

Technical Report No. 99-4

Carbon Mountain Tract 1998 Fish Habitat Survey

Michael Wiedmer

October 1999

Alaska Department of Fish and Game

Habitat and Restoration Division



Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft ³ /s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd
Spell out acre and ton.	

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s
Spell out year, month, and week.	

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
And	&
At	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	\$. ¢
months (tables and figures): first three letters	Jan., ..., Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
Trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H _A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2 , etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log ₂ , etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H ₀
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

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CARBON MOUNTAIN TRACT 1998 FISH HABITAT SURVEY

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ABSTRACT

The Bering River watershed, flowing to the northern Gulf of Alaska, supports 5 species of anadromous Pacific salmon *Oncorhynchus* and resident and anadromous Dolly Varden *Salvelinus malma* and cutthroat trout *O. clarki*. The commercial fishing fleet annually harvests approximately 130,000 Bering River-bound salmon. Approximately 31,160 ha of the upper watershed, known as the Carbon Mountain Tract (Tract), are in private ownership. The landowner is currently developing road access to the Tract to facilitate harvest of approximately 3,200 ha of timber.

Fish habitat distribution in the Tract is incompletely described. However, the level of statutory protection provided Alaskan waterbodies depends upon documentation of fish use, particularly anadromous fish use. Therefore, in response to the proposed resource development plans, Alaska Department of Fish and Game (ADF&G), Habitat and Restoration Division staff, in cooperation with the landowner, conducted a fish habitat survey of the Tract in August 1998.

The survey targeted the suspected upstream limits of spawning sockeye salmon *O. nerka* (primarily lakes) or rearing coho salmon *O. kisutch* habitats (primarily headwater streams). Resident fish habitats were incidentally recorded. Fish were either visually observed (spawning sockeye salmon) or collected with backpack electrofishers. Aquatic habitat parameters, including a novel fish migration barrier classification system, were recorded at each station.

Juvenile coho salmon and Dolly Varden of various life stages were the most commonly encountered species. Sampled fish community structure showed little diversity; only 6 species (4 *Salmonidae*, 1 *Cottidae*, 1 *Gasterosteidae*) were observed in the Tract with a maximum of 3 species at any one location. The survey added 29 streams or stream extensions (total length = 24.3 km) and 6 lakes and wetland complexes (total area = 76.6 ha) to ADF&G's previous anadromous fish distribution atlas. We also documented 11 stream reaches (total length = 5.7 km) and 2 lakes (total area = 2,632 ha) that support resident fish only. We identified 21 stream reaches requiring additional surveys. Among coho salmon juveniles, the prime target species, ephemeral migratory barriers most commonly blocked upstream movements.

Specific spawning locations of sockeye and coho salmon remain poorly documented in the Tract. Non-obligate anadromous fish and resident fish (Dolly Varden and cutthroat trout) distribution remains enigmatic. Extensive foot surveys will be necessary to further delineate the maximal distribution of Dolly Varden and cutthroat trout. Glacial retreat and downwasting has recently and will likely continue to create new fish habitat. Periodic surveys can document the creation of new spawning and rearing habitats.

Data from the survey were used to generate a GIS project, which is included in the CD fixed to the back cover of this report.

Key words: Bering River, Carbon Mountain Tract, fish habitat surveys, coho salmon, Dolly Varden.

INTRODUCTION

The Bering River watershed, flowing to the northern Gulf of Alaska, supports a diverse and abundant assemblage of fish and wildlife. The watershed supports 5 species of anadromous Pacific salmon *Oncorhynchus*, with particularly large runs of sockeye *O. nerka* and coho *O. kisutch*. The commercial fishing fleet annually harvests approximately 130,000 Bering River-bound salmon (S. Morstad, Alaska Department of Fish and Game, Cordova, personal communication). Resident and anadromous Dolly Varden *Salvelinus malma* and cutthroat trout *O. clarki* occur throughout the area. The watershed also supports brown *Ursus arctos* and black *U. americanus* bear, mountain goat *Oreamnos americanus*, wolf *Canis lupus*, and waterfowl concentrations. The watershed is physically dynamic: shaped by Pleistocene and present glacial advance and retreat, isostatic rebound, tectonic uplift, and extreme weather conditions generated by storms flowing from the Gulf of Alaska. Bering Glacier, at the head of the Bering River, is the largest and longest glacier in continental North America (Molnia et al. 1996) and is the largest temperate surging glacier on earth (Molnia et al. 1994).

