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HOFSTRA

REDWOOD NATIONAL PARK

BASELINE DOCUMENTATION OF THE PHYSICAL AND BIOLOGICAL AQUATIC ECOSYSTEM OF LOST MAN CREEK

BY

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TABLE OF CONTENTS

Lost Man Crek Study Area Map

Objectives pg 2

Analysis pg 2

I.Methodology pg 2

Flow Duration Curve

Annual Hydrograph Lost Man Creek

A. Stream Classification pg 4

Channel Parameters pg 5

Stream Type Descriptions pg 5

B. Habitat Type Classification pg 8

Habitat Type Descriptions pg 8

Habitat Parameters pg 12

Shelter Rating pg 12

20% Sampling pg 14

C. Biological Sampling pg 14

Direct Observation pg 14

Electrofishing pg 15

II. Analysis pg 15

A. Stream Classification pg 15

B. Physical Habitat Analysis pg 18

C. Biological Sampling pg 18

Chinook Salmon pg 18

Coho Salmon pg 19

Steelhead Trout pg 20

Direct Observation pg 20

REFERENCES pg 21

Appendix A. Winter and Summer baseflow area/volume pie charts

Appendix B. Lower Stratum summary tables

Appendix C. Lower Stratum distribution histograms

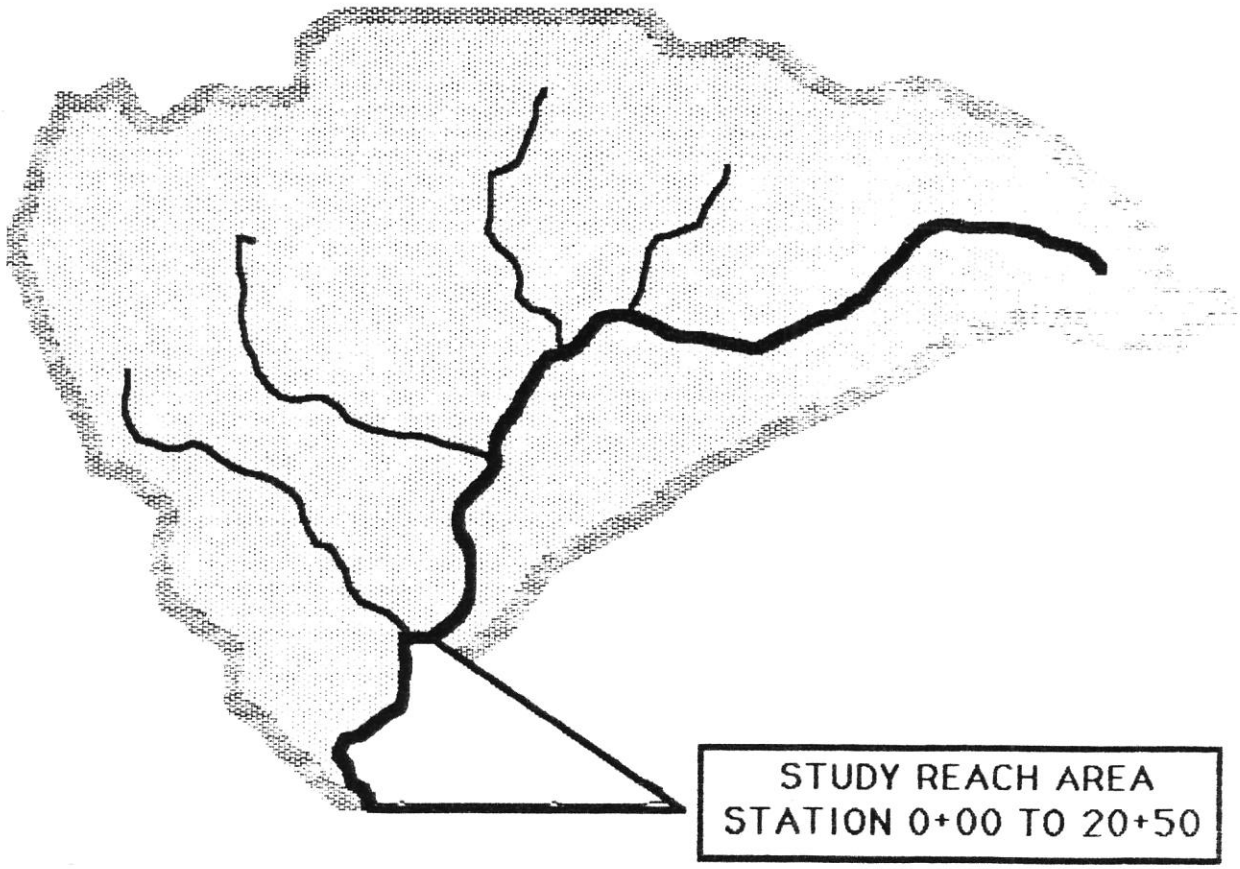
Appendix D. Upper Stratum summary tables

Appendix E. Upper Stratum distribution histograms

Appendix F. Summer baseflow habitat field data

Appendix G. Winter baseflow habitat field data

LOST MAN CREEK, TRIBUTARY TO PRAIRIE CREEK REDWOOD NATIONAL PARK



The project scope is to provide background information to permit the measurement of any changes to the aquatic ecosystem of Lost Man Creek resulting from the planned operations to remove the concrete dam at station 11+63 (m). Documentation of spawning and rearing habitat conditions for salmonids, was selected to measure changes to the aquatic ecosystem. Measurements were collected during winter baseflow that fully occupied the active channel during the frequent event. Summer baseflow measurements were taken during the ten year average sixty day lowflow duration discharge.

OBJECTIVES

1. To provide baseline documentation of the winter and summer aquatic ecosystem on Lost Man Creek, from the mouth (station 00+00) to Lost Man Creek picnic grounds bridge (station 20+50).

> Habitat diversity would be defined by the distribution of micro habitat types (Bisson 1981, Decker 1985, Sullivan 1988), surface area, volume, depth, residual volume, weighted shelter values, spawning area, substrate composition, crown cover. Channel reach geometry and channel and streambank stability are to be documented using a stream classification methodology (Rosgen 1985).

2. To provide baseline documentation of summer salmonid population estimates (Hankin *et al* 1988) by habitat type and weighted shelter value, from station 00+00 to 20+50 at the Lost Man Creek picnic grounds bridge.

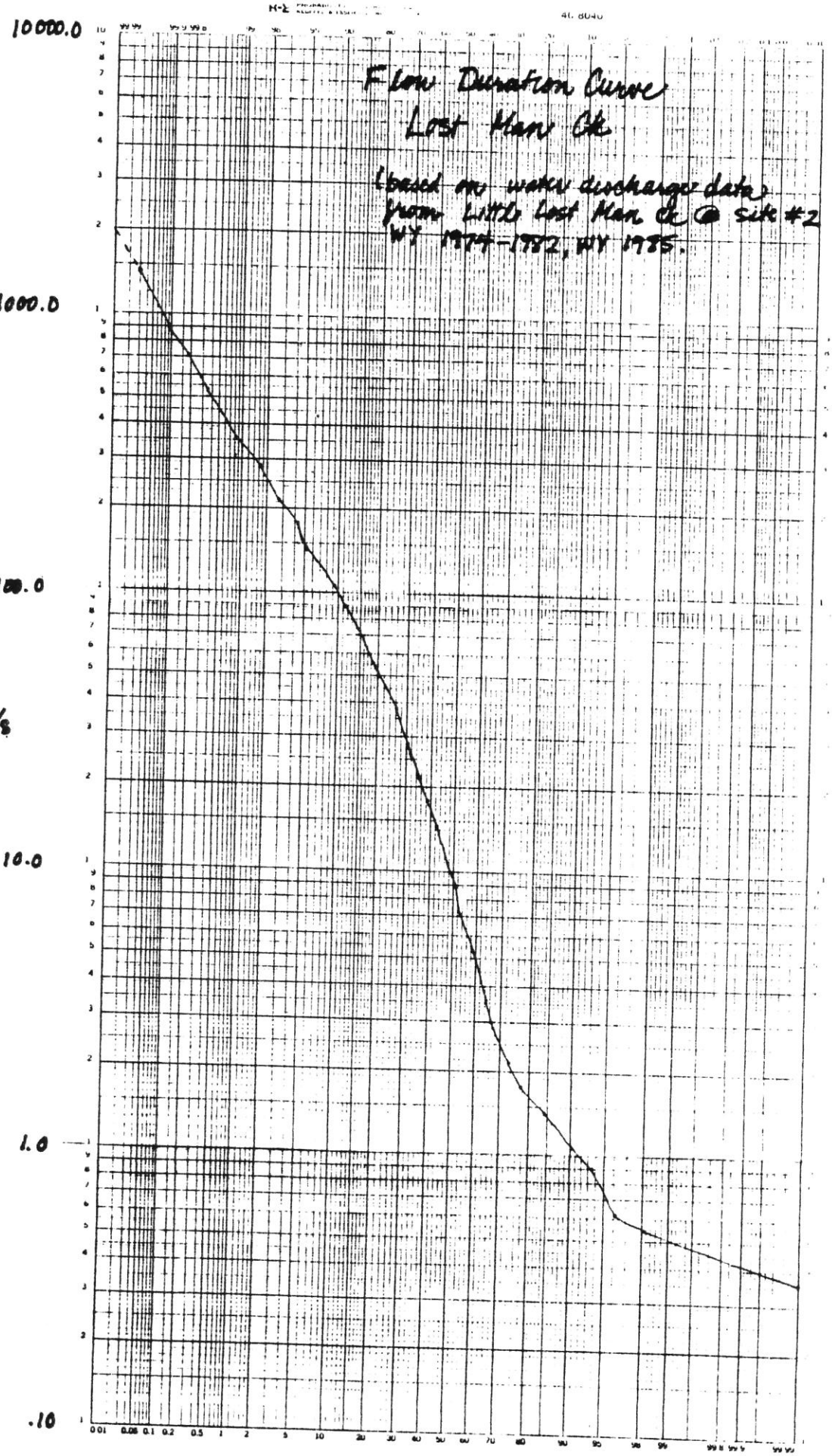
3. To analyze habitat type and shelter selection by juvenile salmonids, estimate habitat carrying capacity for salmonids, and identify limiting factor(s) affecting juvenile salmonid populations, from station 00+00 to 20+50 at the Lost Man Creek picnic grounds bridge.

> The relationship between the physical and biological components in the system will be documented by comparing fish distribution, to habitat type and weighted shelter values.

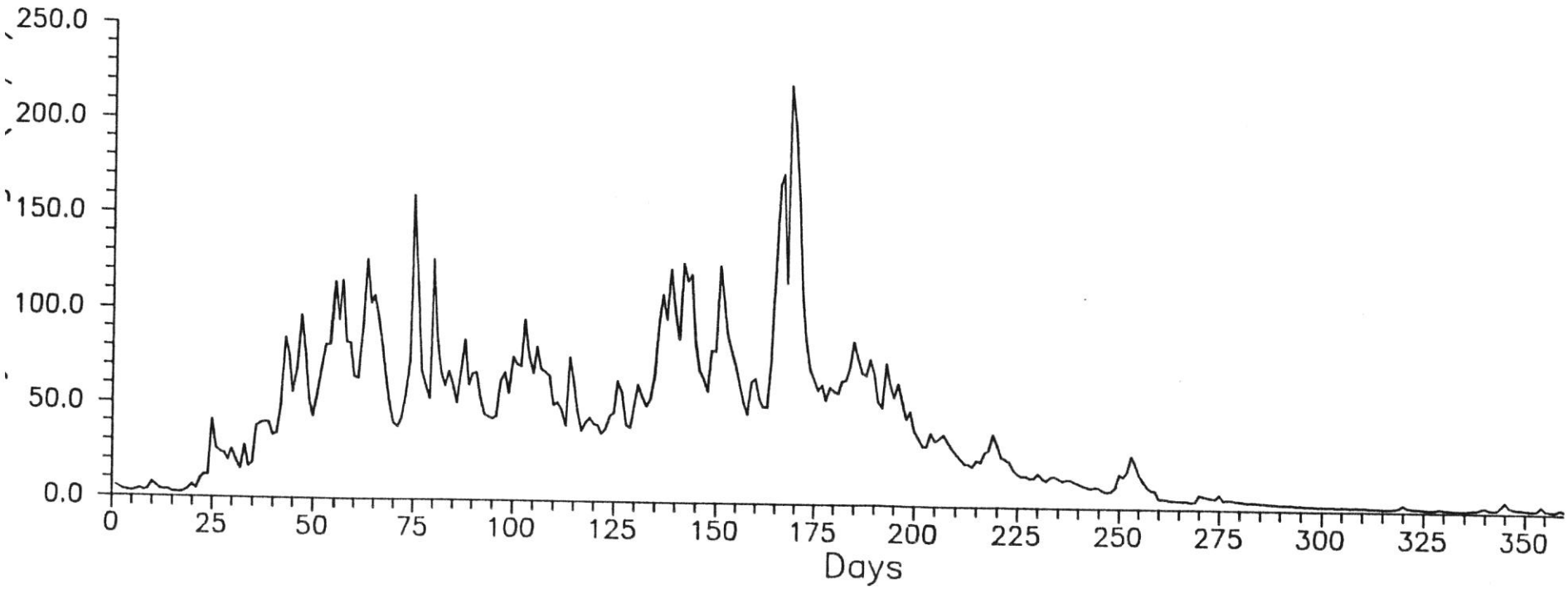
ANALYSIS

I. METHDOLOGY

The methodologies employed here are an integrated synthesis of three separate systems. Basin level hydrologic-geomorphic channel classification developed by Dave Rosgen (1985), is a standardized, replicable methodology that physically describes the channel geometry, and is used to assess the processes that create and maintain the active stream channel, facilitating the determination of the suitability of the stream types to maintain certain types of habitat and/or habitat manipulations. Physical habitat inventory employed at this level (micro habitat typing, with a unit resolution equal to the average wetted channel's base flow width) is based on the habitat typing scheme developed by Pete Bisson *et al* (1981), and expanded and modified by Lynn Decker (1985), and later Kathleen Sullivan (1988). This habitat typing technique is a standardized, replicable methodology that physically describes 100% of the


Flow Duration Curve
Lost Man Ck
(based on water discharge data from Little Lost Man Ck @ site #2 WY 1974-1982, WY 1985.
10000.0
1000.0
100.0
10.0
1.0
.10
Q (ft³/s
% time discharge is equal or exceeded

Lost Man Creek: Mean Daily Discharge



habitat available, without extrapolation from index reaches. Biological sampling to determine habitat and shelter utilization and selection by species and cohorts, given the total habitat available in the basin, is based on the work of Dave Hankin *et al* (1988).

Direct observation of fish, utilizes two total counts of the fish in the sample units (on a 20% of the total number of units sampling base). Observer calibration by electrofishing conducted at this level of inventory, is to determine habitat and shelter selection by fish, and observed standing crop estimates. Documenting the distribution and quantity of habitat types (number of units, length, width, area, average depth, maximum depth, volume, and shelter) and their selection by the fish in the system will facilitate limiting factor analysis, and mitigation planning.

> "Most fishes in small streams are habitat specialists and utilize specific locations within stream channels throughout their freshwater life cycles in response to different spawning, feeding, and overwintering requirements. Within the Salmonidae, competition plays a key role in habitat utilization when food is limited and such density dependent interactions result in habitat partitioning that facilitates the coexistence of several species as well as multiple age classes (Bisson *et al* 1981)."

Fishery and habitat limiting factor analysis can be performed from the information gathered in this level of inventory and unit resolution. In order to quantify habitat utilization and selection by species and cohorts it is necessary to relate the proportion of the total direct observation standing crop estimates and relative densities observed within each habitat type to the relative frequency, distribution and quantity of that habitat type within the entire basin. The habitat suitability criteria and the probability of use criteria developed by the USFWS instream flow team (Bovee 1978, McMahon 1983, Raleigh 1984) identifies the specific habitat requirements and probability of their use by salmonid species utilizing Lost Man Creek. These parameters are then analyzed within the context of the frequency and quantitative distribution documented in the physical inventory of the study reach, and compared with the observations from our biological inventory. Spawning habitat area has been compared with the habitat requirements documented in the previously mentioned references and from (Reiser 1979), and the distribution and frequency occurring in the study are to determine potential redd densities. Information from spawning and redd inventories carried out by RNP personnel in the past,(Anderson 1988 per. comm.) has been used to project adult population levels and habitat seeding.

This three part inventory methodology (stream classification, habitat classification, and direct observation of fish) can be employed as an evaluation technique for limiting factor analysis and determining instream structure design, and it provides excellent baseline documentation from which changes to the aquatic habitat can be measured.

A.STREAM CLASSIFICATION:

The inventory of channel reach unit geometry and channel and streambank stability is built upon,"a universal stream channel classification system, that provides detailed, reproducible, quantitative applications in wildland hydrology, based on the morphological criteria of gradient, width/depth ratio, sinuosity, channel materials, channel confinement, entrenchment, soils, and landform" (Rosgen 1985).

Stream types are the basic units of measure at this level of physical channel and aquatic habitat inventory. Minimum unit lengths are usually equal to ten times the average bankfull width.

> "Stream morphology and related channel patterns are directly influenced by eight major variables including width, depth, velocity, discharge slope, roughness of channel materials, sediment load and sediment size (Leopold et].1964). A change in any one of these variables sets up a series of concurrent changes in the others, resulting in altered channel patterns (Rosgen 1985)."

Describing the diversity, frequency and distribution of channel types provides the means to document the associated aquatic habitat types which are maintained by the hydro-geomorphic forces creating each channel type. The habitat types associated with each stream type can be described in either macro, meso or micro-habitat type levels (Bisson 1981, Decker 1985, Sullivan 1988). Stream Classification provides the means to:

1. Describe 100% of the basin's stream types (sequence,length, bankfull average width and average depth, floodplain average width, dominant particle size, and water slope gradient), facilitating the interpretation of channel stability, and channel maintenance processes.
2. Provide baseline data from which to measure channel responses;

-from upslope management activities affecting sediments, or water discharge rates;

-resulting from major flood events and to assist in determining the stage of channel recovery;

-from controlled or reduced flows resulting from water diversion impoundments, or out of basin water transfers.

3. Determine the suitability of the hydro-geomorphic parameters creating and maintaining the stream types (particularly their effects upon streambank or channel stability, and substrate particle size distribution) which will affect fishery management planning for mitigation/restoration or maintenance of a fishery or its habitat. "Stream channels operate in a consistent and predictable manner and the knowledge of such channel response to artificially placed structures can be used to alter the design, placement or selection of various enhancement structures (Rosgen 1985)."

4. Determine correlations between habitat type parameters (diversity, frequency, distribution, surface area and volume) and stream types. Habitat types can be extrapolated for an entire basin from this level of inventory.

CHANNEL PARAMETERS

Field measurements for channel classification are conducted at velocity cross over areas (often Run habitat types), that are not being influenced by point source sediment supplies or any other outside factors affecting channel geometry.

Length Stream type unit lengths are determined in the field from pre-established station markers set at 50 meter intervals.

Width:

-Bankful/Active Channel The average width of the active channel at the frequent event's bankful discharge, as delineated by the active scour mark and perennial vegetation, measured with an abney level, stadia rod and field tapes.

-Floodplain The active floodplain reoccurring at frequent intervals is measured with a stadia rod, optical rangefinder, and field tapes.

Depth The average depth of the water at the frequent events bankful discharge, as delineated by the active scour mark and perennial vegetation, is measured with stadia rods.

Slope Water surface slopes at bankful discharge are measured through the stream type to determine the energy gradient. They are measured at a minimum from riffle crest to riffle crest through the area of cross channel measurements, with an abney level, stadia rods, rod levels, optical rangefinder and field tapes.

Dominant Substrate Twenty random particle samples are collected within the active bankful channel at the cross channel profile site. The dominant particle size is that which occupies the largest percentage of area in the channel.

Valley Confinement Confinement is defined as the ratio of average floodplain width to average bankful width.

Channel Entrenchment Entrenchment is defined as the ratio of the average width to average depth during the frequent event bankful discharge.

Sinuosity The ratio of the channel length to the valley length. Reflects confinement as a function of stream power and particle size.

Parameters measured in the field, such as width/depth ratios, valley confinement, and channel entrenchment are compared to stream classification criteria developed by Rosgen, to determine channel and streambank characteristics.

STREAM TYPE DESCRIPTIONS

Lost Man Creek from station 0+00 to 20+50 is predominantly a low gradient, slightly confined channel. The following stream type descriptions are from Rosgen 1985, and per. comm..

TYPE C1-1:
General Description: Low gradient bedrock controlled channel.
Landform/Soils: Bedrock controlled channel with depositional fine grained bank material, unstable.
Gradient: 1.5% or less, mean 1.0%.
Valley Confinement: slightly confined, FPW/BFW >2.5.
Channel Entrenchment: Shallow entrenchment.
Width/Depth Ratio: 10 or greater, mean 30.
Sinuosity: 1.5-2.5
Dominant Particle Size of Channel Materials: Bedrock bed, gravel, sand, or finer streambanks.

TYPE C1:
General Description: Low gradient, cobble bed meandering channel, with developed floodplains.
Landform/Soils: Relatively stable coarse textured high alluvial terraces.
Gradient: 1.0-1.5%, mean 1.3%
Valley Confinement: Slightly confined, FPW/BFW >2.5.
Channel Entrenchment: Moderate to shallow channel entrenchment.
Width/Depth Ratio: 10 or greater, mean 18.
Sinuosity: 1.5-2.0
Dominant Particle Size of Channel Materials: Cobble/coarse gravel bed, gravel, sand banks.

TYPE C2:
General Description: Low gradient overfit cobble bed **channel within a channel.**
Landform/Soils: Deeply incised coarse river terraces, active channel oversized by historical geomorphic event .
Gradient: 0.3-1.0%, mean 0.6%.
Valley Confinement: Moderately confined, FPW/BFW=1.5-2.5.
Channel Entrenchment: Moderate channel entrenchment.
Width/Depth Ratio: 15-30, mean 20.
Sinuosity: 1.3-1.5
Dominant Particle Size of Channel Materials: Large cobble with mixture of small boulders and very coarse gravel.

TYPE C3:
General Description: Low gradient, meandering gravel bed channel.
Landform/Soils: Multiple low river terraces, fine textured banks,unconsolidated, noncohesive gravel bed, unstable banks.
Gradient: 0.5-1.0%, mean 0.8%.
Valley Confinement: Slightly confined, FPW/BFW >2.5.
Channel Entrenchment: Moderately entrenched.
Width/Depth Ratio: 10 or greater, mean 25.
Sinuosity: 1.8-2.4.
Dominant Particle Size of Channel Materials: Gravel bed with mixture of small cobble and sands.

TYPE C4:

General Description: Low gradient, meandering sand bed channel, with central and point bar deposition.
Landform/Soils: Low flood terraces, predominantly fine textured alluvium, aeolian, residual and other sand size materials, unstable banks.
Gradient: 0.1-0.5%, mean 0.3%
Valley Confinement: Slightly Confined, FPW/BFW >2.5.
Channel Entrenchment: Moderately entrenched
Width/Depth Ratio: 5 or greater, mean 25
Sinuosity: 2.5 or greater
Dominant Particle Size of Channel Materials: Predominantly fine textured, sand, with mixture of gravel and silt(no bed armor).

TYPE C5:

General Description: Low gradient, meandering cohesive silt/clay channel.
Landform/Soils: Low river terraces, fine textured bank and bed materials Delta deposit, Lacustrine, Loess, predominantly cohesive soils.
Gradient: 1.0% or less, mean 0.05%
Valley Confinement: No valley confinement.
Channel Entrenchment: Moderate channel entrenchment.
Width/Depth Ratio: 5 or greater, mean 10
Sinuosity: 2.5 or greater
Dominant Particle Size of Channel Materials: Silts and clays with mixtures of medium to fine sands (no bed armor).

TYPE C6:

General Description: Narrow and deep low gradient meandering fine grained channel.
Landform/Soils: Fine textured alluvium with low river terraces.
Gradient: 1.5 or less, mean 0.05%.
Valley Confinement: Slightly confined, FPW/BFW >2.5.
Channel Entrenchment: Deeply entrenched.
Width/Depth Ratio: 0.1 -5.0, mean 2
Sinuosity: 2.5 or greater.
Dominant Particle Size of Channel Materials: Sand bed with a mixture of silt with some fine gravels and with stabilizing vegetation.

B. HABITAT TYPE CLASSIFICATION:

Aquatic habitat classification has traditionally been limited to separating a stream into components of riffles, runs, or pools based upon channel characteristics, usually in a very general manner.

> "The lack of a precise language describing the components of the physical environment may limit our ability to predict a stream's productivity for a species of interest. The often-used names 'riffle' and 'pool' convey a notion of relative water depth and current velocity, but beyond this they give little indication of living conditions relative to substrate, flow patterns, and cover. Not surprisingly, considerable variation exists in fish utilization of these general categories within the stream." (Bisson *et al* 1981).

