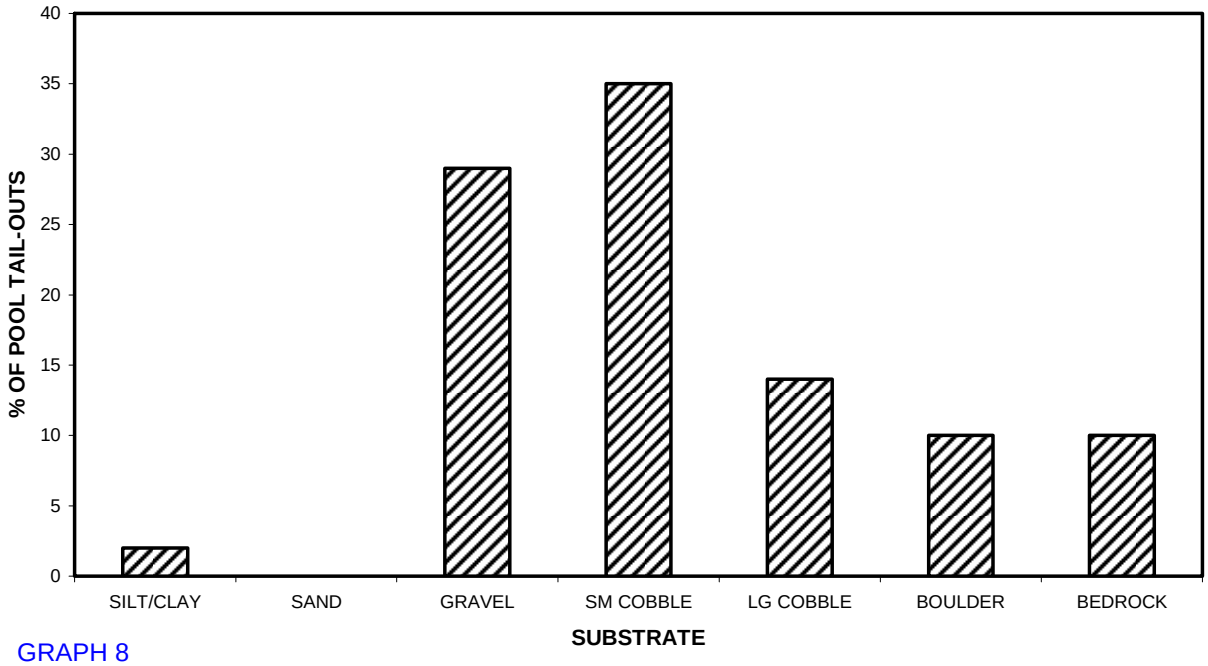
GRAPH 6

JOHNSON CREEK
MEAN PERCENT COVER TYPES IN POOLS



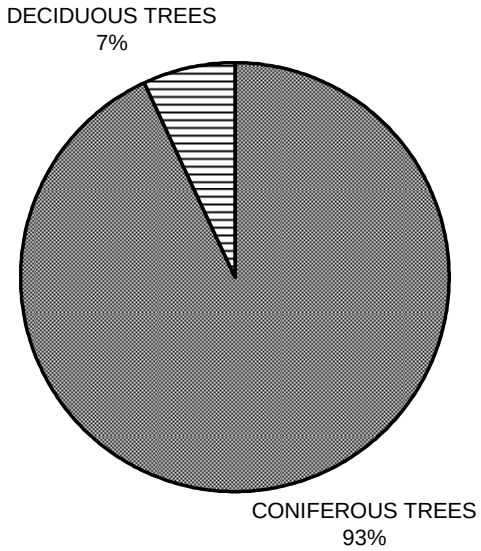
GRAPH 7

JOHNSON CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



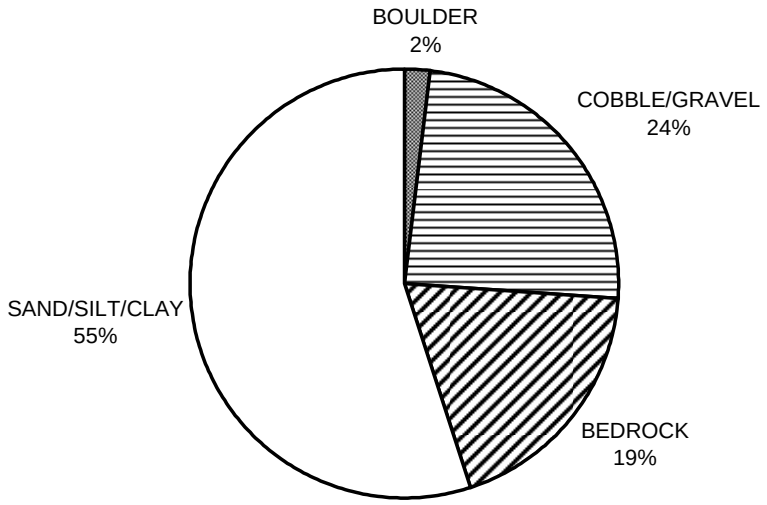
GRAPH 8

JOHNSON CREEK
MEAN PERCENT CANOPY