Approximately 31,160 ha of the upper watershed, known as the Carbon Mountain Tract (Tract), is owned by a private corporation actively pursuing resource development plans (CAC 1999). The Tract is approximately 96 km east of Cordova and 32 km north of the Gulf of Alaska. It is bounded on the north and east by glaciers originating in the Bagley Ice Field, on the west by the Shepard Creek drainage, and on the south by the coastal plain (Appendix A). Elevations in the Tract range from 25 m along the Bering River and Stillwater Creek to 1525 m in the mountains north of Berg Lake.

Coal and other mineral exploration and development and associated railroad construction occurred throughout much of the Tract from 1901 to 1922 (Nielsen 1989). The Tract's numerous published place names date from 1903 to 1911 and derive from local prospectors (Orth 1971). Essentially no additional development activity has occurred during the past 77 years.

Currently the landowner is working with the U. S. Forest Service to develop road access from the Copper River Highway across 46 km of Chugach National Forest land to the Tract. Road construction began in 1998. When the road is completed, the landowner plans to harvest approximately 3,200 ha of mature Sitka spruce *Picea sitchensis* and western hemlock *Tsuga heterophylla* timber (CAC 1999).

Fish habitat on Forest Service land along the proposed access corridor was surveyed in 1997 by Prince William Sound Science Center (PWSSC) staff under contract to the landowner (G. Steinhart, PWSSC, Cordova, personal communication). U. S. Forest Service, Cordova Ranger District (USFS, CRD) staff also surveyed fish habitats along the proposed access corridor in 1998 (D. Schmid, USFS, CRD, Cordova, personal communication).

Fish habitat distribution in the Tract is incompletely described. The USFS conducted limited ground surveys in 1985 (E. Weiss, Alaska Department of Fish and Game, Anchorage, personal communication). The Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries, conducts aerial escapement surveys for sockeye and coho salmon in the major rivers and lakes of the Tract; however, detailed surveys and mapping of spawning areas and juvenile rearing habitats have not been conducted.

The level of state statutory protection (e.g., AS 16.05 and AS 41.17) provided Alaskan

waterbodies depends in large degree upon whether fish use of specific habitats has been documented, particularly anadromous fish habitats (e.g., AS 16.05.870 and AS 41.17.116). Therefore, we conducted a survey of the Tract in August 1998 to identify fish habitats prior to resource development. Results of this survey will guide future administration of ADF&G's Title 16 and Alaska Forest Resources and Practices Act responsibilities and will provide the landowner with detailed, site-specific fish habitat information well in advance of actual Tract development. The survey was timed to coincide with the anticipated maximal distribution of spawning sockeye and rearing coho salmon.

Our survey focus was on those areas of the Tract where fish were likely to occur. Much of the Tract is mountainous with gradients exceeding 100% or is covered by the ice of the Bering/Steller, Kushtaka, or Martin River glaciers. In an area as large as the Tract, no one survey can thoroughly delineate all fish habitat. Therefore, objectives of the survey included identifying not only where fish were found, but explicitly identifying waterbodies requiring additional investigation and waterbodies where sampling indicated the probable absence of fish (particularly anadromous fish).

During past fish habitat surveys in other areas, we frequently have been faced with a trade-off: do we survey in great detail a given stream to precisely characterize fish distribution or do we use our limited field time to survey, in less detail, multiple streams? Because of difficult foot access, some streams require a full day to accurately survey, but that full day is often not available. In these cases we can only approximate upper limits of fish distribution.