Habitat types are classified based upon three components (Decker *et al* 1985):

1) The location of the habitat feature within the channel.
2) The pattern of water flow through the habitat feature.
3) The nature of the flow-controlling structures.

The following list of habitat types and their classification scheme was originally proposed by Bisson *et al* (1981), and modified by Decker/Overton (1985), and Laird (1987).

HABITAT TYPE DESCRIPTION

RIFFLES

Low Gradient Riffle [LGR]	1
High Gradient Riffle [HGR]	2
Cascade [CAS]	3
Chute [CHU]	23

LOW GRADIENT RIFFLES are shallow (<.7 ft; <20 cm deep) stream reaches with moderate current velocity (.7-1.6 ft/sec; 20-50 cm/sec) and moderate turbulence. Substrate is usually composed of gravel, pebble, and cobble-sized particles (.006 - .8 ft; 2-256 mm). An upper channel gradient limit for this habitat type is set at 4%.

HIGH GRADIENT RIFFLES (Rapids) possess a channel gradient greater than 4% with swiftly flowing water (> 1.6 ft/sec; > 50 cm/sec) having considerable turbulence. The substrate of rapids is generally coarser than the substrate of low gradient riffles (larger fraction > .8 ft; > 256 mm), and during low stream flow conditions large boulders typically protrude through the water surface.

CASCADES are the steepest type of riffle habitat. Unlike rapids, which have an even gradient, cascades consist of a series of small steps of alternating small waterfalls and shallow pools. The usual substrate of cascades is bedrock or an accumulation of boulders; however, this habitat type is often at the toe of earth movements and occasionally found on the downstream face of woody debris jams.

CHUTE A narrow, confined channel through which water flows rapidly; a rapid or quick descent in a stream, usually associated with bedrock substrate.

FLATWATER

Glide [GLD]	14
Run [RUN]	15
Step Run [SRN]	16
Edgewater [EDW]	18

GLIDES are characterized by moderately shallow water (.3-1.0 ft; 10-30 cm deep) with an even flow (flat bed and water profiles) that lacks pronounced turbulence. Glides are most frequently located at the transition between a pool and the head of a riffle.

RUNS are long, most often straight, low gradient stream reaches with stable banks and no major flow obstructions. The typical substrates are gravel and cobbles. Often the area of velocity cross over in a meander sequence.

STEP RUNS are low gradient reaches with occasional sections of small (1.6-6.6 ft; 0.5-2 m long) riffles. These reaches fit the description of a run but contain small riffle steps. Substrates are typically boulder dominated.

EDGEWATERS are quiet, shallow areas found along the margins of the stream. These areas are similar to glides in many respects, the major difference being that water velocity is low and sometimes lacking.

POOLS

Secondary Channel Pool [SCP]	4
Backwater Pool Assoc. with Boulder [BPB]	5
Backwater Pool Assoc. with Rootwad [BPR]	6
Backwater Pool Assoc. with Large Debris [BPL]	7
Lateral Scour Pool Assoc. with Large Debris [LSL]	10
Lateral Scour Pool Assoc with Rootwad [LSR]	11
Lateral Scour Pool Assoc. with Bedrock [LSBK]	12
Lateral Scour Pool Assoc. with Boulder [LSBO]	20
Corner Pool [CRP]	22
Trench Pool [TRP]	8
Plunge Pool [PLP]	9
Upsurge Scour Pool [USP]	24
Dammed Pool [DPL]	13
Channel Confluence Pool [CCP]	19
Main Channel Pool Assoc. with Bedrock [MCP]	17
Pocket Water [POW]	21

SECONDARY CHANNEL POOLS are those that remain within the bankful margins of the stream after freshets. During summer low flows these pools may dry up and those remaining have little flow through them. Secondary channel pools are usually associated with gravel bars, but many contain sand and silt substrates.

SECONDARY CHANNEL (Also side channel) Relatively small, sometimes isolated pools and riffles in a smaller braid of the main channel and usually associated with gravel bars.

BACKWATER POOLS are found along channel margins and are caused by eddies around obstructions such as rootwads or boulders. This pool type is often quite shallow (<1 ft; <30 cm) and tends to be dominated by fine-grain substrates. Like secondary channel pools, backwater pools possess current velocities that are very low. The hydraulic control often is LOD, Rootwad(s), or Boulder(s).

LATERAL SCOUR POOLS are formed by flow impinging against one streambank or against a partial channel obstruction. The angle of impingement is greater than that for trench pools formed along bedrock. Often an undercut bank is associated with this pool type. The hydraulic control often is LOD, Rootwad, Boulder(s), or Bedrock.

CORNER POOLS are lateral scour pools resulting from a shift in channel direction, often associated with meander sequences.

TRENCH POOLS are long, generally deep pools in a stable substrate. Channel cross sections are typically U-shaped with a course-grained bottom flanked by bedrock walls. Current velocities in trench pools are the swiftest of any pool type and the direction of flow is most uniform.

PLUNGE POOLS occur where the stream passes over a complete or nearly complete channel obstruction and drops steeply into the streambed below, scouring out a depression. This pool type is large and often quite deep (>3 ft; >1 m). The flow diverges from where it plunges into the pool. Substrate particle size is highly variable.

UPSURGE SCOUR POOL Formed by scouring under an elevated stream obstruction, often spanning the wetted channel, such as a log. Sometimes called under scour pool.

DAMMED POOLS consist of water impounded upstream from a complete or nearly complete channel blockage. Typical causes of dammed pools are debris jams, rock landslides, or beaver dams. Depending on the size of the blockage, dammed pools may be very large. Water velocity in this pool type is characteristically low and substrates tend toward smaller gravels and sand if the blockage is old or sediment inputs are large.

MAIN CHANNEL POOL ASSOCIATED WITH BEDROCK. Pools cover the entire stream channel and are associated with one bedrock bank and typically a bend in the stream. These pools are generally the largest and deepest pools in the stream. The scour encompasses the entire channel rather than a portion of the channel as for a lateral scour pool. Water velocity is quite slow. Substrate varies from sand to boulders.

CHANNEL CONFLUENCE POOLS are found at the downstream end of islands where two or more channels meet. The scour is formed by the action of the two channels meeting. Water velocity in these pools is slow but generally faster than velocities found in other pools.

POCKET WATER is a series of small pools surrounded by swiftly flowing water, usually caused by eddies behind boulders, rubble, or logs, or by potholes in the stream bed.

Habitat Typing (combined with direct observation of fish) provides the means to:

1. Physically describe 100% of the available habitat in a basin, without extrapolation from index reaches.
2. Provide a data base for conducting limiting factor analysis of a fishery or fisheries, facilitating mitigation/restoration planning and fishery management.

HABITAT PARAMETERS

For each discrete unit, the following measurements are taken:

Numbering Each integral unit of fish habitat is consecutively numbered from the mouth of Lost Man Creek station 0+00 to station 20+50, and is assigned a habitat type number according to Bisson/Decker's numbering system (above).
Length Average length is determined using an optical rangefinder, with optical calibrations on 20% of the units measured using a field tape.
Width Average unit width is the average of two measurements taken at 1/4 and 3/4 of the length from the tail of the unit to the head of the unit. Measurements are taken using an optical rangefinder and field tape.
Surface Area Calculated by multiplying the average length by the average width of the unit.
Average Depth Average unit depth is the average depth of two cross sections, taken at 1/4 and 3/4 of the length from the tail of the unit to the head of the unit. Measurements are taken using a stadia rod.
Maximum Depth Maximum thalweg depths are determined using a stadia rod.
Pool Tail Crest Maximum thalweg depth measured at the interface between the riffle head and the pool tail, to measure the depth of discharge above the unit's residual volume.
Volume Calculated by multiplying the surface area by the average depth.
Residual Volume Calculated by subtracting the pool tail crest depth from the average depth and multiplying the result by the surface area.
Spawning Area Area estimated to be of suitable depth, water velocity, and substrate composition for coho salmon spawning.

SHELTER RATING

For each habitat unit, a weighted shelter rating is determined. This weighted shelter rating system, is a replicable field procedure for micro habitat inventories which utilizes objective field measurements. It is intended to rate habitat unit structural complexity that serve as instream shelter or that create areas of diverse velocities which are focal points for salmonids. In this system, structural shelter is considered to be those elements within a stream channel that provide: protection from predation for salmonids; areas of reduced water velocities in which fish can rest and conserve energy; divisions of units to reduce density related competition. This approach does not consider elements affected by changes in discharge, such as water surface turbulence and water depth or seasonal factors such as overhanging terrestrial vegetation.

Percent Cover: Percentage of the habitat unit area occupied by the dominant instream shelter element or the shelter cover selected by the targeted fish species and cohorts.

Shelter Complexity: A value assigned to instream habitat structure and its resulting velocity complexity. This value is a measure of the instream structural quantities and its composition (organic-inorganic).

Value	Shelter Complexity
0.0	-No Shelter
1.0	-Cobble: 2.5-10.0", 6.4-25.6cm -Bedrock ledges
2.0	-1 or 2 pieces of Large Organic Debris (>1' dia, 30.5 cm) -1 or 2 Boulders (>10.0", 25.6cm") -Single Rootwad piece
3.0	-Combinations of solitary pieces of: LOD/ Boulder/ Stump-Rootwad -Multiple:>2 LOD complex -Multiple:>2 Boulder/Rock matrix -Overhanging Banks/Live root systems -Submerged/floating full tree crowns

Weighted Rating: Adjusted values for the unit's shelter rating are obtained by multiplying the percent of escape cover times the shelter complexity value. Identification of habitat unit shelter and shelter selection by fish from direct observations will facilitate documentation of thresholds resulting in increased densities of individual or multiple cohorts capable of occupying similar surface area/volume of habitat but with increased structural shelter and velocity complexity.

This weighted shelter rating can be further expanded during direct observation. To document in greater detail the location of structural elements, and the selection of specific types of shelter by salmonids or different cohorts. This may reflect selection or response to variations in degrees of cover or velocity complexity available.

Plan View Position:
Upstream 1/3
Middle 1/3
Downstream 1/3
Cross-Sectional Position:
Edgewater Zone
Middle Zone
Thalweg Zone
Vertical Position:
Bottom
Continuous
Overhead

20% SAMPLING

Several additional parameters are collected on 20 % of the identified habitat units. One of the first five units numbered from the mouth of Lost Man Creek was randomly selected and every fifth unit thereafter made up the 20 % sample base. For each sampling unit, direct observation of fish is conducted (see below) and the follwing additional physical parameters are collected.

Substrate Composition of the bottom substrate expressed as the percentage of each of nine substrate size categories: silt/clay; sand (<0.2 cm.); gravel (0.2-6.4 cm.); small cobble (6.4-12.8 cm.); large cobble (12.8-25.6 cm.); small boulder (25.6-51.2 cm.); medium boulder (51.2-102.4 cm.); large boulder (>102.4 cm.); bedrock.

Percent Exposed Estimated percentage of the bottom substrate that is exposed above the water surface in an overhead (plan) view

Invertebrate Abundance Number of larval invertebrates per square meter, determined by sampling several randomly selected rocks whose combined surface area is approximately 1 meter and counting all invertebrates observed.

Crown Cover Estimated percentage of the water surface area that is covered by tree canopies in an overhead (plan) view.

Temperature Air temperature and water temperature in degrees centigrade.

Velocity Average surface water velocity calculated from three timed float determinations, taken in the middle zones and thalweg area.

C.BIOLOGICAL SAMPLING:

DIRECT OBSERVATION

A cost-effective (and enlightening) method to determine fish distribution in a stream is to dive selected habitat types and directly observe the fish. Two divers armed with masks, snorkels and wet suits enter the selected habitat unit at the downstream end and swim (or crawl) to the upstream end, each counting and identifying all the fish they see. Steelhead 0+ and 1+ and coho salmon 0+ cohorts are tallied separately. The average of the two total counts is used for the habitat unit population estimate. Since riffles are difficult to effectively dive and count fish, direct observation is conducted only on sample unit pools and runs. Habitat units with excessive channel widths require

delineation of several diving lanes and a number of divers. Contract limitations has prevented the sampling of these multi-lane units.

In the fish inventory summaries, the average number of fish per habitat unit are calculated and entered by habitat type. The fish averages are then divided by the average unit area to determine the number of fish per square meter and divided by the average unit volume to determine the number of fish per cubic meter.

Biological sampling of fish provides the means to:

1. Biologically quantify from direct observations, habitat and shelter utilization and selection by different fish species and cohorts.
2. Estimate standing crops of individual fish species and cohorts within the entire basin.
3. Establish base line data of the physical habitat and biological utilization of the habitat in order to monitor responses of the aquatic system to mitigation/restoration efforts or cumulative effects from upstream/upslope activities.

ELECTROFISHING

Electrofishing is used to calibrate the previously mentioned direct observations. Representative pool and run direct observation diving units are randomly selected for electrofishing. Block nets are placed at the upstream and downstream ends of the habitat unit and a multiple pass removal depletion method of electrofishing is conducted. Electrofishing data is analyzed (Carle *et al*, 1978) to generate a fish population estimate with statistical parameters. The more accurate electrofishing total count per unit is divided by the direct observation count to provide a calibration factor for the remaining direct observation counts.

II.ANALYSIS

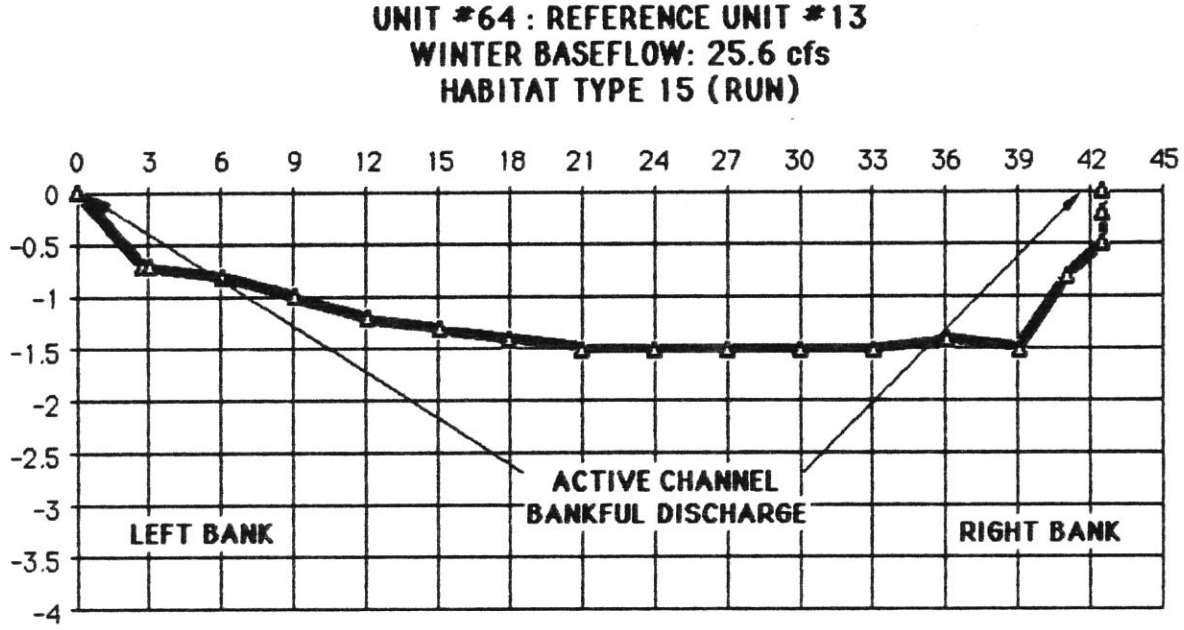
A.STREAM CLASSIFICATION:

Approximately 90% (1,837 meters) of the Lost Man Creek study area from its confluence with Prairie Creek is a C3 channel type and 10% 213 meters from the confluence of Larry Dam Creek to the bridge has characteristics of a C1 channel type as described by Rosgen 1985. Because of the limited area encompassed the C1 characteristics will not be analyzed further.

Strata for the purposes of this project were established around the influence exerted by the Last Man Creek dam. The Lower stratum of Lost Man Creek is from station 0+00 (confluence with Prairie Creek) to station 14+33 at which point were the longitudinal channel profile is no longer directly influenced by the the dam's elevation. The upper stratum is from station 14+33 to station 20+50 at the Lost Man Creek picnic ground bridge.

The Lower Stratum is a low gradient meandering gravel bed channel, described as a C3 under Rosgen's classification scheme. The characteristics of this channel reach are as follows. **Valley confinement** is a ratio of the active floodplain [recurring at frequent intervals (≤20 year)] width to the

average width of the active channel at bankful discharge [the frequent event (1.5 year recurrence interval)]. The lower stratum valley confinement ratio is ≥ 2.5, the bankful width average is 10.7 meters (35.0') and the floodplain average width is equal to or greater than 25.7 meters (87.5'). Average **water slope** at annual bankful discharge of this stratum is approximately 0.5-0.7%. The **particle size distribution** d35 is sand (<0.2 cm), d50 is gravel (0.2-6.4 cm) and d85 is small cobble (6.4-12.8 cm). The active **channel entrenchment** ranges from slight to moderate. The average width to depth ratio is 37. **Sinuosity**, the ratio of the channel length to the valley length, for the study area is 1.2.



STREAM CLASSIFICATION SAMPLE UNIT CROSS SECTIONAL PROFILE

This channel reach is an alluvial landform and has relatively unstable stream banks. The dominant particles are gravel, sand and small cobble. Extensive deciduous and coniferous overstory with dense brush and perennial vegetation has in many areas, temporarily increased, the inherent armament of the floodplain and stream banks above the annual scour zone. Channel bed armament is low because of the small particle sizes (gravel), in a reach dominated by alluvial landforms, such as river terraces. Features which occupy the cross sectional area of the channel or reduce the channel gradient will reduce the stream's ability to carry bedload, resulting in deposition and lateral shifts in the velocity vectors in the water column. With noncohesive bank materials such as gravel, entrainment of stream bank particles may cause banks to rejuvenate and channels to widen, increasing channel roughness and depositional features such as point and central bars. These factors could cause migration of the channel until the channel again recovers and reaches a cross sectional geometry that restores its competence. Habitat type structural features and their stability are determined by the channel type's characteristics and the equilibrium of the channel adjustment processes at work.

An increase in sediment supplied to this channel (a potential from the removal of the Lost Man Dam) will cause an adjustment in the channel geometry to compensate for the influx of bed load. Lost Man Creek, with its low stream power, reduced competence to carry bedload, resulting in the deposition of bedload. The adjustment process for this type of channel would be to initiate lateral migrations of the active channel resulting from the sediment induced depositional bar features. Bed load will be further introduced as streambank rejuvenation results from the lateral migration of the channel. Undercutting of adjacent riparian overstory vegetation will recruit large diameter woody material into the active channel further increasing channel adjustment events and associated sediment increases.

Channel obstructions increase streambed aggradation in this stream type. Sedimentation will cause bar formation up and downstream of obstructions, resulting in decreased channel capacity, and lateral shifts in water velocities. As a gravel bed stream type, bed armoring is not well developed. This may create undercutting of channel obstructions that could destabilize the foundation of these habitat structures. The characteristics of the channel geometry and physical habitat are influenced by the dominant particle, gravel, the low stream power of the stream reach, and the mutually adjusting factors of confinement, channel entrenchment and sinuosity.

Pools compose 43-50% of the surface and 67-85% of the volume. The location of pool habitat types are 91.5-92% Lateral and 8-8.5% Main Channel. The hydraulic control element of these pools is 51-53% Large Organic Debris or Rootwads, 27% Boulders and 20-22% Bedrock or Meander Outturns.

The relatively shallow average maximum depths (0.6-0.7 m/2.0-2.3 ft) and low volumes (37.5-38.1 cu. m/1,339-1,360 cu ft) of the pool units, during summer baseflows, are related to the stream power of the stream reach, dominant particle size, bed armament and the vertical relief of the channel obstruction. Instream shelter in this low gradient laterally shifting channel is high in complexity value (1.93 for bedrock and corner pools, 2.46 for LOD/rootwads and 2.88 for boulder controlled pool units) but low in effected weighted area (0.37 for bedrock and corner pools, 0.52 for LOD/rootwads and 1.02 for boulder controlled pool units). The probability of use or the effective useable surface area and volume of pool units in this channel type is reduced as a function of the channel geometry. Introduction of bedload causing adjustments of the channel geometry will shift the habitat to wider shallower units with a reduction in weighted shelter values. The surface area and volume of habitat types in this channel reach could shift significantly from pools to riffle and run habitats, as the channel adjusts to increase bedload.

This channel type is predominately gravel(0.2-6.4 cm) with sand (<0.2 cm), and small cobble (6.4-12.8 cm) substrate. Spawning habitat substrates, water depths, velocities and adult shelter do not pose limitations in this channel type for either chinook or coho salmon and steelhead trout. The dominant substrate composition of gravel, sand, and small cobble would indicate a mobile substrate with potential negative effects to eggs, aelivn and overwintering juveniles.

B.PHYSICAL HABITAT ANALYSIS:

Habitat typing was conducted on the lower 2050 meters of Lost Man Creek. The lower 1430 meters was the area considered under the influence of the Lost Man Dam and was treated as Stratum 1, Lower Lost Man Creek. The upper 620 meters was treated separately as Stratum 2, Upper Lost Man Creek.

All field data, including the 20% sampling data, was entered on a computer spread sheet so that all the field data for any habitat type unit was in that unit's row. Habitat units were entered in numerical order, starting at the mouth and proceeding upstream. Stratum 1 at summer baseflow includes from Unit #1 to Unit #92. Stratum 2 at summer baseflow starts at Unit #93 and goes to Unit #143.

Each stratum (four total strata, two at winter baseflow and two at summer baseflow) was treated as a discrete database, as follows. An extraction was carried out that separated all habitat types by their habitat type number (#1 is a low gradient riffle, etc.). The data was then summarized by totalling and averaging each parameter and those totals and averages were entered on the appropriate summary sheet. To assist in visualizing the large amount of information, histograms and pie charts were developed for some of the more pertinent parameters (distribution of habitat types, surface area of each habitat type, etc). Detailed analysis of the physical data in the form of tables and charts is enclosed.

It should be mentioned that an almost infinite variety of combinations can be extracted using the data, depending on the objectives of the investigator. For example, one could extract all the pool types that have a maximum depth $\geq$ 1 meter with a weighted shelter rating $\geq$ 2.0.

C.BIOLOGICAL SAMPLING:

The objective of the biological sampling (direct observation of salmonids adjusted by electrofishing) was to determine habitat type selection given the habitat available, by salmonid species and cohort in the survey section during summer baseflow. Contract limitations did not allow for a sampling design to fully determine the limiting factors to full fisheries potential. Limiting factor analysis for anadromous salmonids at its current stage requires targeting of a single species, inventories of summer and winter habitat throughout the entire anadromous basin, fish population sampling on at least 10% of the basin (at least during summer conditions), and spawning surveys conducted during the spawning season. Very little information concerning interspecific relationships between anadromous salmonids is available for use with limiting factor analysis or for determining carrying capacity projections for more than a single species.

CHINOOK SALMON

Chinook salmon (*Oncorhynchus kisutch*) prefer gravel sizes from $\approx$ 2 cm to 10.6 cm for spawning (Raleigh *et al* 1986), slightly larger than either coho salmon or steelhead. Although spawning surveys were outside the scope of this project, a survey conducted on December 12, 1985 found a number of chinook salmon redds, live adults, and carcasses below Lost Man Dam and considerably less above the dam.

Chinook salmon in the Northern California area either migrate out of their natal streams within a few weeks of hatching or they rear in deep, slow pools in summer and use LOD and substrate for winter rearing cover. In the direct observation conducted on Lost Man Creek for this survey, no chinook juveniles were observed. It is assumed that chinook salmon do not rear for much time in Lower Lost Man Creek before they migrate out of the system. Rearing habitat is consequently not likely a limiting factor for chinook salmon in Lost Man Creek.

COHO SALMON

During winter base flow sampling on Lost Man Creek, we conducted an inventory of spawning habitat area for coho salmon (*Oncorhyncus kisutch*) which was based on visual estimates of suitability (based on Keith Barnard's experience working with coho salmon redds on Freshwater Creek during winter, '87-'88 for his MS. thesis). It must be stated that at the time of survey (June, 1988), the discharge was comparable to winter base flows but there was no visible indication of redds. Spawning area surveys should normally be conducted during the winter spawning season, but we felt that within the contract limitations some indication of available gravels would help determine whether spawning area is a limiting factor for full fish production.

A spawning pair of coho salmon in general require approximately 3 square meters of gravels in the size range of 1.3-10.2 cm., with a water depth of >15 cm. and water velocity range of 21-70 cm./sec. to construct a spawning redd (McMahon 1983). This type of substrate is usually found at the tail of pools and at the head of riffles. In Lower Lost Man Creek (Station 0+00 - 14+33), we identified ≈1530 m^2 of spawning area which could represent a maximum of 510 coho redds. In Upper Lost Man Creek (Station 14+33 - 20+50), ≈887 m^2 which could represent 296 redds. Most of the suitable spawning ares were associated with riffle heads. In a very simplified application to a model used by Reeves *et al* (1988), each redd would represent 825 fry which survive to emergence. This would equate to 420,750 fry for the lower section and 244,200 for the upper. Potential carrying capacity for available summer rearing habitat, using the same model, can be estimated by multiplying the total area of pools, glides and riffles by 1.5 fish/m^2, 0.8 fish/m^2, and 0.4 fish/ m^2, respectively. The potential carrying capacity is 10,412 for the lower stratum, and 4970 for the upper stratum. Although these numbers convey a simple model with a single species, they indicate that spawning gravels in the survey section are not likely a limitation.