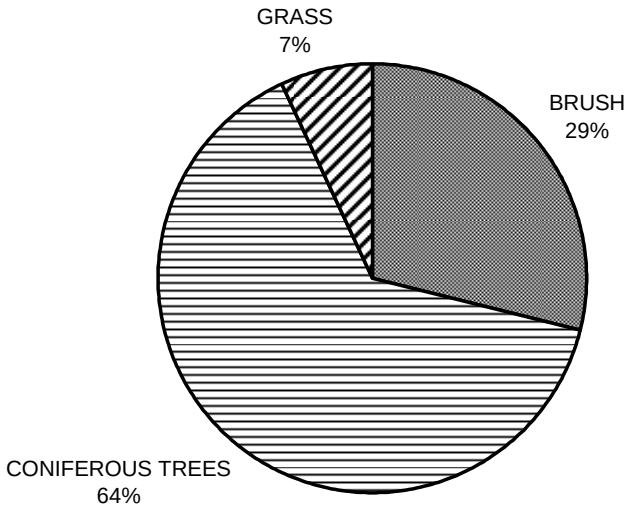
GRAPH 9

JOHNSON CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



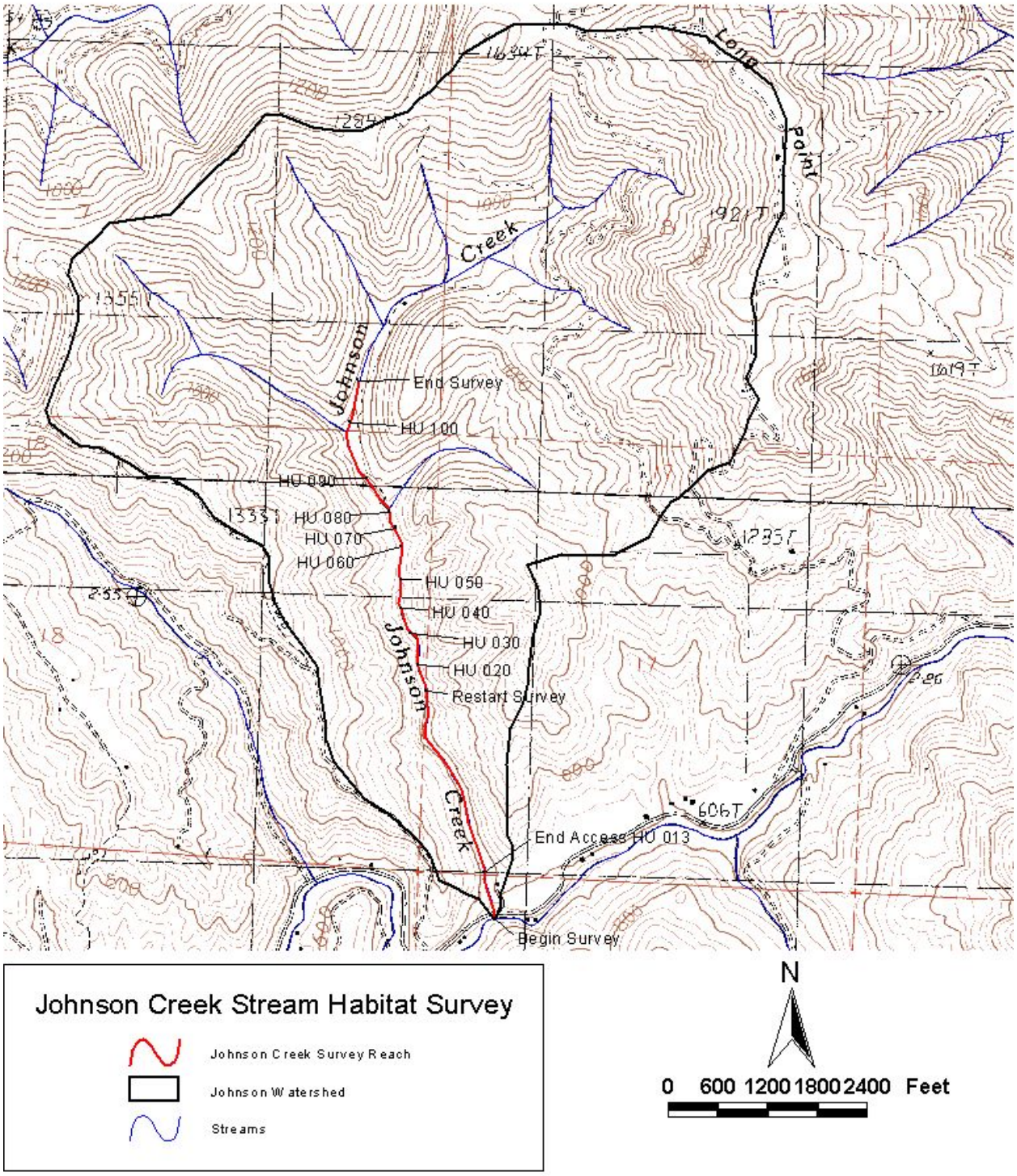
GRAPH 10

JOHNSON CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Johnson Creek



Map 1. Map showing Johnson Creek stream habitat inventory survey reach and watershed.