We also recognize that we often have only one point in time to survey a given stream, yet we know that the factors regulating fish distribution can be transient. That is, although we accurately

locate the upper limit of fish distribution at the time of the survey, another survey conducted at a different time (season) may lead to a different determination. Upstream limits of fish distribution can vary in time and space. Therefore, for the fish habitat survey of the Tract, we made a particular effort to accurately document the extent of our understanding of the physical features blocking fish migration.

METHODS

The survey targeted the suspected upstream limits of spawning sockeye salmon or rearing coho salmon habitat. In general, we did not resurvey waterbodies previously documented to support anadromous fish. Resident fish habitat primarily was incidentally recorded. We surveyed the Tract with two 2-person field crews (Table 1). Crews were based at commercial lodgings in Cordova and flew daily to the Tract *via* an Eurocopter A-Star¹ helicopter. Fuel was cached at Mile 37 on the Copper River Highway to reduce flight time for refueling. In the field, the helicopter shuttled the two crews from station to station.

Table 1.-Carbon Mountain Tract fish habitat survey personnel.

Staff	Affiliation	Dates
Michael Wiedmer	ADF&G	8/24 – 8/28/98
Mike Thompson	ADF&G	8/24 – 8/28/98
Rick Jandreau	Koncor Forest Products	8/24 – 8/28/98
Mark Stahl	Chugach Alaska	8/24/98
Mike Hoyt	Chugach Alaska	8/25 – 8/28/98

Potential survey areas were identified based on analyses of existing documentation of fish distribution, USGS topographic maps, and low-level aerial photographs. Final survey station locations were established during low-level helicopter reconnaissance of individual streams. Stations were intentionally located at, or as near

¹ Use of a company's name does not constitute endorsement.

to, the anticipated upstream limit of target species distribution as helicopter landing locations allowed. If anadromous fish were collected at a station, a foot survey continued upstream until either a barrier to anadromous fish migration was identified or when the time required to conduct further foot surveys undermined the overall objectives of the project. Spawning adult salmon locations were noted during low-level flight as were obvious barriers to fish migration.

A station was defined as a discrete geographic location where: (1) we observed an adult salmon spawning aggregation, (2) we conducted a ground survey of habitat and fish presence, or (3) we collected fish habitat data but did not sample the fish population. Survey stations were recorded on aerial photographs (1:15,840). Where satellite signals were available, latitudes and longitudes were recorded using non-differential Garmin GPS 12 XL¹ Global Positioning System units. Unique alphanumeric values were assigned each survey station.

Each crew typically spent 30 to 60 minutes at each station, sampling extant fish populations and recording habitat characteristics. Fish were collected with Smith-Root Model 12¹ battery-powered backpack electrofishers equipped with Programmable Output Waveforms. Output voltages and waveforms were selected to maximize capture efficiency while minimizing risk of injury or death to fish present. Selected output voltages and waveforms varied from site to site based on aquatic parameters influencing the fundamental performance of the electrofishers (e.g., conductivity and pool depth) and physical characteristics influencing capture efficiency (e.g., turbidity, velocity, and debris concentration). Fish were identified to species and fork lengths measured to the nearest millimeter. For each collected or observed fish we recorded life stage

(Table 2) and suspected life history (anadromous, resident, unknown). After identification, measurement, and a period of recuperation in still water, collected fish were released at their collection site. We did not electrofish in the immediate vicinity of observed large (>150 cm) fish.

Table 2.-Functional Life Stages.

Stage	Definition
Egg/Alevin	Fertilized eggs adhering to, or buried within, a substrate or pre-emergent sac-fry remaining within the substrate.
Planktonic Egg/Larvae	Mobile fertilized eggs or hatched juveniles that primarily drift with currents and have not developed volitional swimming capabilities.
Juvenile	Sexually immature free-swimming fish.
Adult	Fish at, or approaching, sexual maturity.
Juvenile/Adult	Free-swimming fish whose sexual maturity is not determined.
Adult Spawning	Adults observed in the act of spawning.