After emergence, coho juveniles generally rear for 1 to 2 years in freshwater before migrating to the ocean. Coho seem to prefer rearing areas which are large pools (50 -250 m^2), greater than 0.3 m deep, with slow water velocity (<30 cm/sec) and cover composed of woody debris and overhanging banks (McMahon 1983). Lateral scour pools associated with LOD and rootwads (#10 and #11), which meet the above prefered criteria, combine to make up the largest percentage of pool types in both of the surveyed sections of Lost Man Creek. In an extremely general model, a pool to riffle ratio (where runs are considered riffles) of 1:1 is optimum for summer rearing for coho salmon. In both strata of the Lost Man Creek study area, pools make up more than 50% of the total wetted surface area (51.5%, in the lower, 55.6% in the upper).

During the winter, coho salmon prefer rearing in deeper (>.45 m) and slower (<15 cm/sec) areas than in the summer. They tend to select pools associated with dense roots and logs, secondary channel pools, backwater pools and beaver or dammed pools. Shelter features in these pool types offer rearing juveniles protection from downstream displacement by high stream flows (McMahon 1983). The physical summaries of the winter base flow habitat survey of Lost Man Creek demonstrate a low percentage of these prefered types in both strata. The average depths of all pools during winter flow is 0.5 m, just barely deeper than prefered, and the average weighted shelter rating for pools is a relatively low 0.9.

STEELHEAD TROUT

Steelhead (*Salmo gairdneri gairdneri*) prefer spawning gravel of essentially the same size as that of coho salmon, but they seem to be more opportunistic than coho and may spawn in areas with less than perfect gravel conditions with smaller substrate sizes. Adequate spawning gravels for steelhead appear to be plentiful in the surveyed sections of Lost Man Creek.

Steelhead juveniles rear from 1 to 2 years in freshwater before smolting and migration to the ocean, similar to coho. Summer rearing requirements for steelhead are again very similar to coho salmon, although steelhead tend to use shallower pools with cobble and boulders for shelter more than coho. Summer rearing conditions for steelhead in Lost Man Creek appear to be adequate.

Steelhead use LOD, cobble and boulders as winter rearing cover. Between the LOD pools, boulder pools and pocket water available during winter flows in the survey sections of Lost Man Creek, it would seem that there is more winter rearing habitat available to steelhead than coho salmon.

DIRECT OBSERVATION

The direct observation results from this survey indicate that there are more coho juveniles in the surveyed sections than steelhead. No age 1 coho salmon were observed in any unit. No clear cut preference by coho salmon or steelhead for any particular habitat type is indicated by the results. Reeves *et al* (in press) suggest that a potential carrying capacity for juvenile coho salmon is as high as 1.5 fish/m^2 for pool habitat. The average density of coho juveniles for this survey was 0.53 fish/m^2 in the pools of the lower section, and 0.38 fish/m^2 in the upper pools.

The observed rearing density for coho salmon in the Lost Man Creek survey section is less than optimum (Reeves *et al*, in press) and indicates that there is likely a factor which is limiting the population. To conduct a valid limiting factor analysis, a survey of the sort conducted under this contract is required for the entire anadromous section of a Lost Man Creek, along with winter spawning surveys. From the information that is available, though, it appears that winter rearing habitat may be somewhat limited for coho salmon in the lower section. Shelter ratings and depths for winter rearing type pools appear to be less than ideal.

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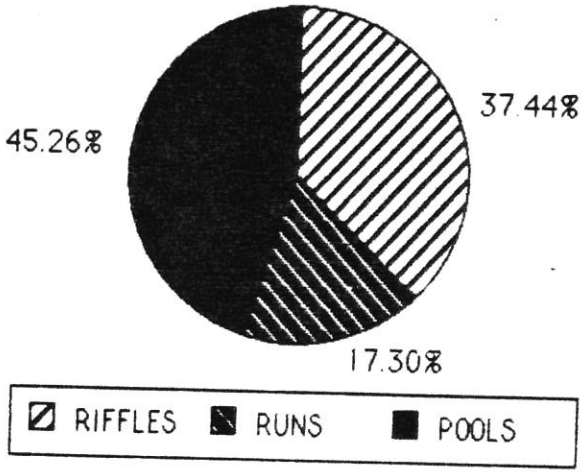
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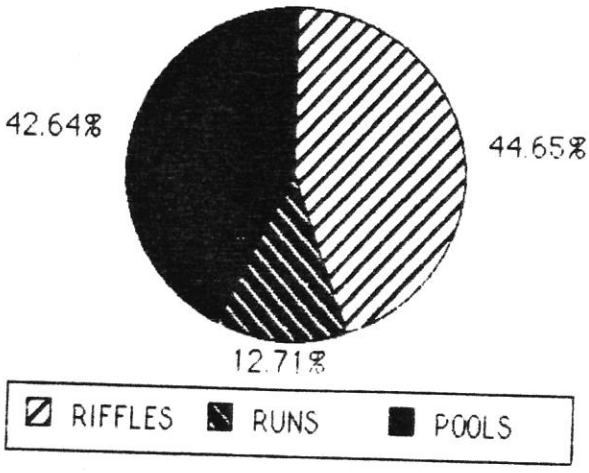
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APPENDIX A

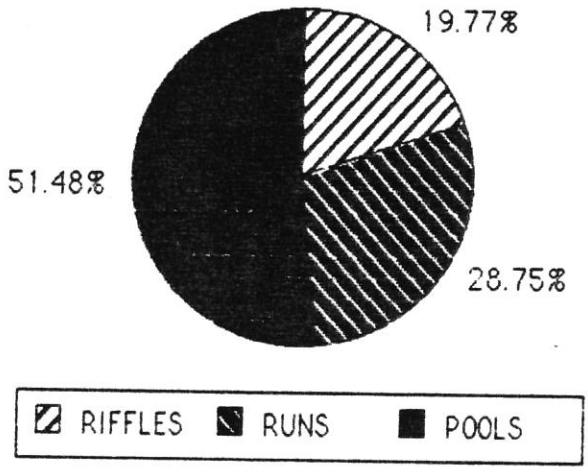
LOWER LOST MAN CREEK
AREA DISTRIBUTION
WINTER BASEFLOW



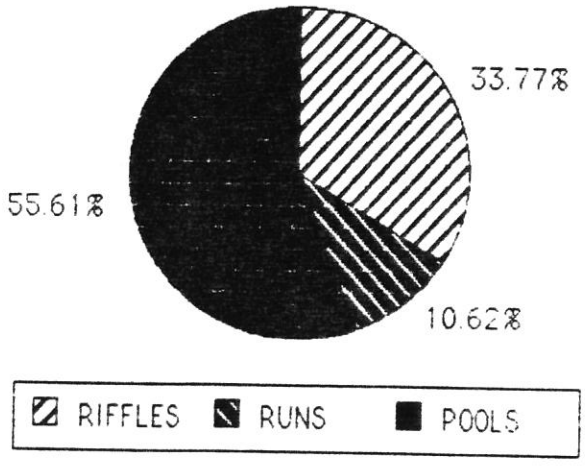
UPPER LOST MAN CREEK
AREA DISTRIBUTION
WINTER BASEFLOW



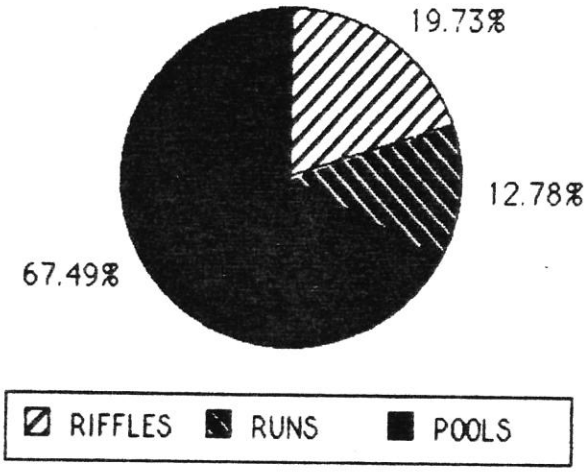
LOWER LOST MAN CREEK
AREA DISTRIBUTION
SUMMER BASEFLOW



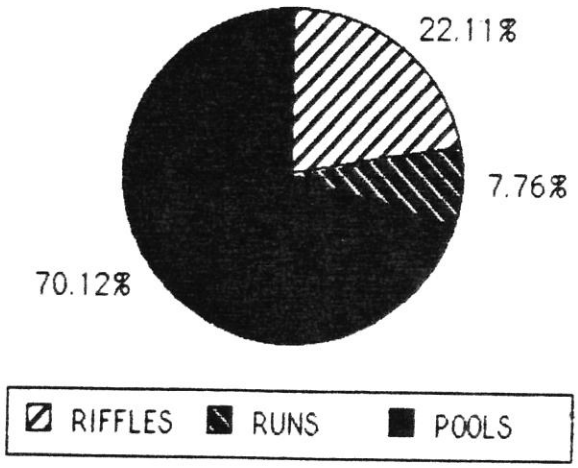
UPPER LOST MAN CREEK
AREA DISTRIBUTION
SUMMER BASEFLOW



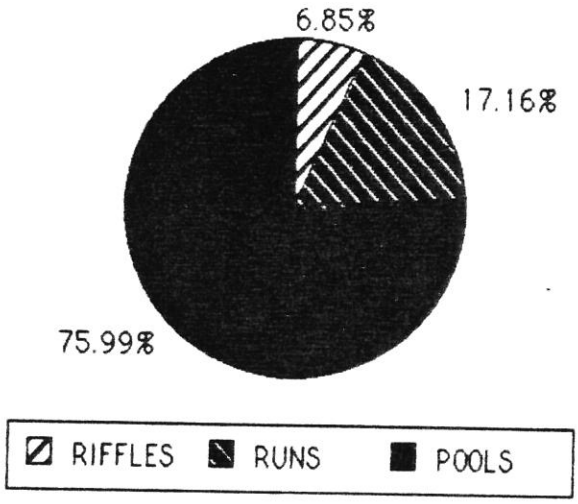
LOWER LOST MAN CREEK
VOLUME DISTRIBUTION
WINTER BASEFLOW



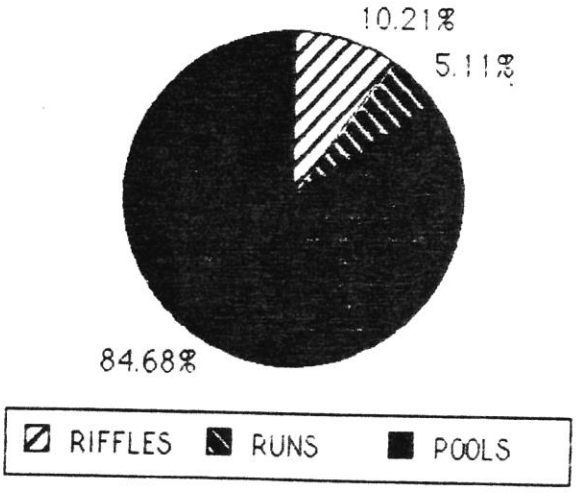
UPPER LOST MAN CREEK
VOLUME DISTRIBUTION
WINTER BASEFLOW



LOWER LOST MAN CREEK
VOLUME DISTRIBUTION
SUMMER BASEFLOW



UPPER LOST MAN CREEK
VOLUME DISTRIBUTION
SUMMER BASEFLOW



APPENDIX B

UNIT: METRIC

LOWER LOST MAN CREEK (0 - 1433 m.)
HABITAT TYPE PHYSICAL SUMMARY
SUMMER BASEFLOW

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	WIDTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING % COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SAMPLE UNITS
RIFFLES																				
LO GRAD. RIFFLES	1	24	26.4%	333.0	20.9%	13.9	5.1	1743.0	18.1%	72.6	0.1	0.3	0.1	136.5	6.1%	5.7	23.2%	1.6	0.4	3
HI GRAD. RIFFLES	2	1	1.1%	12.2	0.8%	12.2	3.0	37.2	0.4%	37.2	0.1	0.1	0.1	3.4	0.2%	3.4	75.0%	1.0	0.8	0
"CHUTE"	23	2	2.2%	10.4	0.7%	5.2	11.6	123.2	1.3%	61.6	0.1	0.3	0.2	14.5	0.6%	7.2	0.0%	0.0	0.0	0
TOTAL/AVG.	**3**	**27**	**29.7%**	**355.6**	**22.3%**	**13.2**	**5.5**	**1903.4**	**19.8%**	**70.5**	**0.1**	**0.3**	**0.1**	**154.4**	**6.8%**	**5.7**	**23.4**	**1.5**	**0.4**	**3**
RUNS																				
GLIDE	14	10	11.0%	109.0	6.8%	10.9	5.5	656.3	6.8%	65.6	0.1	0.3	0.2	89.3	4.0%	8.9	11.3%	1.1	0.1	1
RUN	15	8	8.8%	249.0	15.6%	31.1	6.5	2006.0	20.8%	250.8	0.1	0.3	0.2	274.9	12.2%	34.4	18.8%	1.8	0.3	2
STEP RUN	16	1	1.1%	26.8	1.7%	26.8	4.0	106.3	1.1%	106.3	0.2	0.4	0.4	22.7	1.0%	22.7	65.0%	1.0	0.7	0
TOTAL/AVG.	**3**	**19**	**20.9%**	**384.8**	**24.1%**	**20.3**	**5.8**	**2768.6**	**28.8%**	**145.7**	**0.1**	**0.4**	**0.2**	**386.9**	**17.2%**	**20.4**	**17.3%**	**1.4**	**0.2**	**3**
POOLS																				
2° CHANNEL POOL	4	4	4.4%	53.3	3.3%	13.3	2.5	133.8	1.4%	33.5	0.1	0.6	0.3	20.0	0.9%	5.0	15.0%	2.3	0.3	0
BCKWTR./BOUL.	5	2	2.2%	21.3	1.3%	10.7	5.0	75.7	0.8%	37.9	0.3	0.5	0.5	23.1	1.0%	11.5	40.0%	2.5	1.0	0
BCKWTR./LOD	7	1	1.1%	3.7	0.2%	3.7	1.8	6.7	0.1%	6.7	0.2	0.3	0.3	1.4	0.1%	1.4	5.0%	1.0	0.1	0
PLUNGE POOL	9	3	3.3%	30.2	1.9%	10.1	12.5	356.0	3.7%	118.7	0.6	1.1	1.0	224.2	9.9%	74.7	31.7%	3.0	1.0	0
LAT. SCOUR/LOD	10	13	14.3%	277.0	17.4%	21.3	6.0	1753.0	18.2%	134.8	0.4	1.3	0.7	684.0	30.3%	52.6	23.5%	2.8	0.7	5
LAT. SCOUR/RTWD.	11	5	5.5%	87.5	5.5%	17.5	4.5	412.2	4.3%	82.4	0.3	0.6	0.5	131.5	5.8%	26.3	14.6%	2.8	0.4	1
LAT. SCOUR/BDRK.	12	2	2.2%	36.0	2.3%	18.0	4.6	164.3	1.7%	82.2	0.2	0.5	0.5	37.4	1.7%	18.7	21.5%	1.5	0.3	1
LAT. SCOUR/BOLL	20	8	8.8%	201.0	12.6%	25.1	5.5	1143.0	11.9%	142.9	0.4	1.1	0.6	386.5	17.1%	48.3	15.8%	2.9	0.5	1
POCKET WATER	21	2	2.2%	83.8	5.3%	41.9	10.8	571.8	5.9%	285.9	0.2	0.5	0.4	101.2	4.5%	50.6	35.0%	3.0	1.1	0
CORNER POOL	22	5	5.5%	59.8	3.8%	12.0	5.1	341.3	3.5%	68.3	0.3	0.6	0.5	103.9	4.6%	20.8	11.0%	1.8	0.2	2
TOTAL/AVG.	**10**	**45**	**49.5%**	**853.6**	**53.6%**	**19.0**	**5.8**	**4957.8**	**51.5%**	**110.2**	**0.3**	**1.3**	**0.6**	**1713.2**	**76.0%**	**38.1**	**20.3**	**2.6**	**0.5**	**10**

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	WIDTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING % COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SAMPLE UNITS
RIFFLES	**3**	**27**	**29.7%**	**355.6**	**22.3%**	**13.2**	**5.5**	**1903.4**	**19.8%**	**70.5**	**0.1**	**0.3**	**0.1**	**154.4**	**6.8%**	**5.7**	**23.4%**	**1.5**	**0.4**	**3**
RUNS	**3**	**19**	**20.9%**	**384.8**	**24.1%**	**20.3**	**5.8**	**2768.6**	**28.8%**	**145.7**	**0.1**	**0.4**	**0.2**	**386.9**	**17.2%**	**20.4**	**17.3%**	**1.4**	**0.2**	**3**
POOLS	**10**	**45**	**49.5%**	**853.6**	**53.6%**	**19.0**	**5.8**	**4957.8**	**51.5%**	**110.2**	**0.3**	**1.3**	**0.6**	**1713.2**	**76.0%**	**38.1**	**20.3%**	**2.6**	**0.5**	**10**
TOTAL/AVG.	**16**	**91**	**100.0%**	**1594.0**	**100.0%**	**17.5**	**5.7**	**9629.8**	**100.0%**	**105.8**	**0.2**	**1.3**	**0.4**	**2254.5**	**100.0%**	**24.8**	**20.6%**	**2.0**	**0.4**	**16**

UNIT: METRIC

LOWER LOST MAN CREEK (0 - 1433 m.)
HABITAT TYPE SAMPLE UNIT SUMMARY
SUMMER BASEFLOW

HABITAT	HABITAT	SAMPLE	INVERT	CROWN	AVG. SUBSTRATE PERCENTAGE PER SAMPLE UNIT									
DESCRIPTIONS	TYPES	UNITS	ABUND	COVER	SILT CLAY	SAND <0.2cm	GRAVEL 0.2-6.4	COBBLE 6.4-12.8	COBBLE 12.8-25.6	BOULDER 25.6-51.2	BOULDER 51.2-102.4	BOULDER >102.4	BDRCK.	PERCENT EXPOSED
RIFFLES														
LO GRAD. RIFFLES	1	3	66	60.0%	6.7%	15.0%	40.0%	16.7%	11.7%	8.3%	1.7%	0.0%	0.0%	11.7%
TOTAL/AVG.	**1**	**3**	**66**	**60.0%**	**6.7%**	**15.0%**	**40.0%**	**16.7%**	**11.7%**	**8.3%**	**1.7%**	**0.0%**	**0.0%**	**11.7%**
RUNS														
GLIDE	14	1	50	85.0%	5.0%	20.0%	40.0%	20.0%	10.0%	5.0%	0.0%	0.0%	0.0%	0.0%
RUN	15	2	95	68.0%	5.0%	23.0%	30.0%	22.5%	15.0%	5.0%	0.0%	0.0%	0.0%	5.0%
TOTAL/AVG.	**2**	**3**	**80**	**73.7%**	**5.0%**	**22.0%**	**33.3%**	**21.7%**	**13.3%**	**5.0%**	**0.0%**	**0.0%**	**0.0%**	**3.3%**
POOLS														
LAT. SCOUR/LOD	10	5	83	57.0%	6.0%	20.0%	32.2%	24.0%	12.0%	4.4%	1.0%	0.0%	0.0%	0.0%
LAT. SCOUR/RTWD.	11	1	18	95.0%	5.0%	20.0%	40.0%	20.0%	10.0%	5.0%	0.0%	0.0%	0.0%	5.0%
LAT. SCOUR/BDRK.	12	1	93	85.0%	5.0%	25.0%	40.0%	20.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%
LAT. SCOUR/BOUL.	20	1	27	70.0%	5.0%	15.0%	35.0%	10.0%	10.0%	15.0%	10.0%	5.0%	0.0%	10.0%
CORNER POOL	22	2	68	60.0%	5.0%	20.0%	20.0%	25.0%	22.5%	7.5%	0.0%	0.0%	0.0%	0.0%
TOTAL/AVG.	**5**	**10**	**69**	**65.5%**	**5.5%**	**20.0%**	**31.6%**	**22.0%**	**13.5%**	**5.7%**	**1.5%**	**0.5%**	**0.0%**	**1.5%**

LOWER LOST MAN CREEK (0 - 1433 m.)
FISHERIES INVENTORY SUMMARY
SUMMER BASEFLOW
(SEPTEMBER, 1988)

HABITAT	HABITAT	# OF	AVG.AREA	AVG.VOL	AVG. NUMBER OF FISH PER UNIT					AVG. # OF FISH PER SQUARE METER					AVG. # OF FISH PER CUBIC METER				
DESCRIPTIONS	TYPES	SAMPLES	/UNIT	/UNIT	STEELHEAD			COHO SALMON		STEELHEAD			COHO SALMON		STEELHEAD			COHO SALMON	
					0+	1+	2+	0+	1+	0+	1+	2+	0+	1+	0+	1+	2+	0+	1+
RIFFLES																			
LO GRAD. RIFFLES	1	3	86.30	6.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL/AVG.	**1**	**3**	**86.30**	**6.20**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RUNS																			
RUN	15	1	33.8	4.12	9.50	1.00	0.00	20.00	0.00	0.28	0.03	0.00	0.59	0.00	2.30	0.24	0.00	4.85	0.00
TOTAL/AVG.	**1**	**1**	**33.82**	**4.12**	**9.50**	**1.00**	**0.00**	**20.00**	**0.00**	**0.28**	**0.03**	**0.00**	**0.59**	**0.00**	**2.30**	**0.24**	**0.00**	**4.85**	**0.00**
POOLS																			
LAT. SCOUR/LOD	10	5	107.70	36.10	18.40	3.60	0.60	44.70	0.00	0.17	0.03	0.01	0.42	0.00	0.51	0.10	0.02	1.24	0.00
LAT. SCOUR/RTWD.	11	1	106.00	32.30	17.00	5.00	0.00	49.50	0.00	0.16	0.05	0.00	0.47	0.00	0.53	0.15	0.00	1.53	0.00
LAT. SCOUR/BDRK.	12	1	78.00	19.03	11.50	0.00	0.00	44.00	0.00	0.15	0.00	0.00	0.56	0.00	0.60	0.00	0.00	2.31	0.00
LAT. SCOUR/BOUL.	20	1	57.20	33.14	22.50	7.50	0.00	54.00	0.00	0.39	0.13	0.00	0.94	0.00	0.68	0.23	0.00	1.63	0.00
CORNER POOL	22	2	90.60	26.80	8.00	1.75	0.00	56.50	0.00	0.09	0.02	0.00	0.62	0.00	0.30	0.07	0.00	2.11	0.00
TOTAL/AVG.	**5**	**10**	**96.09**	**31.86**	**15.90**	**3.40**	**0.30**	**48.40**	**0.00**	**0.17**	**0.04**	**0.00**	**0.53**	**0.00**	**0.50**	**0.10**	**0.01**	**1.59**	**0.00**

UNIT: METRIC

UPPER LOST MAN CREEK (1433 - 2050 m.)
HABITAT TYPE PHYSICAL SUMMARY
SUMMER BASEFLOW

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	WIDTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING % COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SAMPL UNITS
RIFFLES																				
LO GRAD. RIFFLES	1	14	26.9%	281.0	33.7%	20.1	4.5	1368.0	29.0%	97.7	0.1	0.3	0.2	117.3	9.1%	8.4	23.4%	1.4	0.3	1
HI GRAD. RIFFLES	2	2	3.8%	21.0	2.5%	10.5	10.4	224.1	4.8%	112.1	0.1	0.1	0.1	13.7	1.1%	6.8	42.5%	1.0	0.4	0
TOTAL/AVG.	**2**	**16**	**30.8%**	**302.0**	**36.2%**	**18.9**	**5.2**	**1592.1**	**33.8%**	**99.5**	**0.1**	**0.3**	**0.1**	**131.0**	**10.2%**	**8.2**	**25.8**	**1.4**	**0.3**	**1**
RUNS																				
GLIDE	14	5	9.6%	52.1	6.2%	10.4	8.2	405.7	8.6%	81.1	0.1	0.3	0.2	51.4	4.0%	10.3	13.0%	1.2	0.2	0
RUN	15	2	3.8%	23.2	2.8%	11.6	4.3	95.1	2.0%	47.6	0.2	0.2	0.2	14.1	1.1%	7.1	10.0%	1.5	0.2	1
TOTAL/AVG.	**2**	**7**	**13.5%**	**75.3**	**9.0%**	**10.8**	**7.1**	**500.8**	**10.6%**	**71.5**	**0.1**	**0.3**	**0.2**	**65.6**	**5.1%**	**9.4**	**12.1**	**1.3**	**0.2**	**1**
POOLS																				
2º CHANNEL POOL	4	6	11.5%	64.6	7.7%	10.8	3.7	227.1	4.8%	37.9	0.2	0.6	0.5	49.5	3.9%	8.3	29.3%	2.7	0.8	0
BCKWTR./BOUL.	5	2	3.8%	13.7	1.6%	6.9	4.6	79.0	1.7%	39.5	0.4	1.4	0.8	42.3	3.3%	21.2	50.0%	3.0	1.5	1
LAT. SCOUR/LOD	10	7	13.5%	113.0	13.5%	16.1	6.2	697.0	14.8%	99.6	0.4	1.3	0.8	266.3	20.8%	38.0	28.7%	2.7	0.8	2
LAT. SCOUR/RTWD.	11	8	15.4%	101.0	12.1%	12.6	4.9	525.9	11.2%	65.7	0.3	1.0	0.6	165.3	12.9%	20.7	18.4%	3.0	0.6	2
LAT. SCOUR/BDRK.	12	6	11.5%	165.0	19.8%	27.5	6.6	1093.0	23.2%	182.2	0.5	1.5	1.1	563.1	43.9%	93.9	24.7%	2.5	0.6	3
TOTAL/AVG.	**5**	**29**	**55.8%**	**457.3**	**54.8%**	**15.8**	**5.3**	**2622.0**	**55.6%**	**90.4**	**0.3**	**1.5**	**0.7**	**1086.5**	**84.7%**	**37.5**	**26.6**	**2.8**	**0.7**	**8**

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	WIDTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING % COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SAMPLI UNITS
RIFFLES	**2**	**16**	**30.8%**	**302.0**	**36.2%**	**18.9**	**5.2**	**1592.1**	**33.8%**	**99.5**	**0.1**	**0.3**	**0.1**	**131.0**	**10.2%**	**8.2**	**25.8%**	**1.4**	**0.3**	**1**
RUNS	**2**	**7**	**13.5%**	**75.3**	**9.0%**	**10.8**	**7.1**	**500.8**	**10.6%**	**71.5**	**0.1**	**0.3**	**0.2**	**65.6**	**5.1%**	**9.4**	**12.1%**	**1.3**	**0.2**	**1**
POOLS	**5**	**29**	**55.8%**	**457.3**	**54.8%**	**15.8**	**5.3**	**2622.0**	**55.6%**	**90.4**	**0.3**	**1.5**	**0.7**	**1086.5**	**84.7%**	**37.5**	**26.6%**	**2.8**	**0.7**	**8**
TOTAL/AVG.	**9**	**52**	**100.0%**	**834.6**	**100.0%**	**16.1**	**5.5**	**4714.9**	**100.0%**	**90.7**	**0.2**	**1.5**	**0.5**	**1283.0**	**100.0%**	**24.7**	**24.4%**	**2.1**	**0.5**	**10**

UNIT: METRIC

UPPER LOST MAN CREEK (1433 - 2000 m.)
HABITAT TYPE SAMPLE UNIT SUMMARY
SUMMER BASEFLOW

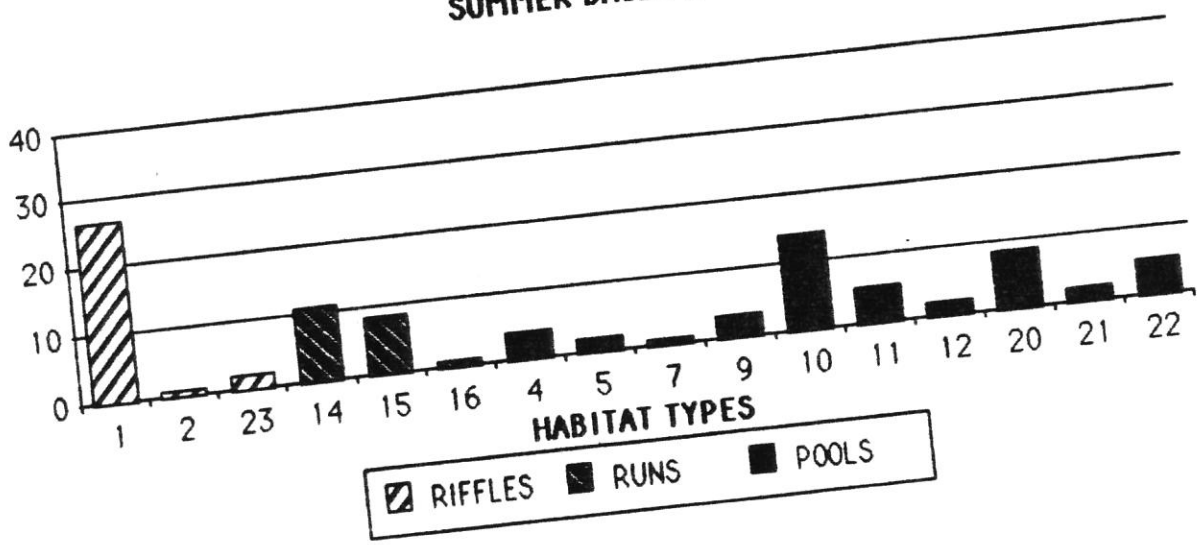
					AVG. SUBSTRATE PERCENTAGE PER SAMPLE UNIT									
HABITAT	HABITAT	SAMPLE	INVERT	CROWN	SILT	SAND	GRAVEL	COBBLE		BOULDER			BDRCK	PERCENT
DESCRIPTIONS	TYPES	UNITS	ABUND	COVER	CLAY	<0.2cm	0.2-6.4	6.4-12.8	12.8-25.6	25.6-51.2	51.2-102.4	>102.4		EXPOSED
RIFFLES														
LO GRAD. RIFFLES	1	1	98	90.0%	5.0%	10.0%	25.0%	35.0%	20.0%	5.0%	0.0%	0.0%	0.0%	20.0%
TOTAL/AVG.	**1**	**1**	**98**	**90.0%**	**5.0%**	**10.0%**	**25.0%**	**35.0%**	**20.0%**	**5.0%**	**0.0%**	**0.0%**	**0.0%**	**20.0%**
RUNS														
RUN	15	1	95	95.0%	5.0%	10.0%	25.0%	30.0%	20.0%	10.0%	0.0%	0.0%	0.0%	15.0%
TOTAL/AVG.	**1**	**1**	**95**	**95.0%**	**5.0%**	**10.0%**	**25.0%**	**30.0%**	**20.0%**	**10.0%**	**0.0%**	**0.0%**	**0.0%**	**15.0%**
POOLS														
BDR.WTR./BOUL	5	1	53	80.0%	35.0%	30.0%	10.0%	10.0%	15.0%	0.0%	0.0%	0.0%	0.0%	5.0%
LAT. SCOUR/LOD	10	2	98	25.0%	10.0%	33.0%	20.0%	23.0%	10.0%	5.0%	0.0%	0.0%	0.0%	0.0%
LAT. SCOUR/RTwD	11	2	110	52.5%	5.0%	23.0%	28.0%	28.0%	15.0%	2.5%	0.0%	0.0%	0.0%	5.0%
LAT. SCOUR/BDRK	12	3	70	28.3%	5.0%	40.0%	20.0%	17.0%	5.0%	1.7%	3.3%	1.7%	3.3%	6.3%
TOTAL/AVG.	**4**	**8**	**85**	**40.0%**	**10.0%**	**32.8%**	**20.8%**	**20.4%**	**10.0%**	**2.5%**	**1.2%**	**0.6%**	**1.2%**	**5.0%**

UPPER LOST MAN CREEK (1433 - 2000 m.)
FISHERIES INVENTORY SUMMARY
SUMMER BASEFLOW
(SEPTEMBER, 1988)

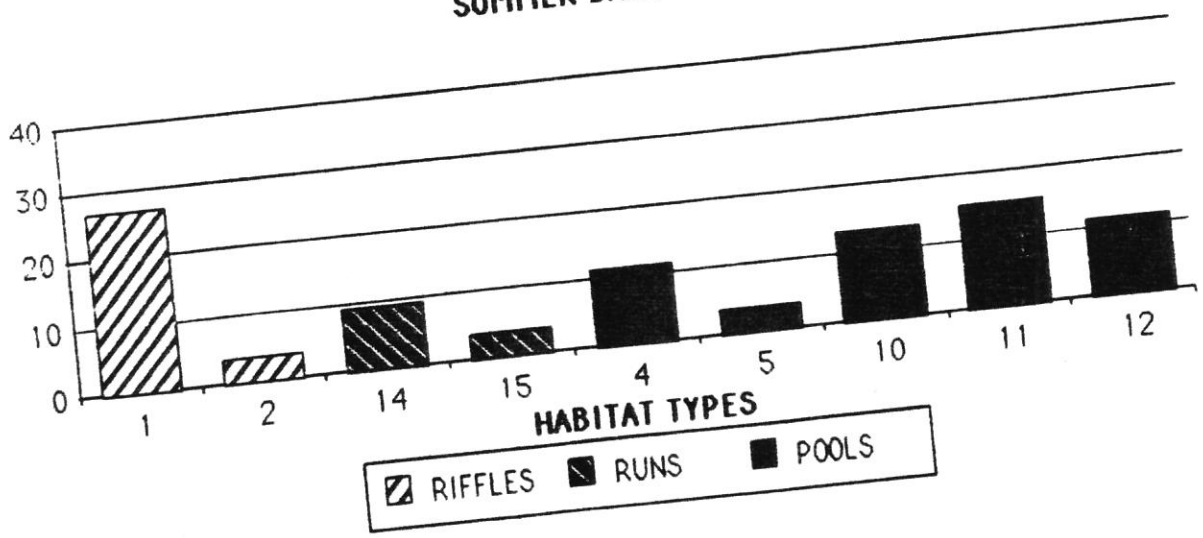
HABITAT DESCRIPTIONS	HABITAT TYPES	# OF SAMPLES	AVG.AREA /UNIT	AVG.VOL /UNIT	AVG. NUMBER OF FISH PER UNIT					AVG. # OF FISH PER SQUARE METER					AVG. # OF FISH PER CUBIC METER				
					STEELHEAD			COHO SALMON		STEELHEAD			COHO SALMON		STEELHEAD			COHO SALMON	
					0+	1+	2+	0+	1+	0+	1+	2+	0+	1+	0+	1+	2+	0+	1+
RIFFLES																			
LO GRAD. RIFFLES	1	1	12.20	4.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL/AVG.	**1**	**1**	**12.20**	**4.90**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RUNS																			
RUN.	15	1	47.6	7.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL/AVG.	**1**	**1**	**47.60**	**7.10**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
POOLS																			
ECRWTR./BOUL.	5	1	71.50	41.43	5.50	0.00	0.00	28.50	0.00	0.08	0.00	0.00	0.40	0.00	0.13	0.00	0.00	0.69	0.00
LAT. SCOUR/LOD.	10	2	131.80	53.51	31.50	2.25	0.00	64.50	0.00	0.24	0.02	0.00	0.49	0.00	0.59	0.04	0.00	1.21	0.00
LAT. SCOUR/RTWD.	11	2	116.40	41.93	20.75	1.50	0.75	45.00	0.00	0.18	0.01	0.01	0.39	0.00	0.49	0.04	0.02	1.07	0.00
LAT. SCOUR/BDRK.	12	3	245.60	140.30	33.67	1.17	0.00	72.33	0.00	0.14	0.00	0.00	0.29	0.00	0.24	0.01	0.00	0.52	0.00
TOTAL/AVG.	**4**	**8**	**163.09**	**81.65**	**26.38**	**1.38**	**0.19**	**58.06**	**0.00**	**0.17**	**0.01**	**0.00**	**0.38**	**0.00**	**0.38**	**0.02**	**0.00**	**0.85**	**0.00**

APPENDIX C

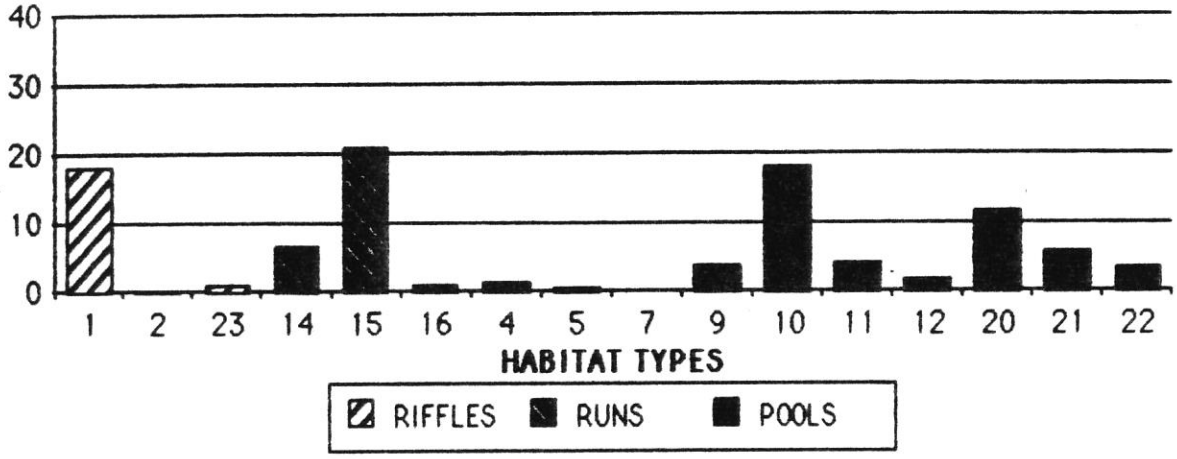
LOWER LOST MAN CREEK (0-1433 m.)
PERCENTAGE OF TOTAL NUMBER OF UNITS
BY HABITAT TYPE
SUMMER BASE FLOW



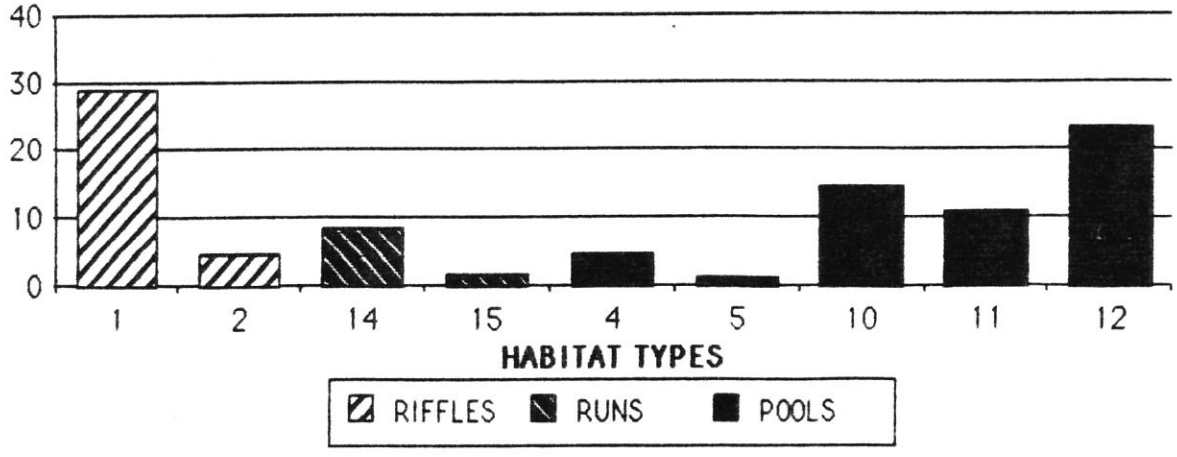
UPPER LOST MAN CREEK (1433 - 2050 m.)
PERCENTAGE OF TOTAL NUMBER OF UNITS
BY HABITAT TYPE
SUMMER BASE FLOW



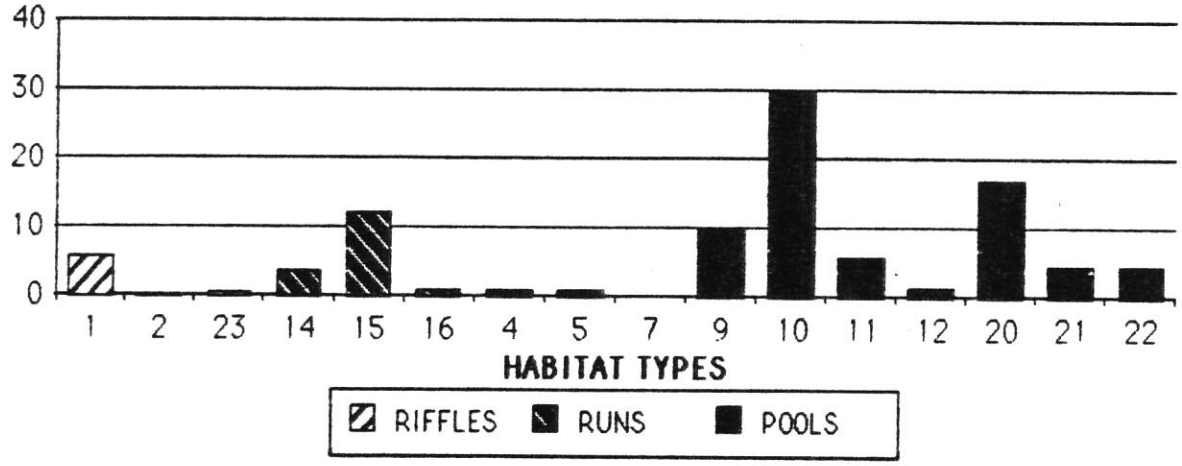
LOWER LOST MAN CREEK (0-1433 m.)
PERCENTAGE OF TOTAL SURFACE AREA
BY HABITAT TYPE
SUMMER BASE FLOW



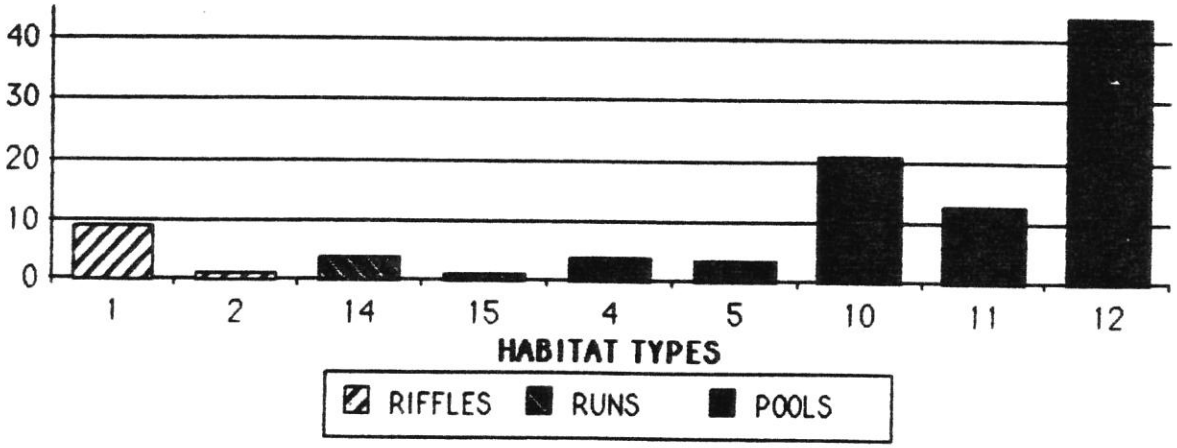
UPPER LOST MAN CREEK (1433 - 2050 m.)
PERCENTAGE OF TOTAL SURFACE AREA
BY HABITAT TYPE
SUMMER BASE FLOW



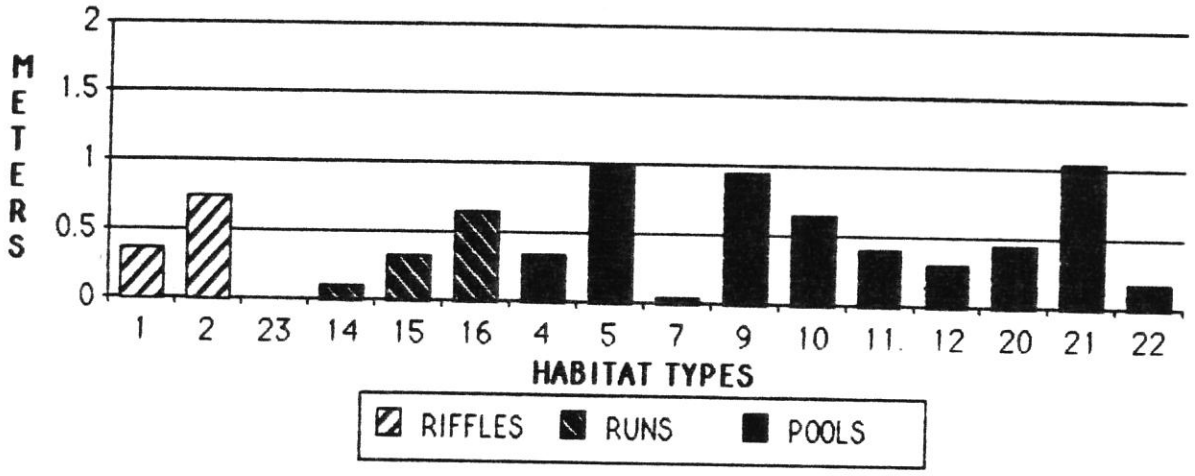
LOWER LOST MAN CREEK (0-1433 m.)
PERCENTAGE OF TOTAL VOLUME
BY HABITAT TYPE
SUMMER BASE FLOW



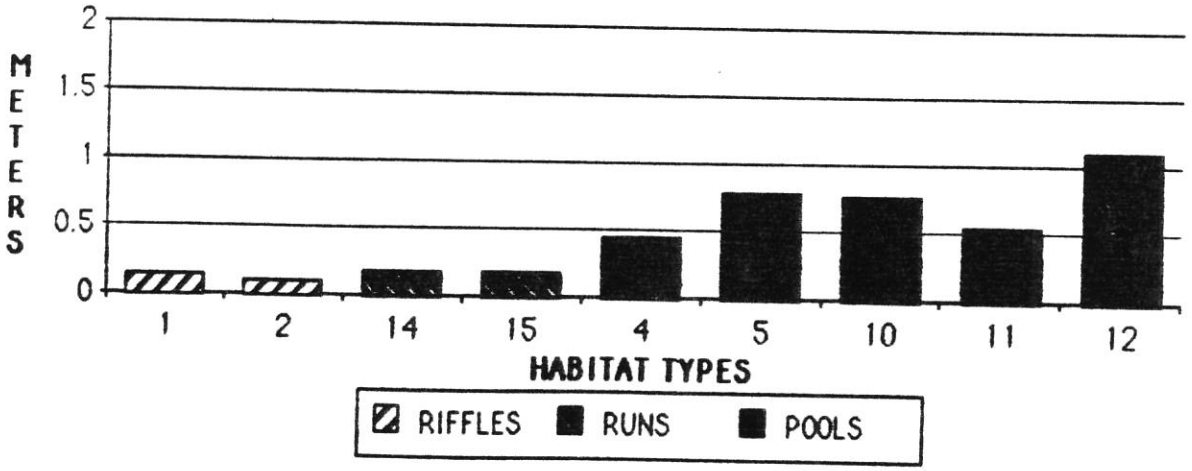
UPPER LOST MAN CREEK (1433 - 2050 m.)
PERCENTAGE OF TOTAL VOLUME
BY HABITAT TYPE
SUMMER BASE FLOW



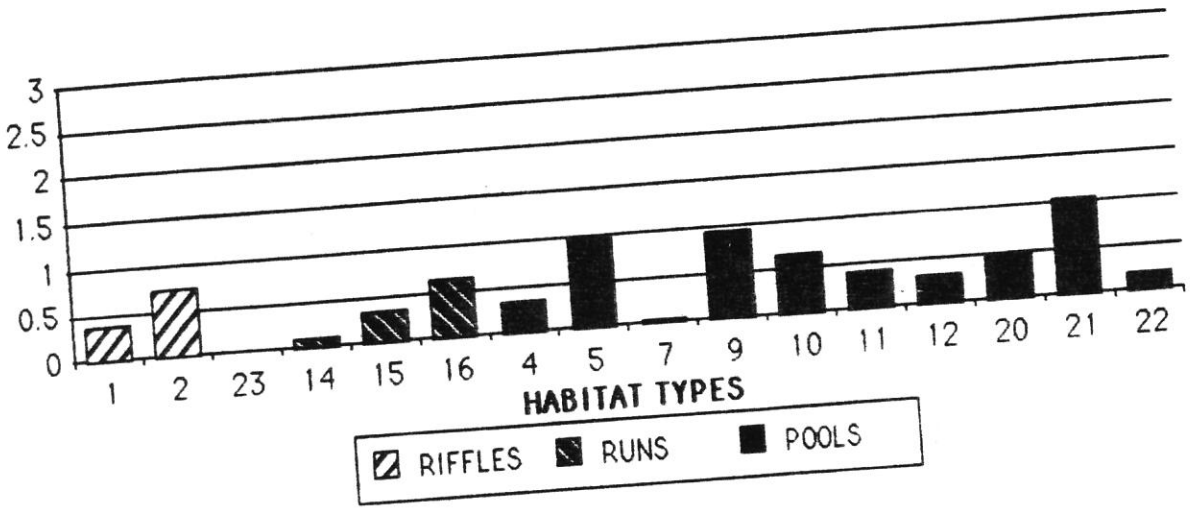
LOWER LOST MAN CREEK (0-1433 m.)
AVERAGE MAXIMUM DEPTH PER UNIT
BY HABITAT TYPE
SUMMER BASE FLOW