Recorded aquatic habitat characteristics included water temperature, clarity/color (clear, ferric, glacial, humic, muddy), and velocity (visually estimated); channel width and depth (both banks and thalweg); waterbody type (adapted from Rosgen 1996); gradient (clinometer reading); flow stage (low, medium, high) and substrate composition (visual estimate of % cover of each of 7 classes, see Table 3). Channel diagrams illustrating typical cross sections, bed and bank morphology, and riparian vegetation were sketched on data forms. Opportunistic wildlife observations were noted as was a general description of the past 48-h precipitation/runoff (none/trace, moderate, heavy). Ground and aerial photographs were taken of survey station with 35-mm print film. Station elevations were derived by plotting station locations on 1:63,360 U.S. Geological Survey (USGS) topographic maps and interpolating between contour lines.

¹ Use of a company's name does not constitute endorsement.

Table 3.-Substrate classes.

Class	Description/particle diameter
Organic	Incompletely decayed plant material > 2.1 mm
Silt/Clay	< 0.062 mm
Sand	0.062 – 2.0 mm
Gravel	2.1 – 63.5 mm
Cobble	63.6 – 256 mm
Boulder	> 256 mm (individual particles)
Bedrock	Contiguous parent rock

At each survey station, we identified physical features, if present, at or near each site that appeared to block additional upstream movement of the specific species and life stage present. We recorded the barrier class (Appendix B1) best describing the observed migratory blockage.

Data were entered into a Microsoft Access¹ database, which was used to generate a GIS data layer for spatial representation within an ESRI ArcView 3.1¹ project file (Appendix C1, CD enclosed on inside of back cover). Within the ArcView project, we included orthophotos and 1:63,360 USGS Digital Raster Graphics (i.e., scanned topographic maps) as base maps. We added a data layer depicting the most recent U.S. Fish and Wildlife Service (USFWS) bald eagle nest locations. We also created hot links between plotted station locations and photographs taken at those locations.

RESULTS

From August 24 through 28, 1998, we surveyed approximately 6,700 ha (23% of the area) of the Carbon Mountain Tract and observed or sampled for fish or assessed fish habitat at 62 stations (Appendix A and Appendix E1). At 7 (11%) of these stations, we recorded information entirely from the air (observations of spawning sockeye salmon aggregations on lake shore margins). We conducted ground surveys of both fish presence and habitat at 53 (86%) stations.

¹ Use of a company's name does not constitute endorsement.

At 2 (3%) additional sites, we did not sample for or observe fish, but we did make observations on the connectivity of 2 streams to known anadromous fish waterbodies.

We observed or collected at least one fish species at 43 (69%) stations (Appendix D1), coho salmon (all rearing juveniles) were the most frequently encountered species (Table 4). We observed or collected more than one fish species at 19 (31%) stations (Table 5). Coho salmon and Dolly Varden were the most commonly encountered species combination (12 stations).

Table 4.-Summary of fish species observations at 62 survey stations.

Species	Number of stations observed
Coho salmon	28
Dolly Varden	20
No fish observed	17
Sockeye salmon	11
Cutthroat trout	2
Habitat observation only	2
Threespine stickleback	1
Sculpin	1
Fish observed, not identified	1

We recorded a specific waterbody type at 57 stations. We identified 16 distinct waterbody types; collecting/observing fish in 14 (Appendix D2). Surveyed waterbodies ranged from streams with gradients in excess of 10% (types Aa2 and Aa3) to lakes and sloughs with 0% gradient. Waterbody type C4 was the most frequent class (12 of 57, 21%) encountered. Coho salmon were collected in 13 (81%) waterbody types, Dolly Varden in 8 (50%).