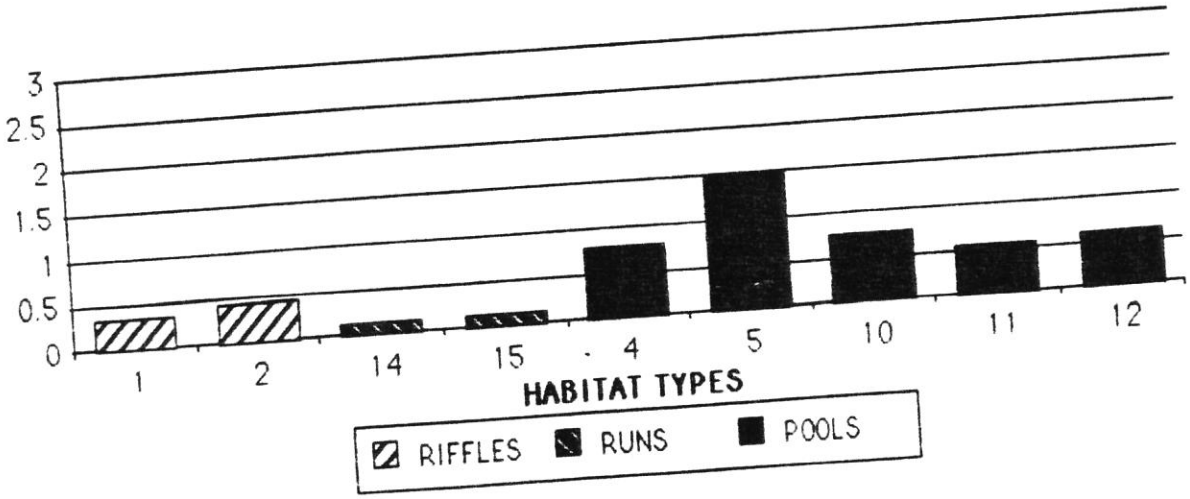
UPPER LOST MAN CREEK (1433 - 2050 m.)
AVERAGE MAXIMUM DEPTH PER UNIT
BY HABITAT TYPE
SUMMER BASE FLOW



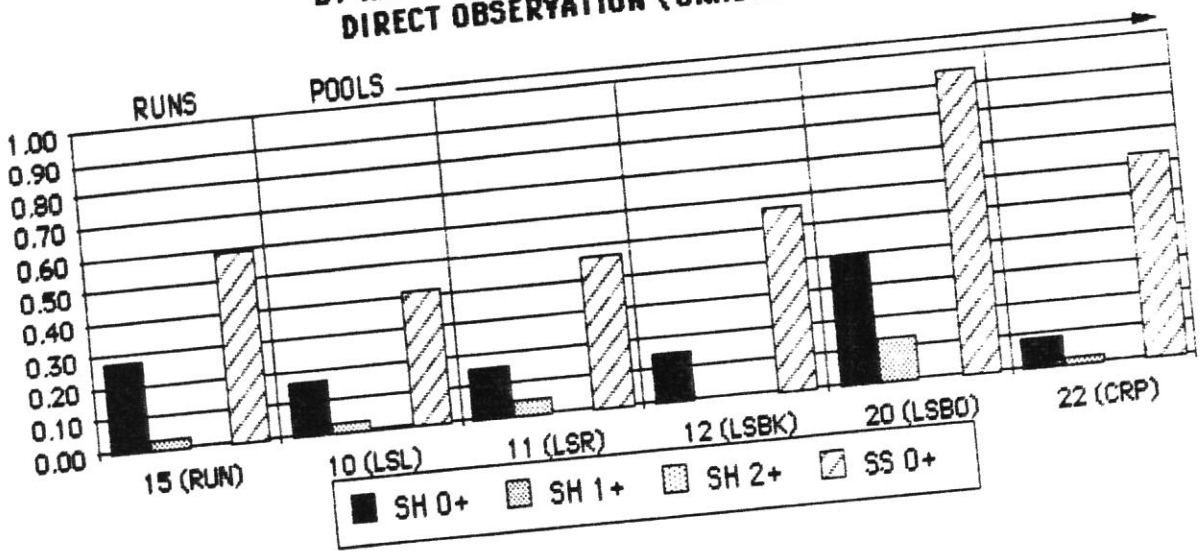
LOWER LOST MAN CREEK (0-1433 m.)
AVERAGE WEIGHTED SHELTER RATING
BY HABITAT TYPE
SUMMER BASE FLOW



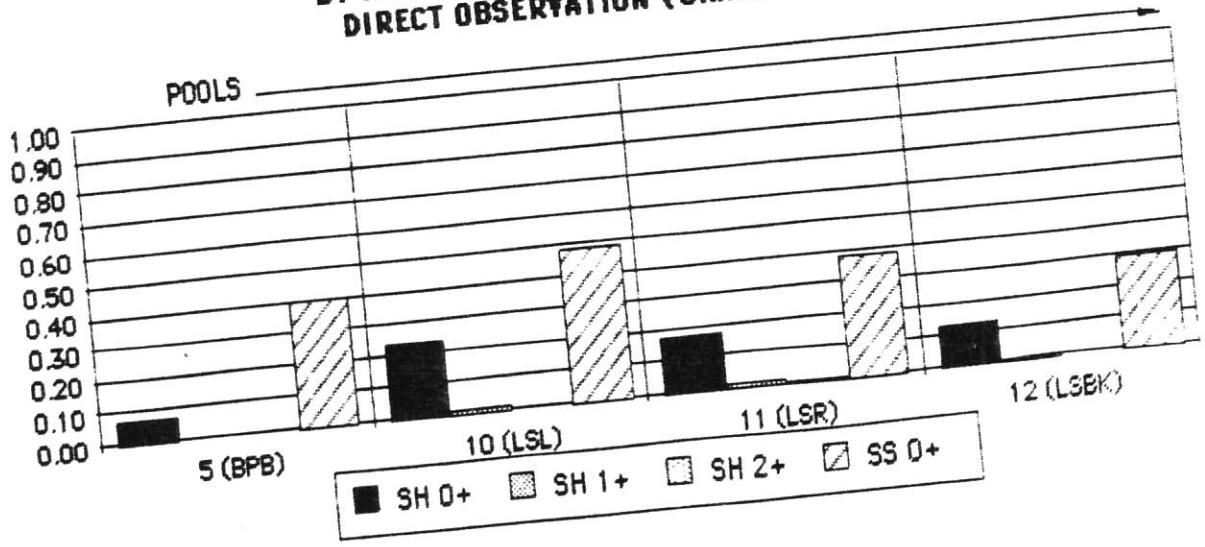
UPPER LOST MAN CREEK (1433 - 2050 m.)
AVERAGE WEIGHTED SHELTER RATING
BY HABITAT TYPE
SUMMER BASE FLOW



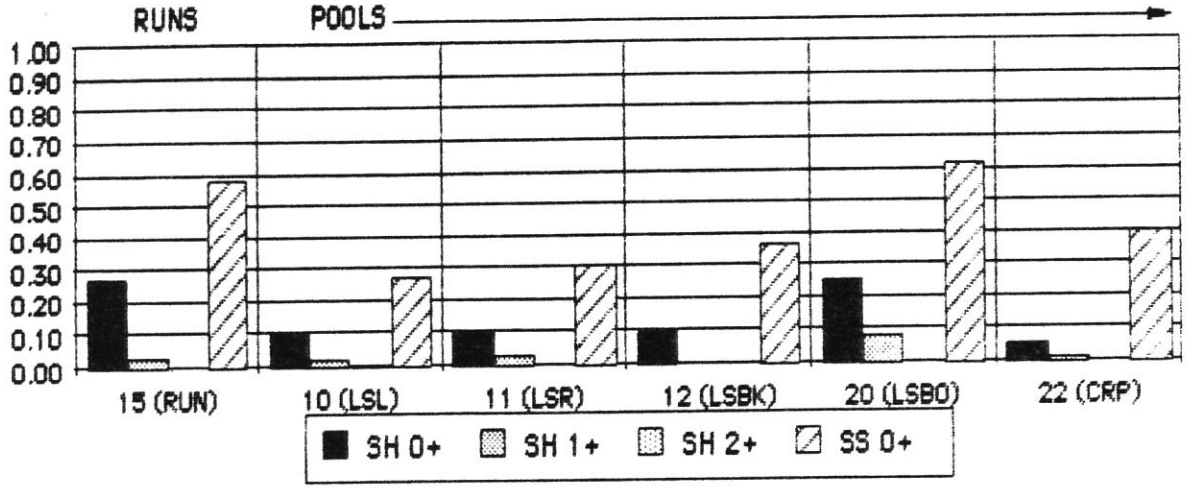
LOWER LOST MAN CREEK (0 - 1433 m.)
AVERAGE NUMBER OF SALMONIDS PER SQUARE METER
BY HABITAT TYPE - SUMMER BASE FLOW
DIRECT OBSERVATION (UNADJUSTED)



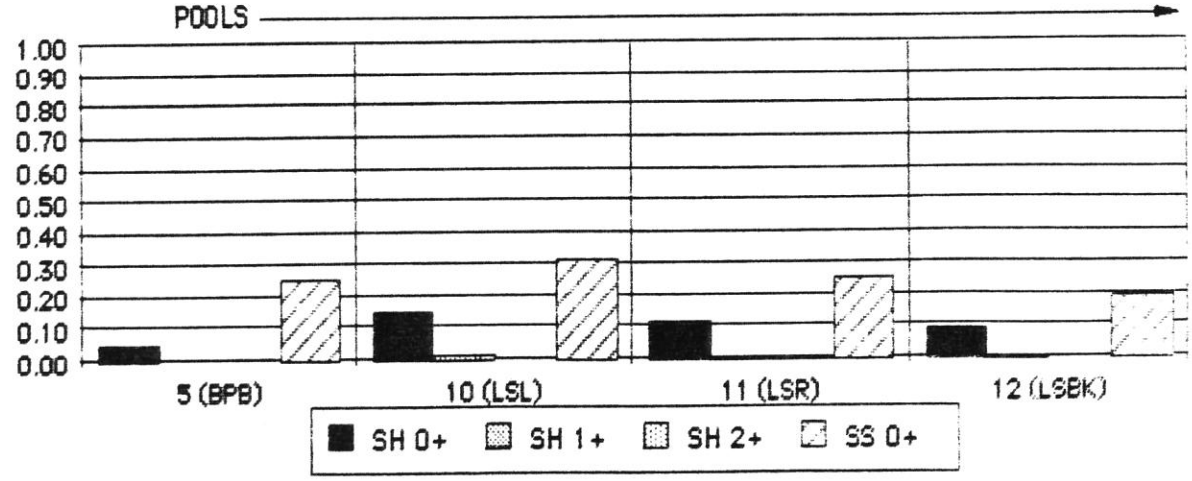
UPPER LOST MAN CREEK (1433 - 2050 m.)
AVERAGE NUMBER OF SALMONIDS PER SQUARE METER
BY HABITAT TYPE - SUMMER BASE FLOW
DIRECT OBSERVATION (UNADJUSTED)



LOWER LOST MAN CREEK (0 - 1433 m.)
AVERAGE NUMBER OF SALMONIDS PER SQUARE METER
BY HABITAT TYPE - SUMMER BASE FLOW
DIRECT OBSERVATION (ADJUSTED)



UPPER LOST MAN CREEK (1433 - 2050 m.)
AVERAGE NUMBER OF SALMONIDS PER SQUARE METER
BY HABITAT TYPE - SUMMER BASE FLOW
DIRECT OBSERVATION (ADJUSTED)



APPENDIX D

UNIT: METRIC

LOWER LOST MAN CREEK (0-1433 m.)
HABITAT TYPE PHYSICAL SUMMARY
WINTER BASEFLOW

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING % COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SPAWNING AREA TOTAL	SPAWNING AREA % OF TOTAL	SAMPLE UNITS
RIFFLES																					
LO GRAD. RIFFLES	1	22	28.2%	607.0	36.2%	27.6	4393.0	35.9%	199.7	0.2	0.4	0.3	866.2	19.3%	39.4	15.9%	1.9	0.3	1162.6	76.0%	4
HI GRAD. RIFFLES	2	1	1.3%	13.4	0.8%	13.4	65.5	0.5%	65.5	0.2	0.3	0.3	12.0	0.3%	12.0	40.0%	1.0	0.4	0.0	0.0%	0
"CHUTE"	23	2	2.6%	11.0	0.7%	5.5	118.9	1.0%	59.5	0.1	0.2	0.1	6.7	0.1%	3.3	0.0%	0.0	0.0	0.0	0.0%	0
TOTAL/AVG.	**3**	**25**	**32.1%**	**631.4**	**37.7%**	**25.3**	**4577.4**	**37.4%**	**183.1**	**0.2**	**0.4**	**0.3**	**884.9**	**19.7%**	**35.4**	**15.6%**	**1.7**	**0.3**	**1162.6**	**76.0%**	**4**
RUNS																					
GLIDE	14	8	10.3%	74.7	4.5%	9.3	586.0	4.8%	73.3	0.3	0.6	0.4	159.5	3.6%	19.9	1.9%	0.3	0.0	101.1	6.6%	1
RUN	15	6	7.7%	164.4	9.8%	27.4	1529.5	12.5%	254.9	0.3	0.5	0.4	411.8	9.2%	68.6	4.2%	1.3	0.1	57.7	3.8%	2
TOTAL/AVG.	**2**	**14**	**18.0%**	**239.1**	**14.3%**	**17.1**	**2115.5**	**17.3%**	**151.1**	**0.3**	**0.6**	**0.4**	**571.3**	**12.8%**	**40.8**	**2.9%**	**0.7**	**0.0**	**158.8**	**10.4%**	**3**
POOLS																					
2° CHANNEL POOL	4	1	1.3%	52.5	3.1%	52.5	96.0	0.8%	96.0	0.2	0.4	0.4	23.4	0.5%	23.4	70.0%	3.0	2.1	0.0	0.0%	0
BCKWTR./BOUL.	5	2	2.6%	25.9	1.5%	13.0	140.9	1.2%	70.5	0.4	1.0	0.7	62.0	1.4%	31.0	47.5%	2.0	1.0	0.0	0.0%	0
BCKWTR./LOD	7	1	1.3%	8.2	0.5%	8.2	20.1	0.2%	20.1	0.3	0.5	0.5	6.7	0.2%	6.7	0.0%	0.0	0.0	0.0	0.0%	0
PLUNGE POOL	9	3	3.8%	22.3	1.3%	7.4	334.5	2.7%	111.5	1.0	1.5	1.3	351.8	7.9%	117.3	60.0%	3.0	1.8	0.0	0.0%	0
LAT. SCOUR/LOD	10	9	11.5%	178.0	10.6%	19.8	1313.0	10.7%	145.9	0.6	1.6	1.0	855.0	19.1%	95.0	35.0%	2.9	1.0	16.0	1.0%	5
LAT. SCOUR/RTWD.	11	8	10.3%	221.0	13.2%	27.6	1350.0	11.0%	168.8	0.4	1.0	0.7	584.1	13.0%	73.0	25.6%	2.9	0.7	53.0	3.5%	1
LAT. SCOUR/BDRK.	12	3	3.8%	46.4	2.8%	15.5	343.4	2.8%	114.5	0.5	1.2	0.9	175.1	3.9%	58.4	11.7%	1.7	0.2	26.0	1.7%	0
LAT. SCOUR/BOUL.	20	7	9.0%	180.0	10.7%	25.7	1279.0	10.5%	182.7	0.6	1.3	0.8	686.2	15.3%	98.0	27.1%	2.6	0.7	97.3	6.4%	1
POCKET WATER	21	1	1.3%	12.8	0.8%	12.8	218.8	1.8%	218.8	0.5	0.6	0.5	100.1	2.2%	100.1	90.0%	3.0	2.7	0.0	0.0%	0
CORNER POOL	22	4	5.1%	58.6	3.5%	14.7	437.4	3.6%	109.4	0.4	0.8	0.7	176.4	3.9%	44.1	12.5%	2.0	0.3	16.1	1.1%	2
TOTAL/AVG.	**10**	**39**	**50.0%**	**805.7**	**48.0%**	**20.7**	**5533.1**	**45.3%**	**141.9**	**0.5**	**1.6**	**0.8**	**3020.8**	**67.4%**	**77.5**	**31.5%**	**2.6**	**0.9**	**208.4**	**13.7%**	**9**

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING % COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SPAWNING AREA TOTAL	SPAWNING AREA % OF TOTAL	SAMPLE UNITS
RIFFLES	**3**	**25**	**32.1%**	**631.4**	**37.7%**	**25.3**	**4577.4**	**37.4%**	**183.1**	**0.2**	**0.4**	**0.3**	**884.9**	**19.7%**	**35.4**	**15.6%**	**1.7**	**0.3**	**1162.6**	**76.0%**	**4**
RUNS	**2**	**14**	**18.0%**	**239.1**	**14.3%**	**17.1**	**2115.5**	**17.3%**	**151.1**	**0.3**	**0.6**	**0.4**	**571.3**	**12.8%**	**40.8**	**2.9%**	**0.7**	**0.0**	**158.8**	**10.4%**	**3**
POOLS	**10**	**39**	**50.0%**	**805.7**	**48.0%**	**20.7**	**5533.1**	**45.3%**	**141.9**	**0.5**	**1.6**	**0.8**	**3020.8**	**67.4%**	**77.5**	**31.5%**	**2.6**	**0.9**	**208.4**	**13.7%**	**9**
TOTAL/AVG.	**15**	**78**	**100.1%**	**1676.2**	**99.9%**	**21.5**	**12226.0**	**100.0%**	**156.7**	**0.4**	**1.6**	**0.6**	**4477.0**	**99.9%**	**57.4**	**21.3%**	**2.0**	**0.5**	**1529.8**	**100.1%**	**16**

UNIT: METRIC

LOWER LOST MAN CREEK (0-1433 m.)
HABITAT TYPE SAMPLE UNIT SUMMARY
WINTER BASEFLOW

HABITAT	HABITAT	SAMPLE	AVG. SUBSTRATE PERCENTAGE PER SAMPLE UNIT														
DESCRIPTIONS	TYPES	UNITS	SILT CLAY	SAND <0.2cm	GRAVEL 0.2-6.4	COBBLE 6.4-12.8	COBBLE 12.8-25.6	BOULDER 25.6-51.2	BOULDER 51.2-102.4	BOULDER >102.4	BEDROCK	PERCENT EXPOSED	INVERT ABUND.	CROWN COVER	TEMP AIR	TEMP H20
RIFFLES																
LO GRAD. RIFFLES	1	4	2.0%	9.5%	40.0%	35.0%	10.0%	2.3%	0.5%	0.2%	0.0%	0.8%	COMMON	72.5%	15.9°C	12.4°C
TOTAL/AVG.	**1**	**4**	**2.0%**	**9.5%**	**40.0%**	**35.0%**	**10.0%**	**2.3%**	**0.5%**	**0.2%**	**0.0%**	**0.8%**	**COMMON**	**72.5%**	**15.9°C**	**12.4°C**
RUNS																
GLIDE	14	2	0.0%	10.0%	80.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	FEW	85.0%	15.0°C	12.0°C
RUN	15	1	0.0%	15.0%	20.0%	10.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	FEW	32.5%	13.5°C	11.4°C
TOTAL/AVG.	**2**	**3**	**0.0%**	**13.3%**	**40.0%**	**10.0%**	**3.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**FEW**	**50.0%**	**14.0°C**	**11.6°C**
POOLS																
LAT. SCOUR/LOD	10	5	9.0%	30.0%	29.6%	19.4%	7.0%	1.0%	0.0%	0.0%	0.0%	0.0%	FEW	72.0%	15.1°C	11.6°C
LAT. SCOUR/RTWD	11	1	0.0%	20.0%	45.0%	20.0%	10.0%	5.0%	0.0%	0.0%	0.0%	0.0%	COMMON	80.0%	15.0°C	12.0°C
LAT. SCOUR/BOUL	20	1	0.0%	30.0%	25.0%	15.0%	10.0%	5.0%	5.0%	0.0%	10.0%	5.0%	COMMON	10.0%	17.0°C	13.8°C
CORNER POOL	22	2	0.0%	40.0%	27.5%	20.0%	7.5%	2.5%	0.0%	0.0%	0.0%	0.0%	FEW	20.0%	14.6°C	11.7°C
TOTAL/AVG.	**4**	**9**	**5.0%**	**31.1%**	**30.3%**	**19.1%**	**7.8%**	**2.2%**	**0.6%**	**0.0%**	**1.1%**	**0.6%**	**F-C**	**54.4%**	**15.2°C**	**11.9°C**

INIT: METRIC

UPPER LOST MAN CREEK (1433-2050 m.)
HABITAT TYPE PHYSICAL SUMMARY
WINTER BASEFLOW

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING %COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SPAWNING AREA TOTAL	SPAWNING AREA % OF TOTAL	SAMPLE UNITS
RIFFLES																					
LO GRAD. RIFFLES	1	15	30.0%	348.9	38.8%	23.3	2470.5	39.4%	164.7	0.2	0.6	0.4	460.2	19.6%	30.7	21.3%	1.6	0.3	555.5	62.6%	1
HI GRAD. RIFFLES	2	3	6.0%	51.2	5.7%	17.1	328.2	5.2%	109.4	0.2	0.4	0.3	59.5	2.5%	19.8	20.0%	1.3	0.3	0.0	0.0%	0
TOTAL/AVG.	**2**	**18**	**36.0%**	**400.1**	**44.5%**	**22.2**	**2798.7**	**44.6%**	**155.5**	**0.2**	**0.6**	**0.3**	**519.7**	**22.1%**	**28.9**	**21.1%**	**1.6**	**0.3**	**555.5**	**62.6%**	**1**
RUNS																					
GLIDE	14	6	12.0%	59.2	6.6%	9.9	565.9	9.0%	94.3	0.2	0.7	0.5	128.9	5.5%	21.5	5.0%	1.5	0.1	172.5	19.4%	0
RUN	15	3	6.0%	48.5	5.4%	16.2	235.1	3.7%	78.4	0.2	0.5	0.5	53.2	2.3%	17.7	11.7%	1.7	0.2	79.3	8.9%	1
TOTAL/AVG.	**2**	**9**	**18.0%**	**107.7**	**12.0%**	**12.0**	**801.0**	**12.7%**	**89.0**	**0.2**	**0.7**	**0.5**	**182.1**	**7.8%**	**20.2**	**7.2%**	**1.6**	**0.1**	**251.8**	**28.3%**	**1**
POOLS																					
2° CHANNEL POOL	4	2	4.0%	40.0	4.4%	20.0	178.8	2.9%	89.4	0.3	0.7	0.7	57.9	2.5%	29.0	22.5%	3.0	0.7	0.0	0.0%	0
BCKWTR./BOUL	5	1	2.0%	11.0	1.2%	11.0	67.0	1.1%	67.0	0.6	1.1	1.1	39.0	1.7%	39.0	70.0%	3.0	2.1	0.0	0.0%	1
BCKWTR./LOD	7	1	2.0%	8.2	0.9%	8.2	33.0	0.5%	33.0	0.5	0.8	0.8	17.0	0.7%	17.0	80.0%	3.0	2.4	0.0	0.0%	0
PLUNGE POOL	9	1	2.0%	15.9	1.8%	15.9	106.0	1.7%	106.0	0.4	0.6	0.6	42.0	1.8%	42.0	15.0%	2.0	0.3	0.0	0.0%	0
LAT. SCOUR/LOD	10	6	12.0%	96.1	10.7%	16.0	673.9	10.7%	112.3	0.5	1.4	1.1	387.5	16.5%	64.6	29.8%	3.0	0.9	25.8	2.9%	1
LAT. SCOUR/RTWD.	11	5	10.0%	72.0	8.0%	14.4	447.0	7.1%	89.4	0.5	1.1	0.8	201.8	8.6%	40.4	22.0%	3.0	0.7	41.5	4.7%	2
LAT. SCOUR/BDRK.	12	6	12.0%	119.3	13.3%	19.9	926.9	14.8%	154.5	0.6	1.5	1.1	636.0	27.1%	106.0	34.2%	2.2	0.7	12.5	1.4%	3
LAT. SCOUR/BOU.	20	1	2.0%	28.1	3.1%	28.1	240.0	3.8%	240.0	1.1	1.4	1.4	263.0	11.2%	263.0	40.0%	3.0	1.2	0.0	0.0%	1
TOTAL/AVG.	**8**	**23**	**46.0%**	**390.6**	**43.4%**	**17.0**	**2672.6**	**42.6%**	**116.2**	**0.5**	**1.6**	**1.0**	**1644.2**	**70.1%**	**71.5**	**32.3%**	**2.7**	**0.9**	**79.8**	**9.0%**	**8**

HABITAT DESCRIPTIONS	HABITAT TYPES	UNITS TOTAL	UNITS % OF TOTAL	LENGTH TOTAL	LENGTH % OF TOTAL	LENGTH AVG./ UNIT	AREA TOTAL	AREA % OF TOTAL	AREA AVG./ UNIT	DEPTH AVG./ UNIT	DEPTH MAXI- MUM	DEPTH AVG. MAX.	VOLUME TOTAL	VOLUME % OF TOTAL	VOLUME AVG./ UNIT	SHELTER RATING %COVER AVG./ UNIT	SHELTER RATING VALUE AVG./ UNIT	SHELTER RATING WEIGHTED VALUE AVG./UNIT	SPAWNING AREA TOTAL	SPAWNING AREA % OF TOTAL	SAMPLE UNITS
RIFFLES	2	18	36.0%	400.1	44.5%	22.2	2798.7	44.6%	155.5	0.2	0.6	0.3	519.7	22.1%	28.9	21.1%	1.6	0.3	555.5	62.6%	1
RUNS	2	9	18.0%	107.7	12.0%	12.0	801.0	12.7%	89.0	0.2	0.7	0.5	182.1	7.8%	20.2	7.2%	1.6	0.1	251.8	28.3%	1
POOLS	8	23	46.0%	390.6	43.4%	17.0	2672.6	42.6%	116.2	0.5	1.6	1.0	1644.2	70.1%	71.5	32.3%	2.7	0.9	79.8	9.0%	8
TOTAL/AVG.	12	50	100.0%	898.4	99.9%	18.0	6272.3	99.9%	125.4	0.4	1.6	0.7	2346.0	99.9%	46.9	23.8%	2.1	0.5	887.1	99.9%	10

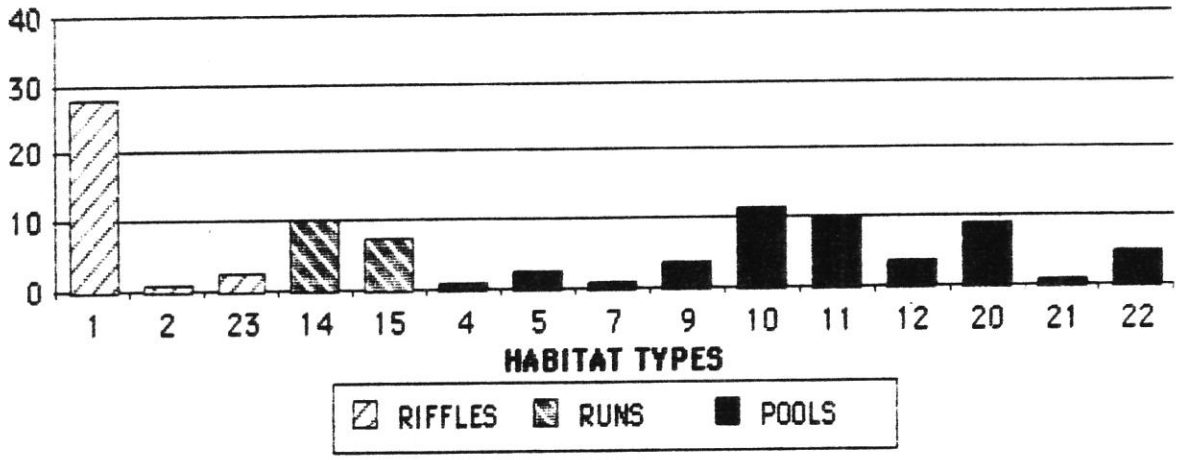
UNIT: METRIC

UPPER LOST MAN CREEK (1433-2050 m.)
HABITAT TYPE SAMPLE UNIT SUMMARY
WINTER BASEFLOW

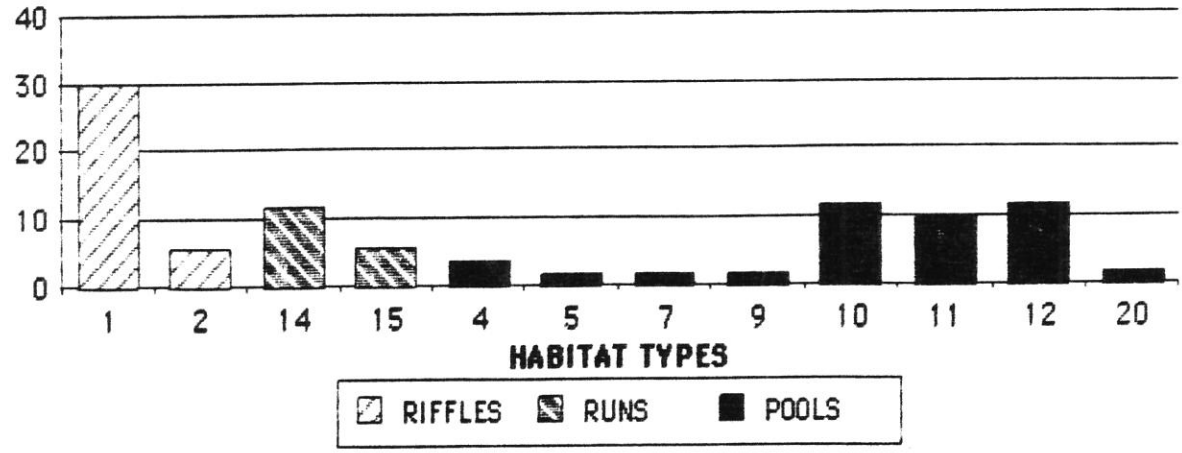
HABITAT	HABITAT	SAMPLE	AV6. SUBSTRATE PERCENTAGE PER SAMPLE UNIT														
DESCRIPTIONS	TYPES	UNITS	SILT CLAY	SAND <0.2cm	GRAVEL 0.2-6.4	COBBLE 6.4-12.8	COBBLE 12.8-25.6	BOULDER 25.6-51.2	BOULDER 51.2-102.4	BOULDER >102.4	BEDROCK	PERCENT EXPOSED	INVERT ABUND.	CROWN COVER	TEMP AIR	TEMP H20
RIFFLES																
LO GRAD RIFFLES	1	1	0.0%	5.0%	65.0%	25.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	FEW	70.0%	14.0°C	11.8°C
TOTAL/AV6.	**1**	**1**	**0.0%**	**5.0%**	**65.0%**	**25.0%**	**5.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**FEW**	**70.0%**	**14.0°C**	**11.8°C**
RUNS																
RUN	15	1	0.0%	15.0%	65.0%	15.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	FEW	100.0%	15.5°C	12.8°C
TOTAL/AV6.	**1**	**1**	**0.0%**	**15.0%**	**65.0%**	**15.0%**	**5.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**FEW**	**100.0%**	**15.5°C**	**12.8°C**
POOLS																
BCKWTR./BOUL	5	1	45.0%	30.0%	15.0%	5.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	FEW	30.0%	15.5°C	12.2°C
LAT. SCOUR/LOD	10	1	0.0%	55.0%	30.0%	10.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	FEW	70.0%	16.0°C	12.0°C
LAT. SCOUR/RTWD	11	2	0.0%	17.5%	47.5%	22.5%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	FEW	95.0%	15.0°C	12.0°C
LAT SCOUR/BDRK	12	3	3.3%	60.0%	23.3%	5.0%	1.7%	0.0%	0.8%	0.8%	5.0%	0.0%	FEW	36.7%	15.5°C	12.1°C
LAT. SCOUR/BOUL	20	1	5.0%	80.0%	10.0%	0.0%	0.0%	0.0%	2.5%	2.5%	0.0%	0.0%	FEW	75.0%	15.0°C	12.0°C
TOTAL/AV6.	**5**	**8**	**7.5%**	**47.5%**	**27.5%**	**9.4%**	**4.4%**	**0.0%**	**0.6%**	**0.6%**	**1.9%**	**0.0%**	**FEW**	**59.4%**	**15.4°C**	**12.1°C**

APPENDIX E

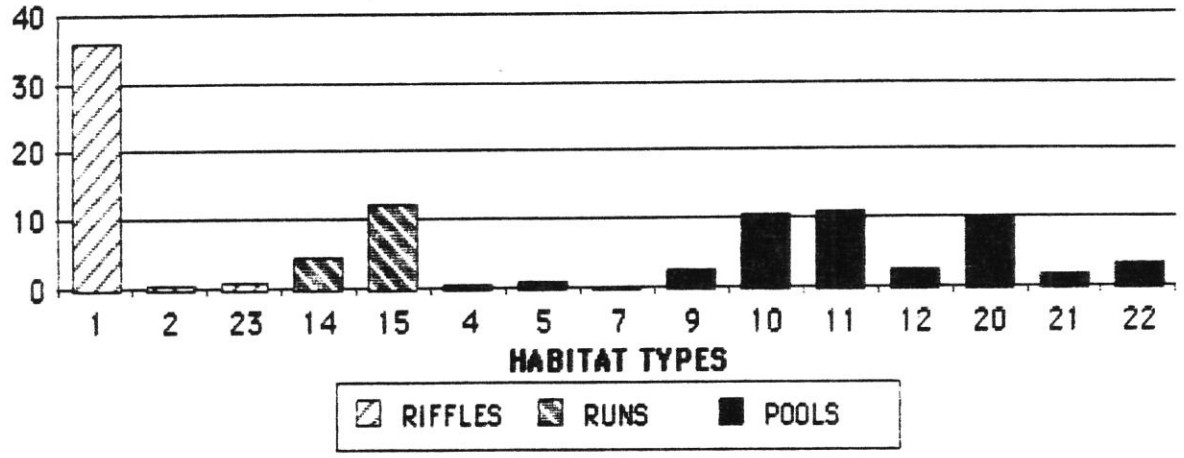
LOWER LOST MAN CREEK (0-1433 m.)
PERCENTAGE OF TOTAL NUMBER OF UNITS
BY HABITAT TYPE
WINTER BASE FLOW



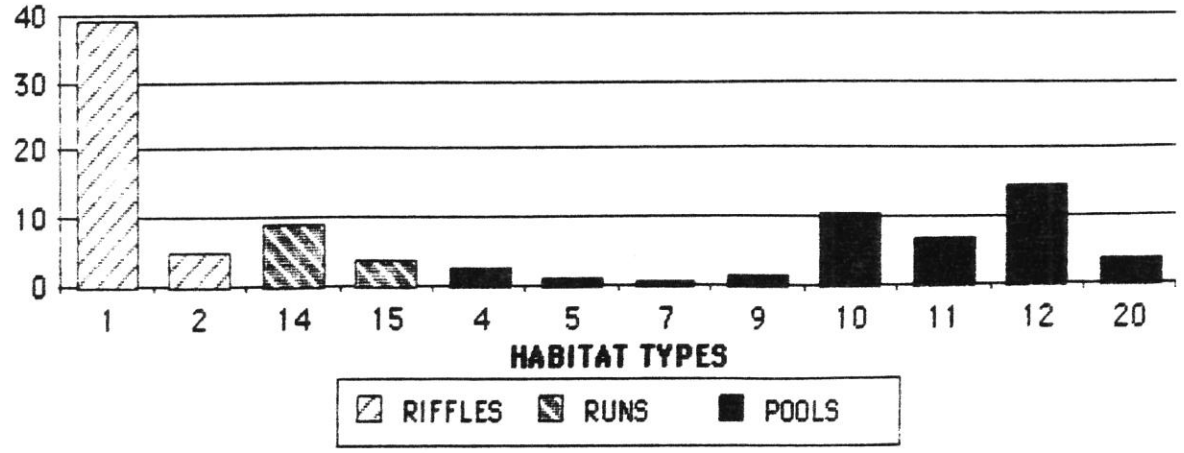
UPPER LOST MAN CREEK (1433-2050 m.)
PERCENTAGE OF TOTAL NUMBER OF UNITS
BY HABITAT TYPE
WINTER BASE FLOW



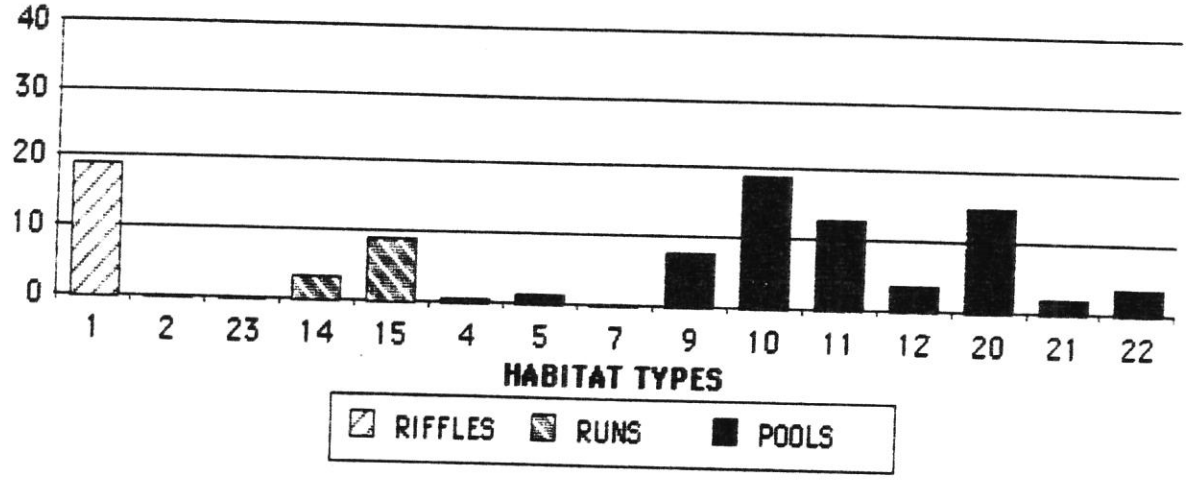
LOWER LOST MAN CREEK (0-1433 m.)
PERCENTAGE OF TOTAL SURFACE AREA
BY HABITAT TYPE
WINTER BASE FLOW



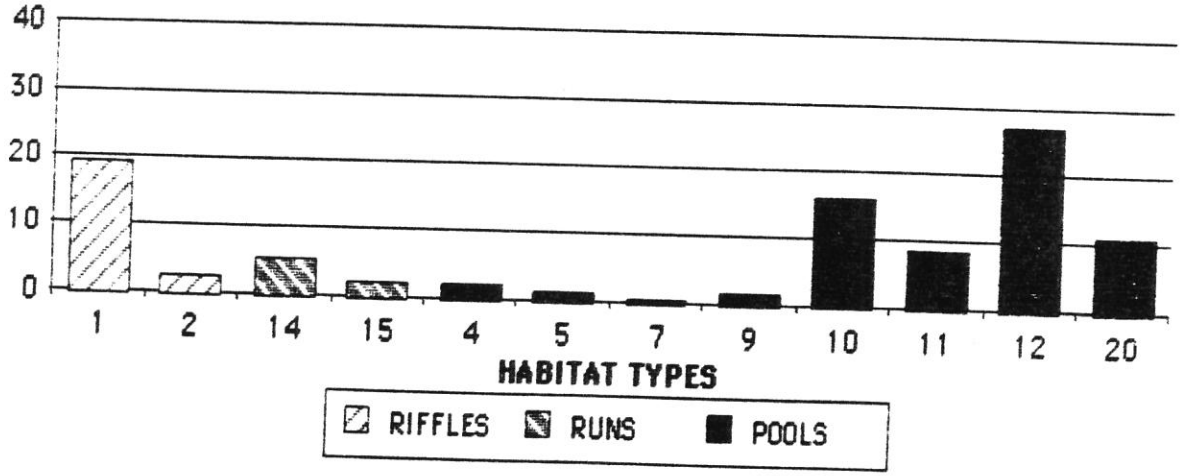
UPPER LOST MAN CREEK (1433-2050 m.)
PERCENTAGE OF TOTAL SURFACE AREA
BY HABITAT TYPE
WINTER BASE FLOW



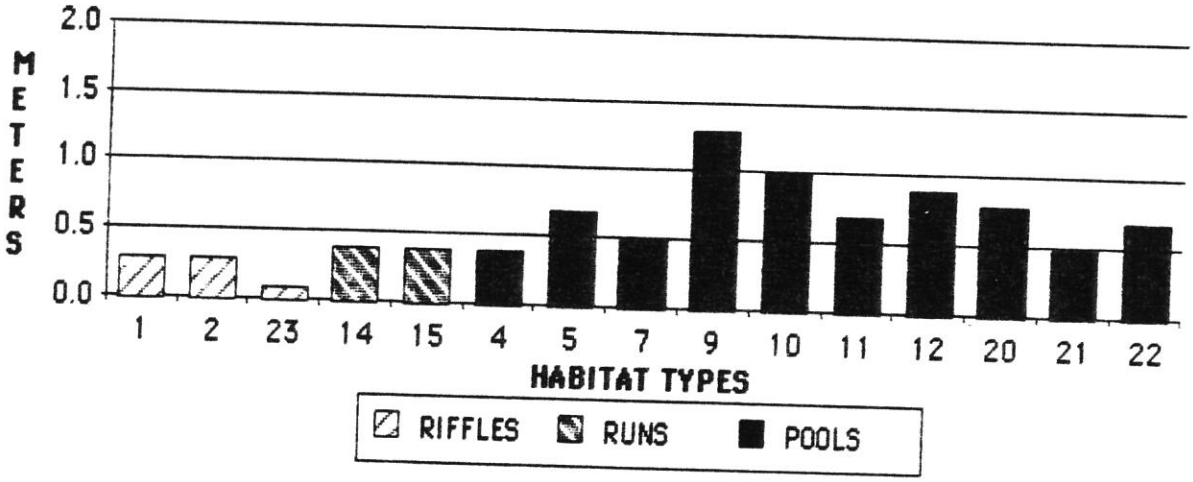
LOWER LOST MAN CREEK (0-1433 m.)
PERCENTAGE OF TOTAL VOLUME
BY HABITAT TYPE
WINTER BASE FLOW



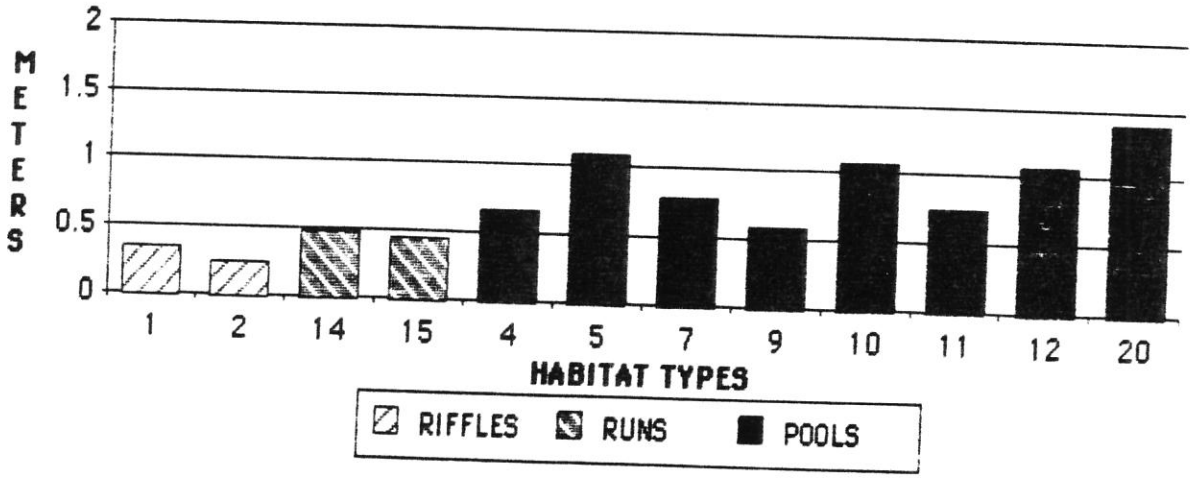
UPPER LOST MAN CREEK (1433-2050 m.)
PERCENTAGE OF TOTAL VOLUME
BY HABITAT TYPE
WINTER BASE FLOW



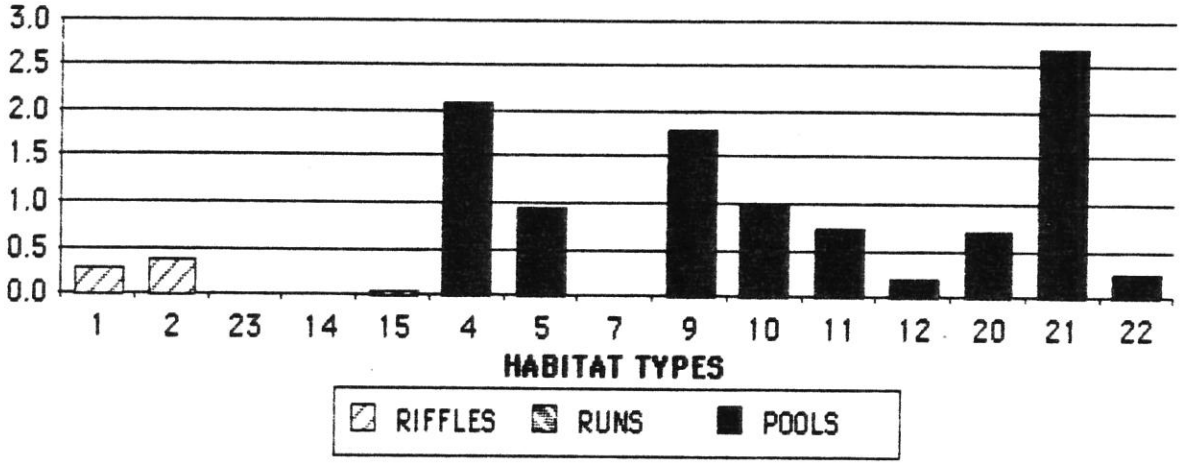
LOWER LOST MAN CREEK (0-1433 m.)
AVERAGE MAXIMUM DEPTH PER UNIT
BY HABITAT TYPE
WINTER BASE FLOW



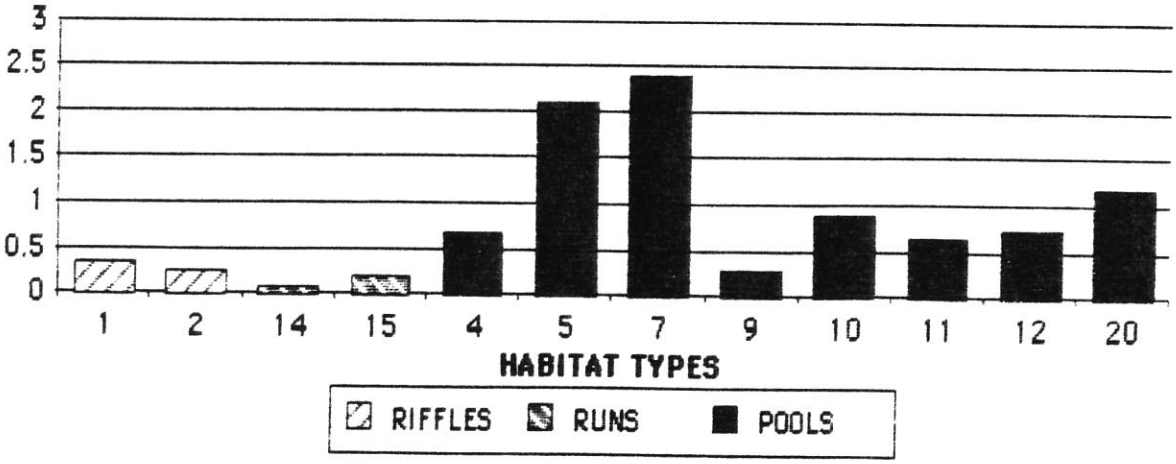
UPPER LOST MAN CREEK (1433-2050 m.)
AVERAGE MAXIMUM DEPTH PER UNIT
BY HABITAT TYPE
WINTER BASE FLOW