Water temperatures ranged from 6 to 12 °C (mean = 7.8 °C, SD = 1.5, *n* = 18; Appendix D3). Channel gradients ranged from 0 to 15% (mean = 3.2%, *n* = 45, Appendix D4). Clear water dominated (67%) at our survey stations, followed by humic (17%), and glacial (16%). We recorded all substrate classes but bedrock (Appendix D5). Gravel was the most commonly

encountered substrate, present to some degree at 89% of the stations where we recorded the substrate. While we did not record bedrock substrate, at many locations it was covered by only a thin veneer of other substrate types. Stream widths (not including lakes and sloughs) ranged from 0.5 to 8 m (mean = 2.8 m; median = 3 m, SD = 1.7, $n = 44$; Appendix D6). Thalweg depths ranged from 0.06 to 1.6 m (mean = 0.37 m, median = 0.3 m, SD = 0.32, $n = 49$; Appendix D7). Station elevations ranged from 25 to 215 m (mean = 59 m, median = 57, SD = 35, $n = 62$); anadromous fish were observed from 25 to 105 m (Appendix D8). Precipitation was heavy for the duration of the project, yet stream levels were typically considered normal and were always below bankfull.

Table 5.-Summary of fish species diversity.

Fish community	Number of stations observed
coho salmon only	10
sockeye salmon only	7 [†]
Dolly Varden only	5
threespine stickleback only	1
coho salmon and Dolly Varden	12
coho salmon and sockeye salmon	3
coho salmon and sculpin	1
sockeye salmon and Dolly Varden	1
coho salmon, Dolly Varden, and cutthroat trout	2
fish observed, not identified	1
no fish observed	17
Habitat observation only	2
	62

[†] These sockeye salmon observations were made from the air. Other species may have been present but not recorded. Other records represent ground sampling results.

We measured lengths of 128 fish of 3 species (Table 6). We measured only fish collected by electrofisher, therefore adult sockeye salmon, many of which were observed, were not

measured. Assessment of length frequencies suggests 2 coho salmon age classes (age-0. and age-1.) may be represented in our sample. The bulk of our sample appears to be age-0. (Appendix D9). Juvenile coho salmon lengths and ages (derived from scale pattern analysis) collected on Montague Island, Prince William Sound, in mid-August 1988, suggested that the length threshold between age-0. and age-1. coho salmon for that sample was approximately 64 mm (Wiedmer *unpublished*, Appendix D9). Dolly Varden ranged from 32-mm age-0. juveniles to 340-mm (not aged) adults (Appendix D10).

The most commonly (41%, $n = 27$) recorded barrier to fish (all species combined) migration was “Unknown”, predominantly because we did not pursue investigations of the upper limit of Dolly Varden distribution (Appendix D11). Ephemeral barriers were the next most common (29%, $n = 19$). Only 20% ($n = 13$) of barriers were considered geologically fixed. For juvenile coho salmon, a target species, we classified 36% ($n = 10$) of the migratory barriers ephemeral, 32% ($n = 9$) unknown, 21% ($n = 6$) geologically-fixed, and 11% ($n = 3$) none (Appendix 12).

Table 6.-Summary of fork lengths (mm) of collected fish.

	Dolly Varden	Coho salmon	Cutthroat Trout
n	46	81	1
Mean	83	45	95
SD	68.4	7.0	-
Median	65	44	95
Minimum	32	35	95
Maximum	340	68	95

The survey added 29 streams or stream extensions (total length = 24.3 km) and 6 lakes and wetland complexes (total area = 76.6 ha) to our previous anadromous fish distribution maps. We documented 11 stream reaches (total length = 5.7 km) and 2 lakes (total area = 2,632 ha) that supported fish that were not verifiably anadromous or were definitely resident. We also

noted 21 stream reaches requiring additional surveys.

Observations of bald eagles and of brown bears were the most commonly noted wildlife comments. The USFWS recorded 11 bald eagle nests (3 active, 8 inactive) in the Tract in 1997 (P. Schempf, USFWS, Juneau, *unpublished*). This information is included as a layer in our ArcView project. Specific comments about bears (primarily brown bears) were made at 18 stations, including the direct observation of 4 brown bears. Brown bears appear ubiquitous in the Tract. The abundant salmon runs, coupled with lush growths of salmonberry and skunk cabbage, appear to provide a good food supply. The availability of moose and goats as well as alpine rodents and plants adds to the brown bear food base.

Moose do not appear to fully utilize the Tract. Their densities appeared much lower than in the Martin River valley to the west. In particular, areas within the Canyon Creek valley supported lush growths of riparian willows which did not appear recently browsed.