LOWER LOST MAN CREEK (0-1433 m.)
AVERAGE WEIGHTED SHELTER RATING
BY HABITAT TYPE
WINTER BASE FLOW



UPPER LOST MAN CREEK (1433-2050 m.)
AVERAGE WEIGHTED SHELTER RATING
BY HABITAT TYPE
WINTER BASE FLOW



APPENDIX F

STREAM: LOST MAN
STRATUM: LOWER
MEASURE: METRIC

DATE: 8/31-9/1
CFS: 1.95
SURVEYOR: BARNARD

HABITAT TYPE FIELD DATA
SUMMER BASEFLOW

STREAM TYPE:C3

UNIT #	HABITAT TYPE	AVERAGE L	AVERAGE W	SURFACE AREA	DEPTH AVG	DEPTH MAX	POOL TAIL CREST	VOLUME	RESIDUAL VOLUME	SHELTER RATING % COVER	SHELTER RATING VALUE	WEIGHTED RATING	STATION NUMBER	NOTES:
1	LGR	28.0	2.1	59.8	0.1	0.2	0.00	5.5	5.5	10	2	0.2	00+00	
2	**LSL**	**20.7**	**4.6**	**94.8**	**0.2**	**0.4**	**0.09**	**20.2**	**11.6**	**15**	**3**	**0.45**		**SAMPLE UNIT: WTR #3**
3	LGR	12.5	5.8	72.4	0.1	0.2	0.00	6.6	6.6	8	2	0.16	00+50	
4	GLD	11.0	6.4	70.2	0.1	0.2	0.06	8.6	4.3	5	2	0.1		
5	LSBO	44.2	4.6	202.1	0.2	0.4	0.06	37.0	24.6	10	3	0.3		BRIDGE
6	CRP	7.1	3.7	25.9	0.4	0.6	0.06	10.2	8.7	5	2	0.1		
7	**LGR**	**13.1**	**7.6**	**99.9**	**0.1**	**0.1**	**0.00**	**6.1**	**6.1**	**30**	**1**	**0.3**		**SAMPLE UNIT: WTR #8**
8	GLD	18.3	8.2	150.5	0.2	0.3	0.03	22.9	18.3	10	1	0.1		SMALL TRIB ON RT.BANK
9	LSBO	3.7	7.3	26.8	0.5	1.1	0.09	12.2	9.8	15	3	0.45		
10	PLP	5.8	8.5	49.4	0.5	0.8	0.00	27.1	27.1	10	3	0.3		HATCHERY OUTFLOW
11	LSBO	70.1	6.7	470.1	0.4	0.7	0.06	171.9	143.3	8	3	0.24		
12	PLP	18.3	10.7	195.1	0.6	1.1	0.03	118.9	113.0	20	3	0.6		CONCRETE DAM
13	CHU	4.9	6.4	31.2	0.0	0.0	0.00	0.5	0.5	0	0	0		CONCRETE APRON
14	**LSBO**	**8.5**	**6.7**	**57.2**	**0.6**	**1.0**	**0.03**	**33.1**	**31.4**	**20**	**3**	**0.6**		**SAMPLE UNIT: WTR #18**
15	LGR	9.8	3.7	35.7	0.1	0.2	0.00	2.2	2.2	5	2	0.1		
16	LSBO	6.1	4.3	26.0	0.2	0.4	0.03	6.3	5.6	20	2	0.4		
17	LGR	6.1	2.4	14.9	0.0	0.0	0.00	0.5	0.5	5	1	0.05	3+00	
18	LGR	12.5	1.5	19.0	0.1	0.2	0.00	1.7	1.7	20	3	0.6		ADJ. TO #17
19	LSBO	30.5	6.1	185.8	0.4	0.6	0.06	79.3	68.0	25	3	0.75		
20	LGR	6.4	6.1	39.0	0.1	0.1	0.00	2.4	2.4	10	1	0.1		
21	GLD	7.9	6.7	53.1	0.1	0.1	0.06	4.9	1.6	10	1	0.1		
22	**LSR**	**28.0**	**3.8**	**106.0**	**0.3**	**0.5**	**0.06**	**32.3**	**25.8**	**12**	**3**	**0.36**	**3+50**	**SAMPLE UNIT: WTR #23**
23	LSL	13.1	6.1	79.9	0.7	1.2	0.06	58.4	53.6	40	3	1.2		
24	LGR	6.4	3.7	23.4	0.2	0.2	0.00	3.6	3.6	40	1	0.4		
25	GLD	8.5	3.0	26.0	0.2	0.3	0.00	6.3	6.3	5	2	0.1		
26	LGR	4.3	2.1	9.1	0.1	0.1	0.00	0.8	0.8	8	1	0.08		
27	LSL	4.3	3.7	15.6	0.2	0.3	0.03	3.8	3.3	5	2	0.1		TEMPORARY LOD
28	GLD	2.4	2.1	5.2	0.1	0.1	0.00	0.3	0.3	10	1	0.1		

29	LSR	4.3	2.4	10.4	0.2	0.5	0.06	2.2	1.6	8	3	0.24		
30	LSBO	8.5	3.7	31.2	0.4	0.5	0.00	11.4	11.4	10	3	0.30		WEIR AND OUTFLOW
31	BPB	4.6	7.6	34.8	0.3	0.5	0.00	10.6	10.6	5	2	0.10	4+00	ADJ. TO #31
32	**LDL**	**25.9**	**4.6**	**118.5**	**0.5**	**0.8**	**0.03**	**54.2**	**50.5**	**22**	**3**	**0.66**		**SAMPLE UNIT: WTR #28**
33	POW	70.1	4.9	341.9	0.2	0.5	0.00	52.1	52.1	25	3	0.75	4+50	POCKET WATER OFF LOD
34	LSR	21.3	4.6	97.5	0.3	0.6	0.03	32.7	29.7	28	3	0.84	5+00	
35	LSL	31.4	6.7	210.5	0.6	0.7	0.06	121.9	109.1	35	3	1.05		
36	**CRP**	**6.4**	**4.3**	**27.3**	**0.2**	**0.3**	**0.12**	**6.7**	**3.3**	**30**	**1**	**0.30**	**5+50**	**SAMPLE UNIT: WTR #33**
37	CRP	10.7	4.0	42.3	0.2	0.3	0.03	6.4	5.2	5	3	0.15		#36/#37 SEPARATED BY LGR
38	SCP	30.5	2.4	74.3	0.2	0.5	0.00	13.6	13.6	40	3	1.20		ADJ. TO #41-#44
39	SCP	9.1	3.0	27.9	0.1	0.2	0.00	2.5	2.5	5	2	0.10		ADJ. TO #41-#44
40	SCP	7.6	2.4	18.6	0.1	0.2	0.00	2.3	2.3	5	2	0.10		ADJ. TO #41-#44
41	LGR	8.5	4.6	39.0	0.1	0.1	0.00	3.6	3.6	50	1	0.50		
42	LSL	21.6	5.5	118.7	0.2	0.6	0.03	29.0	25.3	8	3	0.24		
43	LGR	17.7	4.9	86.2	0.1	0.2	0.00	10.5	10.5	55	1	0.55	6+00	
44	SRN	26.8	4.0	106.3	0.2	0.4	0.00	22.7	22.7	65	1	0.65		
45	LGR	13.4	4.6	61.3	0.1	0.1	0.00	3.7	3.7	25	1	0.25		
46	GLD	6.1	4.9	29.7	0.1	0.1	0.00	2.7	2.7	25	1	0.25		
47	**LSL**	**12.2**	**5.5**	**66.9**	**0.2**	**0.4**	**0.06**	**16.3**	**12.2**	**5**	**3**	**0.15**	**6+50**	**SAMPLE UNIT: WTR #38**
48	LGR	16.5	6.7	110.4	0.1	0.1	0.00	10.1	10.1	8	3	0.24		
49	GLD	16.8	7.3	122.6	0.2	0.2	0.00	18.7	18.7	25	1	0.25		
50	LSL	49.1	7.3	359.0	0.4	1.3	0.06	131.3	109.4	30	3	0.90	7+00	
51	LGR	26.5	6.1	161.7	0.1	0.1	0.00	9.9	9.9	8	2	0.16	7+50	
52	**GLD**	**15.2**	**7.6**	**116.1**	**0.2**	**0.2**	**0.00**	**17.7**	**17.7**	**8**	**1**	**0.08**		**SAMPLE UNIT: WTR #43**
53	LSL	18.3	6.7	122.6	0.3	0.5	0.09	37.4	26.2	12	3	0.36		
54	LGR	20.4	6.4	130.7	0.1	0.1	0.00	8.0	8.0	35	1	0.35	8+00	LEFT BANK TRIB.
55	RUN	15.2	5.5	83.6	0.2	0.2	0.00	12.7	12.7	35	1	0.35		
56	LGR	17.7	5.8	102.4	0.1	0.3	0.00	12.5	12.5	10	2	0.20	8+50	
57	**RUN**	**7.9**	**4.3**	**33.8**	**0.1**	**0.2**	**0.00**	**4.1**	**4.1**	**30**	**1**	**0.30**		**SAMPLE UNIT**
58	LGR	9.4	4.9	46.1	0.1	0.1	0.00	4.2	4.2	30	1	0.30		
59	SCP	6.1	2.1	13.0	0.1	0.2	0.00	1.6	1.6	10	2	0.20		ADJ. TO #58, NO FLOW
60	RUN	62.5	7.3	453.3	0.2	0.3	0.00	82.9	82.9	5	2	0.10	9+00	
61	**LGR**	**14.3**	**4.9**	**69.9**	**0.1**	**0.1**	**0.00**	**4.3**	**4.3**	**10**	**1**	**0.10**		**SAMPLE UNIT: WTR #48**
62	LSBK	18.3	4.3	78.0	0.2	0.5	0.06	19.0	14.3	35	1	0.35		
63	LGR	7.0	3.4	23.5	0.1	0.2	0.00	1.4	1.4	5	2	0.10	9+50	
64	GLD	9.8	3.0	29.7	0.2	0.2	0.00	4.5	4.5	2	1	0.02		

65	GLD	13.7	1.5	20.9	0.1	0.1	0.00	1.9	1.9	8	1	0.08		ADJ. TO #64, NO FLOW
66	LSL	20.1	7.6	153.3	0.5	1.0	0.06	70.1	60.7	10	2	0.20		
67	LGR	27.4	9.1	250.8	0.1	0.1	0.00	15.3	15.3	65	1	0.65	10+00	
68	RUN	16.8	6.1	102.2	0.1	0.2	0.00	9.3	9.3	35	1	0.35		
69	LGR	3.0	13.7	41.8	0.0	0.1	0.00	1.3	1.3	60	1	0.60		
70	RUN	66.4	8.5	567.1	0.1	0.3	0.00	69.1	69.1	5	3	0.15	10+50	
71	**LGR**	**14.6**	**6.1**	**89.2**	**0.1**	**0.1**	**0.00**	**8.2**	**8.2**	**5**	**3**	**0.15**	**11+00**	**SAMPLE UNIT: WTR #58**
72	LSR	13.1	5.5	71.9	0.3	0.5	0.06	21.9	17.5	5	2	0.10		
73	LGR	30.5	4.6	139.4	0.1	0.2	0.00	12.7	12.7	20	3	0.60	11+50	
74	POW	13.7	16.8	229.9	0.2	0.4	0.00	49.1	49.1	45	3	1.35		
75	PLP	6.1	18.3	111.5	0.7	1.1	0.06	78.2	71.4	65	3	1.95		DAM POOL
76	CHU	5.5	16.8	92.0	0.2	0.0	0.00	14.0	14.0	0	0	0.00		DAM APRON
77	**RUN**	**61.0**	**11.0**	**668.9**	**0.1**	**0.2**	**0.00**	**81.6**	**81.6**	**5**	**1**	**0.05**	**12+00**	**SAMPLE UNIT: WTR #64**
78	LSL	19.5	7.9	154.6	0.3	0.6	0.06	51.8	42.4	8	3	0.24		
79	RUN	10.7	6.7	71.5	0.1	0.2	0.06	8.7	4.4	30	3	0.90	12+50	
80	**LSL**	**33.5**	**6.7**	**224.8**	**0.3**	**0.9**	**0.06**	**75.4**	**61.7**	**30**	**3**	**0.90**		**SAMPLE UNIT: WTR #68**
81	GLD	7.6	7.6	58.1	0.1	0.2	0.00	7.1	7.1	10	1	0.10		
82	LSBK	17.7	4.9	86.2	0.2	0.4	0.06	18.4	13.1	8	2	0.16	13+00	
83	LSBO	29.6	4.9	144.2	0.2	0.5	0.06	35.2	26.4	18	3	0.54		RIP-RAP L. BK W/ RTWD
84	CRP	13.7	6.7	92.0	0.4	0.5	0.09	33.6	25.2	5	2	0.10		
85	LGR	6.4	2.7	17.6	0.1	0.1	0.00	1.6	1.6	35	1	0.35	13+50	
86	**CRP**	**21.9**	**7.0**	**153.8**	**0.3**	**0.5**	**0.03**	**46.9**	**42.2**	**10**	**1**	**0.10**		**SAMPLE UNIT: WTR #73**
87	BPB	16.8	2.4	40.9	0.3	0.5	0.00	12.5	12.5	75	3	2.25		ADJ. TO #89, NO FLOW
88	BPL	3.7	1.8	6.7	0.2	0.3	0.00	1.4	1.4	5	1	0.05		ADJ. TO #89, NO FLOW
89	HGR	12.2	3.0	37.2	0.1	0.1	0.00	3.4	3.4	75	1	0.75		
90	LSR	20.7	6.1	126.3	0.3	0.5	0.03	42.4	38.5	20	3	0.60		
91	**LSL**	**7.3**	**4.6**	**33.4**	**0.4**	**0.6**	**0.06**	**14.3**	**12.2**	**85**	**3**	**2.55**		**SAMPLE UNIT: WTR #78**

STREAM: LOST MAN
STRATUM: LOWER
MEASURE: METRIC

DATE: 8/31-9/1/88
CFS: 1.95
SURVEYOR: SMITH/WROBLE

HABITAT TYPE SAMPLE UNIT PHYSICAL DATA
SUMMER BASEFLOW

STREAM TYPE: C3

UNIT	HABITAT	SILT	SAND	GRAVEL	COBBLE		BOULDER			BDRK	PERCENT	INVERT	CROWN	TEMP		VELOCITY
#	TYPE	CLAY	<0.2cm	0.2-6.4	6.4-12.8	12.8-25.6	25.6-51.2	51.2-102.4	>102.4		EXPOSED	ABUND	COVER	AIR	H20	MPS
2	LSL	10	32	36	10	10	2	0	0	0	0	4.7	90	16.3°	12.9°	0
7	LGR	10	10	65	0	10	5	0	0	0	10	6.7	10			0
14	LSBO	5	15	35	10	10	15	10	5	0	10	2.5	70			0
22	LSR	5	20	40	20	10	5	0	0	0	5	1.7	95			0
32	LDL	5	15	45	20	5	5	5	0	0	0	7.4	50			0
36	CRP	5	25	20	30	15	5	0	0	0	0	3.9	90			0.4
47	LSL	5	20	25	30	15	5	0	0	0	0	12.5	90			0.1
52	GLD	5	20	40	20	10	5	0	0	0	0	4.7	85			0.1
57	RUN	5	20	25	30	15	15	0	0	0	10		95			
61	LGR	5	15	35	20	15	10	0	0	0	10	6.8	75			0.0
62	LSBK	5	25	40	20	10	0	0	0	0	0	8.6	85			0.0
71	LGR	5	20	20	30	10	10	5	0	0	15	4.9	95			0.0
77	RUN	5	25	35	15	15	5	0	0	0	0	8.8	40			0.1
80	LSL	5	20	40	25	10	0	0	0	0	0	6.3	40			0.1
86	CRP	5	15	20	20	30	10	0	0	0	0	8.6	30			0.1
91	LSL	5	15	15	35	20	10	0	0	0	0	7.5	15			0.0

STREAM: LOST MAN
STRATUM: LOWER

DATE: 8/31-9/1/88
CFS: 1.95
SURVEYOR: SMITH/WROBLE

HABITAT TYPE SAMPLE UNIT DIRECT OBSERVATION DATA
SUMMER BASEFLOW

STREAM TYPE:C3		FIRST DIVE					SECOND DIVE							
UNIT	HABITAT	COHO		STEELHEAD			COHO		STEELHEAD			OTHER	SELECTED	SELECTED
#	TYPE	0+	1+	0+	1+	2+	0+	1+	0+	1+	2+	SP.	POSITION	SHELTER
2	LSL	43	0	60	12	3	70	0	76	8	3	stickleback	mid, mid bottom	LOD
7	LGR													
14	LSBO	51	0	20	7	0	57	0	25	8	0		mid,mid,cont.	concr. deflector
22	LSR	51	0	12	8	0	48	0	22	2	0	stickleback	mid, thal. bottom	boulder
32	LDL	66	0	6	5	0	62	0	10	1	0		mid thal, bottom	LOD
36	CRP	16	0	3	0	0	25	0	2	0	0		mid mid bottom	
47	LSL	50	0	8	2	0	66	0	15	3	0		mid mid cont	
52	GLD													
57	RUN	15	0	9	1	0	25	0	10	1	0			
61	LGR													
62	LSBK	45	0	5	0	0	43	0	18	0	0	stickleback	mid mid cont	
71	LGR													
77	RUN													
80	LSL	38	0	4	2	0	52	0	5	3	0		mid thal bottom	LOD
86	CRP	110	0	12	3	0	75	0	15	4	0		mid edge bottom	
91	LSL													

STREAM: LOST MAN
STRATUM: UPPER
MEASURE: METRIC

DATE: 8/31-9/1
CFS: 1.95
SURVEYOR: SMITH/BARNARD

HABITAT TYPE FIELD DATA
SUMMER BASEFLOW

STREAM TYPE:C3

UNIT #	HABITAT TYPE	AVERAGE L	AVERAGE W	SURFACE AREA	DEPTH AVG	DEPTH MAX	POOL TAIL CREST	VOLUME	RESIDUAL VOLUME	SHELTER RATING % COVER	SHELTER RATING VALUE	WEIGHTED RATING	STATION NUMBER	NOTES:
92	LSL	15.2	7.6	116.1	0.4	0.7	0.06	46.0	15.4	40	3	1.20		
93	LGR	24.4	4.6	111.5	0.1	0.1	0.00	10.2	0.9	10	1	0.10	14+50	
94	GLD	7.6	4.6	34.8	0.1	0.2	0.00	4.2	0.5	5	1	0.05		
95	LSR	6.7	3.7	24.5	0.2	0.4	0.06	6.0	1.1	10	3	0.30		
96	**LGR**	**12.2**	**4.9**	**59.5**	**0.1**	**0.1**	**0.00**	**3.6**	**0.2**	**10**	**1**	**0.10**		**SAMPLE UNIT: WTR #83**
97	LSBK	18.3	7.9	144.9	0.6	1.2	0.03	83.9	46.0	15	3	0.45		LOG OVER STREAM
98	LGR	13.1	4.6	59.9	0.1	0.1	0.00	3.7	0.2	15	1	0.15	15+00	
99	**LSL**	**20.7**	**4.9**	**101.1**	**0.3**	**0.8**	**0.03**	**27.7**	**6.8**	**25**	**3**	**0.75**	**15+05**	**SAMPLE UNIT: WTR #88**
100	LSR	12.2	3.7	44.6	0.3	0.6	0.06	12.2	2.6	25	3	0.75		SCOUR BERRIES AND FERNS
101	HGR	12.2	12.2	148.6	0.1	0.1	0.00	9.1	0.6	40	1	0.40		
102	GLD	7.6	15.2	116.1	0.1	0.2	0.03	10.6	0.6	25	1	0.25		
103	**LSBK**	**30.5**	**8.5**	**260.1**	**0.6**	**1.5**	**0.06**	**166.5**	**96.4**	**25**	**2**	**0.50**	**15+50**	**SAMPLE UNIT: WTR #93**
104	LSR	16.8	4.9	81.8	0.4	0.7	0.06	29.9	9.1	12	3	0.36		
105	LGR	11.3	4.6	51.6	0.1	0.2	0.00	4.7	0.4	40	1	0.40	16+00	BOTTOM OF UNIT 15+90
106	LSL	10.1	4.9	49.1	0.2	0.3	0.03	10.5	1.9	30	2	0.60		
107	**LSBK**	**33.5**	**7.0**	**235.0**	**0.5**	**1.3**	**0.06**	**114.6**	**48.9**	**35**	**3**	**1.05**		**SAMPLE UNIT: WTR #98**
108	SCP	13.7	1.5	20.9	0.1	0.2	0.00	1.6	0.1	70	3	2.10		A FEW 0+
109	LGR	44.2	8.2	363.7	0.1	0.2	0.00	33.3	3.0	15	1	0.15	16+50	BOTTOM OF UNIT 16+30
110	LSL	16.8	5.5	92.0	0.3	0.5	0.03	25.2	6.2	15	3	0.45		
111	LGR	5.9	3.0	18.0	0.1	0.1	0.00	1.6	0.2	8	1	0.08	17+00	
112	LSR	5.5	3.0	16.7	0.3	0.5	0.03	4.6	1.1	30	3	0.90		
113	LGR	27.4	4.3	117.1	0.1	0.3	0.00	10.7	1.0	12	3	0.36		
114	GLD	16.8	5.5	92.0	0.1	0.2	0.03	8.4	0.5	15	1	0.15		
115	LSBK	24.4	4.6	111.5	0.3	0.6	0.06	30.6	6.5	30	1	0.30	17+50	
116	BPB	3.0	2.4	7.4	0.1	0.2	0.00	0.9	0.1	70	3	2.10		ADJ. TO #115
117	LGR	13.4	2.4	32.7	0.1	0.2	0.00	4.0	0.5	60	1	0.60		
118	**LSL**	**21.3**	**7.6**	**162.6**	**0.5**	**1.3**	**0.03**	**79.3**	**36.3**	**28**	**3**	**0.84**	**18+00**	**SAMPLE UNIT: WTR #103**
119	SCP	12.2	5.5	66.9	0.1	0.5	0.03	9.2	1.0	8	2	0.16		ADJ. TO #111 - #118

120	LGR	27.4	2.4	66.9	0.1	0.1	0.00	4.1	0.2	30	1	0.30		ADJ. TO #111- #118
121	SCP	9.8	4.6	44.6	0.3	0.6	0.03	12.2	3.0	5	2	0.10		ADJ. TO #111- #118
122	**RUN**	**14.6**	**3.7**	**53.5**	**0.1**	**0.2**	**0.00**	**6.5**	**0.8**	**15**	**1**	**0.15**		**SAMPLE UNIT: WTR #108**
123	SCP	4.6	3.7	16.7	0.2	0.4	0.03	3.1	0.5	60	3	1.80		ADJ. TO #111- #118
124	LGR	12.8	2.4	31.2	0.1	0.1	0.00	1.9	0.1	25	2	0.50		ADJ. TO #111- #118
125	SCP	6.1	3.7	22.3	0.2	0.4	0.03	4.8	0.9	18	3	0.54		ADJ. TO #111- #118
126	LGR	9.8	7.3	71.3	0.1	0.2	0.00	4.3	0.3	8	2	0.16		BOTTOM OF UNIT AT 18+05
127	GLD	7.3	7.3	53.5	0.2	0.2	0.03	8.2	1.0	15	1	0.15		
128	**LSR**	**18.0**	**8.2**	**148.0**	**0.2**	**0.6**	**0.06**	**36.1**	**6.6**	**25**	**3**	**0.75**		**SAMPLE UNIT: WTR #113**
129	LSR	10.4	6.1	63.2	0.2	0.4	0.06	13.5	2.1	5	3	0.15		

STREAM TYPE:C1

130	RUN	8.5	4.9	41.6	0.2	0.2	0.03	7.6	1.2	5	2	0.10	18+50	BOTTOM OF UNIT AT 18+45
131	LGR	5.5	4.6	25.1	0.1	0.1	0.00	2.3	0.2	30	1	0.30		
132	LSBK	27.4	3.7	100.3	0.3	0.5	0.03	27.5	6.7	35	3	1.05		
133	LGR	28.0	4.9	136.8	0.1	0.2	0.00	12.5	1.1	55	1	0.55	19+00	
134	LSL	8.5	7.3	62.4	0.2	0.7	0.03	15.2	3.2	8	2	0.16		
135	**BPB**	**10.7**	**6.7**	**71.5**	**0.6**	**1.4**	**0.06**	**41.4**	**21.5**	**30**	**3**	**0.90**		**SAMPLE UNIT: WTR #118**
136	LSR	17.1	3.7	62.4	0.2	0.4	0.03	15.2	3.2	15	3	0.45		
137	HGR	8.8	8.5	75.4	0.1	0.1	0.00	4.6	0.3	45	1	0.45		
138	LSL	20.7	5.5	113.7	0.5	1.0	0.03	62.4	32.3	55	3	1.65	19+50	BOTTOM OF UNIT AT 19+45
139	**LSR**	**14.6**	**5.8**	**84.7**	**0.6**	**1.0**	**0.03**	**47.8**	**25.5**	**25**	**3**	**0.75**		**SAMPLE UNIT: WTR #123**
140	LGR	45.7	4.9	223.0	0.1	0.1	0.00	20.4	1.9	10	3	0.30	20+00	BOULDERS
141	BPB	18.3	3.0	55.7	0.3	0.6	0.06	18.7	5.1	15	3	0.45		ADJ TO #140
142	GLD	12.8	8.5	109.3	0.2	0.3	0.00	20.0	3.7	5	2	0.10		ADJ TO #140
143	**LSBK**	**30.5**	**7.9**	**241.5**	**0.6**	**1.5**	**0.03**	**139.9**	**76.7**	**8**	**3**	**0.24**	**20+50**	**SAMPLE UNIT: WTR #128**

STREAM: LOST MAN
STRATUM: UPPER
MEASURE: METRIC

DATE: 8/31-9/1/88
CFS: 1.95
SURVEYOR: SMITH/WROBLE

HABITAT TYPE SAMPLE UNIT PHYSICAL DATA
SUMMER BASEFLOW

STREAM TYPE: C3

UNIT	HABITAT	SILT	SAND	GRAVEL	COBBLE		BOULDER			BDRK	PERCENT	INVERT	CROWN	TEMP		VELOCITY
#	TYPE	CLAY	<0.2cm	0.2-6.4	6.4-12.8	12.8-25.6	25.6-51.2	51.2-102.4	>102.4		EXPOSED	ABUND	COVER	AIR	H20	MPS
96	LGR	5	10	25	35	20	5	0	0	0	20	9.1	90			0.0
99	LSL	15	20	20	30	10	5	0	0	0	0	12.3	5			0.1
103	LSBK	5	15	30	25	10	0	0	0	5	5	6.0	35			0.0
107	LSBK	5	70	10	5	0	0	5	5	0	10	6.9	40			0.2
118	LSL	5	45	20	15	10	5	0	0	0	0	6.0	45			0.0
122	RUN	5	10	25	30	20	10	0	0	0	15	8.8	95			0.0
128	LSR	5	25	20	25	20	5	0	0	0	5	6.5	90			0.0

STREAM TYPE:C1

135	BPB	35	30	10	10	15	0	0	0	0	5	4.9	80			0.0
139	LSR	5	20	35	30	10	0	0	0	0	5	14.0	15			0.0
143	LSBK	5	35	20	20	5	5	5	0	5	10	6.5	10			0.0

LOST MAN CREEK
ELECTROFISHING DATA
SUMMER BASE FLOW

UNIT #	HABITAT TYPE
57	**15**

		COHO		STEELHEAD			OTHER	REMOVAL
PASS	EFFORT	0+	1+	0+	1+	2+	SPECIES	PATTERN
FIRST	454 sec.	5	0	7	0	0	0	12
SECOND		1	0	5	2	0	0	8
THIRD	426 sec.	4	0	1	0	0	0	5
TOTAL		**10**	**0**	**13**	**2**	**0**	**0**	**25**

AVG.FORK LENGTH (mm.)	66.3	0	48.0	121.5
AVG. WEIGHT (gm.)	5	0	1.2	19.8

TOTAL CAPTURE = 25
PROBABILITY OF CATCH = .43
STANDARD ERROR = 8.1
ESTIMATED POPULATION = 30
95% CONFIDENCE INTERVAL = 25, 46

DIRECT OBSERVATION (D.O.) TOTAL = 30.5

D.O.CORRECTION FACTOR = 30/30.5 = .98

UNIT #	HABITAT TYPE
128	**11**

		COHO		STEELHEAD			OTHER	REMOVAL
PASS	EFFORT	0+	1+	0+	1+	2+	SPECIES	PATTERN
FIRST	383 sec.	11	0	3	1	0	0	15
SECOND	464 sec.	9	0	0	0	0	1 LAMPREY	9
THIRD	475 sec.	5	0	0	2	0		7
TOTAL		**25**	**0**	**3**	**3**	**0**	**1**	**31**

AVG.FORK LENGTH (mm.)	66.3	0	48.0	121.5
AVG. WEIGHT (gm.)	5	0	1.2	19.8

TOTAL CAPTURE = 31
PROBABILITY OF CATCH = .41
STANDARD ERROR = 9.25
ESTIMATED POPULATION = 38
95% CONFIDENCE INTERVAL = 31, 56

DIRECT OBSERVATION (D.O.) TOTAL = 58.5

D.O.CORRECTION FACTOR = 38/58.5 = .65

APPENDIX G

STREAM: LOST MAN
STRATUM: LOWER
MEASURE: METRIC

DATE: 6/15-16/88
CFS: 25.6
SURVEYOR: A. LAIRD/K.BARNARD

HABITAT TYPE FIELD DATA
WINTER BASEFLOW

STREAM TYPE:C3

UNIT	HABITAT	AVERAGE		SURFACE	DEPTH			SHELTER RATING		WEIGHTED	SPAWNING	STATION	
#	TYPE	L	W	AREA	AVG	MAX	VOLUME	% COVER	VALUE	RATING	AREA	NUMBER	NOTES:
1	LGR	24.4	5.2	126.5	0.3	0.4	38.6	15	2	0.30	9	0+00	
2	LGR	24.4	1.5	37.2	0.1	0.1	3.7	5	2	0.10	0		SIDE CHANNEL
3	**LSL**	**20.7**	**7.3**	**151.8**	**0.5**	**0.7**	**69.5**	**30**	**2**	**0.60**	**0**		**SAMPLE UNIT #1**
4	LGR	17.7	7.3	129.5	0.3	0.3	39.5	10	2	0.20	9	0+50	
5	GLD	6.4	6.7	43.0	0.3	0.3	13.1	15	2	0.30	19		
6	LSBO	43.9	6.7	294.7	0.3	0.7	89.9	20	3	0.60	9	1+00	
7	CRP	7.9	8.2	65.3	0.3	0.8	19.9	15	3	0.45	0		
8	**LGR**	**18.6**	**8.8**	**164.6**	**0.3**	**0.3**	**41.7**	**0**	**0**	**0.00**	**99**		**SAMPLE UNIT #2**
9	GLD	9.2	7.6	69.8	0.3	0.4	21.3	0	0	0.00	28		
10	LSR	32.0	6.4	205.1	0.7	0.9	135.1	30	3	0.90	10	1+50	
11	PLP	5.8	10.4	60.1	1.0	0.8	57.9	65	3	1.95	0		
12	LSBO	39.3	7.3	288.0	0.7	0.6	189.7	15	3	0.45	43	2+00	
13	**LGR**	**11.0**	**6.7**	**73.7**	**0.3**	**0.4**	**18.7**	**10**	**3**	**0.30**	**18**		**SAMPLE UNIT #3**
14	LSBO	21.4	7.0	149.8	0.5	0.7	68.5	50	3	1.50	7	2+50	
15	GLD	6.4	10.4	66.4	0.3	0.5	20.3	0	0	0.00	0		
16	PLP	10.7	14.9	159.5	1.0	1.5	153.8	15	3	0.45	0		CONCRETE DAM 2'
17	CHU	5.5	4.6	25.1	0.2	0.2	3.8	0	0	0.00	0		DAM APRON
18	**LSBO**	**7.3**	**6.4**	**46.9**	**1.2**	**1.3**	**57.2**	**40**	**3**	**1.20**	**0**	**3+00**	**SAMPLE UNIT #4**
19	LGR	15.9	6.4	101.6	0.3	0.3	25.7	5	2	0.10	20		
20	LSBO	23.8	7.6	181.4	1.0	0.8	174.8	15	3	0.45	0		
21	LGR	11.6	7.3	84.8	0.2	0.3	17.1	10	3	0.30	51		
22	GLD	8.5	2.7	23.4	0.1	0.1	2.9	0	0	0.00	2		BKWTR GLIDE ADJ#23
23	**LSR**	**25.0**	**3.7**	**91.5**	**0.5**	**0.6**	**44.7**	**25**	**3**	**0.75**	**5**	**3+50**	**SAMPLE UNIT #5**
24	LSBO	15.6	6.4	99.6	0.9	1.2	91.2	30	3	0.90	0		
25	LGR	27.1	5.8	157.3	0.3	0.4	43.2	5	2	0.10	47		
26	BPB	7.3	7.6	55.8	0.4	0.5	20.4	5	1	0.05	0		BO/CONC WIER ADJ#27
27	LSBO	6.1	4.6	27.9	0.3	0.5	8.5	0	0	0.00	8	4+00	

28	**LSBO**	**27.5**	**5.2**	**142.3**	**0.5**	**1.0**	**69.5**	**30**	**3**	**0.90**	**7**		**SAMPLE UNIT#6**
29	LGR	17.7	9.5	167.3	0.1	0.2	20.4	10	3	0.30	67	4+50	
30	LGR	46.1	9.5	435.5	0.1	0.2	53.1	50	1	0.50	131		
31	LSR	46.1	2.4	112.4	0.3	0.5	34.3	50	3	1.50	0		ADJ #30
32	LSR	53.4	8.5	455.8	0.4	0.8	166.8	25	3	0.75	23	5+00	
33	**CRP**	**15.9**	**7.6**	**120.9**	**0.3**	**0.5**	**36.9**	**10**	**3**	**0.30**	**9**	**5+50**	**SAMPLE UNIT#7**
34	SCP	52.5	1.8	96.0	0.2	0.4	23.4	70	3	2.10	0		ADJ #33
35	LGR	11.6	5.2	60.1	0.2	0.3	14.7	70	1	0.70	15		
36	LSL	11.9	6.7	79.8	0.6	0.8	46.3	20	3	0.60	0		
37	LGR	69.8	6.4	447.4	0.2	0.3	95.5	5	2	0.10	157	6+00	
38	**LSL**	**10.7**	**1.5**	**16.3**	**0.6**	**0.6**	**9.9**	**25**	**3**	**0.75**	**0**	**6+50**	**SAMPLE UNIT#8**
39	LGR	16.8	11.9	199.5	0.2	0.2	30.4	25	2	0.50	50		
40	GLD	14.0	11.6	162.6	0.2	0.5	34.7	0	0	0.00	16		
41	LSL	47.0	10.7	501.4	0.8	1.6	397.6	50	3	1.50	0	7+00	
42	LGR	34.5	6.7	231.3	0.2	0.2	42.3	5	2	0.10	58	7+50	
43	**GLD**	**13.1**	**7.6**	**100.0**	**0.3**	**0.4**	**27.5**	**0**	**0**	**0.00**	**10**		**SAMPLE UNIT#9.**
44	LSR	16.2	6.7	108.5	0.4	0.7	39.7	20	3	0.60	0		LB TRIBUTARY
45	LGR	86.9	7.6	662.8	0.2	0.2	101.1	20	3	0.60	166	8+00/50	
46	RUN	30.5	9.2	279.1	0.3	0.4	76.6	0	0	0.00	28	9+00	
47	LSR	15.9	7.3	116.1	0.4	0.6	49.6	10	3	0.30	0		
48	**LGR**	**9.5**	**8.5**	**80.7**	**0.2**	**0.3**	**19.7**	**5**	**2**	**0.10**	**40**		**SAMPLE UNIT#10**
49	GLD	9.2	5.8	53.0	0.2	0.4	12.9	0	0	0.00	27		ADJ #48
50	LSBK	11.9	4.3	50.8	0.5	0.8	27.9	25	1	0.25	0		RB:ADJ#52 CTRL BAR
51	LGR	10.7	4.6	48.8	0.2	0.3	8.9	10	3	0.30	0		RB:ADJ#53
52	LGR	14.0	2.4	34.2	0.2	0.3	7.3	20	3	0.60	3		LB:ADJ#50
53	**RUN**	**8.8**	**2.7**	**24.3**	**0.3**	**0.3**	**6.7**	**10**	**2**	**0.20**	**2**	**9+50**	**SAMPLE UNIT#11**
54	GLD	7.9	8.5	67.7	0.4	0.5	26.9	0	0	0.00	0		
55	LSBK	17.7	6.7	118.7	0.8	1.2	94.1	5	2	0.10	0		
56	LGR	86.9	8.8	768.9	0.2	0.3	164.1	5	2	0.10	154	10+00/50	
57	RUN	33.2	8.2	273.8	0.3	0.5	75.2	5	3	0.15	27		
58	**LGR**	**10.7**	**7.6**	**81.4**	**0.2**	**0.3**	**19.9**	**5**	**1**	**0.05**	**16**	**11+00**	**SAMPLE UNIT#12**
59	LSR	14.0	7.6	107.0	0.4	0.5	39.2	15	2	0.30	0		
60	LGR	30.5	6.1	186.1	0.2	0.3	39.7	60	1	0.60	19		
61	POW	12.8	17.1	218.8	0.5	0.5	100.1	90	3	2.70	0	11+50	ARTIFICAL BANKS
62	PLP	5.8	19.8	114.9	1.2	1.5	140.2	100	3	3.00	0		
63	CHU	5.5	17.1	93.8	0.0	0.1	2.9	0	0	0.00	0		DAM APRON

64	**RUN**	**53.7**	**11.0**	**589.4**	**0.3**	**0.5**	**161.8**	**0**	**0**	**0.00**	**0**	**12+00**	**SAMPLE UNIT#13**
65	LSL	14.0	4.3	59.9	0.5	0.7	32.9	30	3	0.90	0		ADJ#66
66	RUN	14.0	7.0	98.4	0.3	0.3	27.0	0	0	0.00	0		RUN CONTINOUS W/#64
67	RUN	24.1	11.0	264.6	0.2	0.5	64.6	10	3	0.30	0	12+50	
68	**LSL**	**18.0**	**9.8**	**175.6**	**0.5**	**1.1**	**91.1**	**30**	**3**	**0.90**	**0**		**SAMPLE UNIT#14**
69	LGR	10.7	10.7	114.0	0.2	0.4	20.9	0	0	0.00	34		
70	LSBK	16.8	10.4	174.0	0.3	0.6	53.1	5	2	0.10	26	13+00	
71	LSBO	38.1	7.6	290.7	0.3	0.7	97.5	50	3	1.50	29		
72	CRP	14.6	7.9	116.1	0.4	0.7	49.6	10	1	0.10	0	13+50	
73	**CRP**	**20.1**	**6.7**	**135.1**	**0.5**	**0.7**	**70.0**	**15**	**1**	**0.15**	**7**		**SAMPLE UNIT#15**
74	BPL	8.2	2.4	20.1	0.3	0.5	6.7	0	0	0.00	0		ADJ#76
75	BPB	18.6	4.6	85.1	0.5	1.0	41.5	90	3	2.70	0		ADJ#76
76	HGR	13.4	4.9	65.5	0.2	0.3	12.0	40	1	0.40	0		
77	LSR	18.6	8.2	153.2	0.5	0.8	74.8	30	3	0.90	15	14+00	
78	**LSL**	**12.8**	**6.7**	**86.0**	**0.5**	**0.9**	**47.2**	**70**	**3**	**2.10**	**9**		**SAMPLE UNIT#16**

STREAM: LOST MAN
STRATUM: LOWER
MEASURE: METRIC

DATE: 6/15-16/88
CFS: 25.6
SURVEYOR: LAIRD/BARNARD

HABITAT TYPE SAMPLE UNIT PHYSICAL DATA
WINTER BASEFLOW

STREAM TYPE: C3

UNIT	HABITAT	SILT	SAND	GRAVEL	COBBLE		BOULDER			BDRK	PERCENT	INVERT	CROWN	TEMP		VELOCITY
#	TYPE	CLAY	<0.2cm	0.2-6.4	6.4-12.8	12.8-25.6	25.6-51.2	51.2-102.4	>102.4		EXPOSED	ABUND	COVER	AIR	H20	MPS
3	5	40	45	3	7	0	0	0	0	0	0	0.33	95	17.0	12.0	0.3
8	1	3	10	40	40	7	0	0	0	0	0	0.33	90	18.0	13.0	0.7
13	1	0	8	30	35	15	7	2	1	0	3	0.66	15	18.5	14.0	0.7
18	20	0	30	25	15	10	5	5	0	10	5	0.66	10	17.0	13.8	0.0
23	11	0	20	45	20	10	5	0	0	0	0	0.5	80	15.0	12.0	1.0
28	10	0	15	65	15	5	0	0	0	0	0	0.33	20	14.8	11.5	0.0
33	22	0	50	40	10	0	0	0	0	0	0	0.33	35	13.2	11.8	0.0
38	10	0	40	20	15	10	0	0	0	0	0	0.66	100	13.2	11.2	0.0
43	14	0	10	80	10	0	0	0	0	0	0	0.33	85	15.0	12.0	0.6
48	1	5	5	50	30	10	0	0	0	0	0	0.66	95	14.0	11.5	0.7
53	14	0	10	70	15	0	0	0	0	0	0	0.33	100	13.0	11.2	0.0
58	1	0	15	40	35	8	2	0	0	0	0	0.33	90	13.0	11.2	0.5
64	15	0	30	40	20	10	0	0	0	0	0	0.33	65	14.0	11.5	0.3
68	10	5	20	40	20	10	5	0	0	0	0	0.33	65	15.0	11.5	0.0
73	22	0	30	15	30	15	5	0	0	0	0	0.5	5	16.0	11.5	0.6
78	10	0	30	20	40	10	0	0	0	0	0	0.33	80	15.5	12.0	0.0

STREAM: LOST MAN
STRATUM: UPPER
MEASURE: METRIC

DATE: 6/15-16/88
CFS: 25.6
SURVEYOR: LAIRD/BARNARD

HABITAT TYPE FIELD DATA
WINTER BASEFLOW

STREAM TYPE: C3													
UNIT	HABITAT	AVERAGE		SURFACE	DEPTH		VOLUME	SHELTER RATING		WEIGHTED	SPAWNING	STATION	NOTES:
#	TYPE	L	W	AREA	AVG.	MAX		% COVER	VALUE	VALUE	AREA	NUMBER	
79	LSL	17.1	7.9	135.4	0.5	1.0	74.4	25	3	0 75	7		
80	BPL	8.2	4.0	32.7	0.5	0.8	16.9	80	3	2 40	0		ADJ#79
81	LGR	27.5	7.0	192.6	0.2	0.2	29.4	0	0	0.00	58	14+50	
82	LSR	14.6	5.8	84.8	0.4	0.6	31.1	20	3	0.60	17		
83	**LGR**	**9.2**	**8.2**	**75.4**	**0.2**	**0.3**	**11.5**	**5**	**3**	**0.15**	**11**		**SAMPLE UNIT#17**
84	GLD	8.5	9.5	80.7	0.2	0.7	19.7	5	1	0 05	48		
85	LSBK	14.0	13.1	184.0	0.9	1.3	162.8	40	3	1 20	0		
86	LGR	12.2	9.8	119.1	0.2	0.4	25.4	10	1	0.10	0	15+00	CENTRAL BAR
87	LSL	12.8	5.8	74.2	0.5	1.0	36.2	4	3	0.12	4		
88	**LSBK**	**20.1**	**5.2**	**104.4**	**0.5**	**0.7**	**50.9**	**40**	**3**	**1.20**	**0**		**SAMPLE UNIT#18**
89	HGR	10.4	3.4	34.8	0.2	0.4	6.4	20	3	0.60	0		
90	LGR	39.7	3.4	133.0	0.1	0.1	8.1	20	1	0.20	0		ADJ#86-89
91	LGR	12.2	14.6	178.6	0.1	0.2	21.8	0	0	0.00	89	15+50	
92	GLD	11.3	11.3	127.4	0.3	0.6	38.8	5	1	0.05	25		
93	**LSBK**	**19.5**	**11.0**	**214.3**	**0.9**	**1.5**	**196.1**	**20**	**2**	**0.40**	**0**		**SAMPLE UNIT#19**

STREAM TYPE: C1													
94	LSR	10.7	5.2	55.3	0.5	0.8	27.0	20	3	0.60	0		CENTRAL BAR
95	LGR	18.3	6.4	117.2	0.2	0.3	17.9	5	2	0.10	0	16+00	
96	SCP	18.6	3.7	68.1	0.3	0.7	20.8	25	3	0.75	0		ADJ#94-95
97	GLD	11.9	9.2	108.8	0.1	0.5	13.3	10	3	0.30	16		
98	**LSBO**	**28.1**	**8.5**	**239.6**	**1.1**	**1.4**	**263.1**	**40**	**3**	**1.20**	**0**		**SAMPLE UNIT#20**
99	LGR	59.5	10.1	598.6	0.2	0.5	127.8	0	0	0.00	209	16+50	
100	LGR	50.9	7.6	388.4	0.2	0.6	71.1	10	3	0.30	136	17+00	CENTRAL BAR
101	LSBK	19.8	5.5	108.8	0.4	0.7	43.2	5	1	0.05	5	17+50	
102	LGR	20.7	4.0	82.2	0.3	0.4	22.6	15	3	0.45	4		
103	**LSL**	**18.3**	**8.2**	**150.7**	**0.7**	**1.4**	**110.3**	**40**	**3**	**1.20**	**8**	**18+00**	**SAMPLE UNIT#21**
104	PLP	15.9	6.7	106.4	0.4	0.6	42.2	15	2	0.30	0	17+00	ADJ#100-103

105	LGR	17.7	3.1	54.0	0.2	0.4	8.2	15	3	0.45	0		ADJ#100-103
106	GLD	8.2	4.9	40.2	0.2	0.3	6.1	5	1	0.05	0		ADJ#100-103
107	LSL	7.9	4.6	36.3	0.5	0.7	16.6	20	3	0.60	0		ADJ#100-103
108	**RUN**	**20.4**	**3.4**	**68.6**	**0.2**	**0.4**	**12.5**	**5**	**2**	**0.10**	**3**		**SAMPLE UNIT#22**
109	LGR	11.9	3.1	36.3	0.1	0.2	3.3	5	3	0.15	4		ADJ#100-103
110	RUN	13.1	3.7	48.0	0.2	0.5	11.7	30	3	0.90	5	18+00	ADJ#100-103
111	LGR	9.5	8.2	77.9	0.2	0.5	16.6	5	2	0.10	0		LARRY DAM CREEK
112	RUN	14.9	7.9	118.5	0.2	0.5	28.9	0	0	0.00	71		
113	LSR	10.7	7.3	78.1	0.4	0.6	33.4	30	3	0.90	12		SAMPLE UNIT#23
114	LGR	28.1	7.6	214.0	0.3	0.6	58.7	60	1	0.60	44	18+50	
115	LSBK	27.5	5.2	142.3	0.4	0.8	56.4	90	1	0.90	7		CLAY BK 100% OH VEG.
116	LGR	22.9	4.9	111.6	0.2	0.5	23.8	80	1	0.80	0	19+00	
117	LSL	7.3	10.7	78.1	0.4	1.0	28.6	30	3	0.90	8		
118	**BPB**	**11.0**	**6.1**	**67.0**	**0.6**	**1.1**	**38.8**	**70**	**3**	**2.10**	**0**		**SAMPLE UNIT#24**
119	LSR	21.0	6.1	128.4	0.3	0.6	43.1	15	3	0.45	13		
120	LGR	8.8	10.4	91.7	0.2	0.3	14.0	90	1	0.90	0		
121	LSL	32.6	6.1	199.1	0.6	1.3	121.4	60	3	1.80	0	19+50	
122	GLD	7.3	6.7	49.1	0.2	0.4	12.0	0	0	0.00	34		
123	**LSR**	**14.9**	**6.7**	**100.3**	**0.7**	**1.1**	**67.3**	**25**	**3**	**0.75**	**0**		**SAMPLE UNIT #25**
124	HGR	36.3	7.9	287.8	0.2	0.3	52.7	40	1	0.40	0	20+00	
125	HGR	4.6	1.2	5.6	0.1	0.1	0.5	0	0	0.00	0		ADJ#124
126	SCP	21.4	5.2	110.7	0.3	0.7	37.1	20	3	0.60	0		ADJ#124
127	GLD	11.9	13.4	159.6	0.2	0.4	38.9	5	3	0.15	48		
128	**LSBK**	**18.3**	**9.5**	**173.0**	**0.7**	**1.6**	**126.7**	**10**	**3**	**0.30**	**0**	**20+50**	**SAMPLE UNIT#26**

STREAM: LOST MAN
STRATUM: UPPER
MEASURE: METRIC

DATE: 6/15-16/88
CFS: 25.6
SURVEYOR: LAIRD/BARNARD

HABITAT TYPE SAMPLE UNIT PHYSICAL DATA
WINTER BASEFLOW

STREAM TYPE:C3																
UNIT	HABITAT	SILT	SAND	GRAVEL	COBBLE		BOULDER			BDRK	PERCENT	INVERT	CROWN	TEMP		VELOCITY
#	TYPE	CLAY	<0.2cm	0.2-6.4	6.4-12.8	12.8-25.6	25.6-51.2	51.2-102.4	>102.4		EXPOSED	ABUND	COVER	AIR	H20	MPS
83	1	0	5	65	25	5	0	0	0	0	0	0.33	70	14.0	11.8	1.0
88	12	5	50	25	10	5	0	0	0	5	0	0.33	30	15.5	12.0	0.8
93	12	0	60	25	5	0	0	0	0	10	0	0.33	50	18.0	12.0	0.2
98	20	5	80	10	0	0	0	2.5	2.5	0	0	0.33	75	15.0	12.0	0.3
103	10	0	55	30	10	5	0	0	0	0	0	0.33	70	16.0	12.0	0.0
108	15	0	15	65	15	5	0	0	0	0	0	0.33	100	15.5	12.8	0.3
113	11	0	10	55	25	10	0	0	0	0	0	0.33	100	15.0	12.0	0.3
STREAM TYPE:C1																
118	5	45	30	15	5	5	0	0	0	0	0	0.33	30	15.5	12.2	0.0
123	11	0	25	40	20	10	0	0	0	0	0	0.33	90	15.0	12.0	0.4
128	12	5	70	20	0	0	0	2.5	2.5	0	0	0.33	30	13.0	12.2	0.2