Because we confined our survey to valley floors and because cloud cover often obscured the higher peaks, we did not observe mountain goats during the survey.

DISCUSSION AND RECOMMENDATIONS

Our survey delineated the general extent of anadromous fish distribution in the Tract. Additional work remains to refine our understanding of anadromous fish distribution in Trout Creek and in small floodplain channels along Shepard and Clear creeks. Spawning locations of sockeye and particularly coho salmon also remain poorly documented. While we observed no adult coho salmon during the survey, at 24 stations, we believed—based on

aquatic habitat conditions, particularly substrate size, and the presence of small age-0 juveniles—that coho salmon spawning at or near those locations was probable. Coho salmon spawning surveys should be after August, because adult coho salmon had not reached spawning areas during our survey.

Sockeye salmon spawning locations in the Tract, particularly lake shore spawning sites, should be further delineated. Sockeye are the only salmon species that spawn extensively in shoal areas along lake shores. Shoal spawning sites are typically at areas where upwelling groundwater provides winter-long supplies of clean, oxygenated water to incubating eggs and alevins (Burgner 1991). The source of the upwelling groundwater is, in part, a function of adjacent upland topography, geology, and vegetation. Alteration of the groundwater flow regime during sockeye salmon incubation could increase pre-emergence mortality (Foerster 1968). Existing Alaska forest practices standards (AS 41.17) do not provide specific protection for the slope basins that are the source of the groundwater supplying shoal spawning sites. Accurate mapping of shoal spawning locations will be difficult because of the highly turbid waters of the Tract's glacially-fed lakes.

The distribution of non-obligate anadromous fish (primarily Dolly Varden and cutthroat trout) remains enigmatic. These species occupy high gradient habitats in areas with difficult access. The Tract's high gradient streams do not just provide habitat for small individuals; one of the largest Dolly Varden observed during the survey (300-mm FL) was collected in a small Aa2 channel with a gradient of 12%. Fully mapping the distribution of Dolly Varden will require an extensive and laborious field effort. Dolly Varden were confirmed in Berg Lake, which has been blocked from downstream habitats alternately by a lobe of the Bering Glacier or by substantial falls

in the outlet channel. How long this population has remained isolated from the rest of the watershed is unknown.

Observed fish community structure showed little diversity. At most only 3 species were identified at any one location and only 6 species were identified throughout the Tract. Our sampling probably underestimated species diversity because: (1) we did little lake or large stream sampling, and (2) we typically stopped stream sampling if we collected a target obligate anadromous species such as coho salmon. In spite of our sampling biases, actual species diversity in the 1st through 3rd order streams that made up the bulk of our survey effort is probably not much greater than that observed.

The high proportion (41%) of migratory barriers classified “unknown” indicates the need for additional survey effort. In particular, our current understanding of the range of resident (or non-obligate anadromous) fish distribution in the Tract is limited. Extensive foot surveys will be necessary to further delineate the distribution of Dolly Varden and cutthroat trout. These surveys will be particularly important wherever road construction is anticipated.

Where we did record a specific barrier to fish migration, ephemeral barriers predominated. At stations where we recorded an ephemeral fixed, debris jam barrier ($n = 5$), the general location of the debris jam often coincided with a transition of channel gradient and entrenchment ratio. That is, debris jam barriers were often generally located where channels transitioned from valley slope to valley bottom. The specific location of the debris jam blocking upstream (anadromous) fish movement in a given stream may change from year to year, depending on flood events and debris cycling. However, the general location of any barrier-creating debris jam in a given stream will often be restricted to a reach a few 100 m

long in the gradient and entrenchment transition zone at the base of valley slopes.

Ephemerally fixed, low flow barriers ($n = 3$) were all recorded in low ($< 0.5\%$) gradient, valley bottom, groundwater-fed streams. The upstream limit of fish distribution in these streams can vary on the scale of 10^1 to 10^2 m, depending on seasonal discharge rates. Flow rates and fish utilization in these streams may be particularly sensitive to local development activities, particularly road construction (ditching) and timber harvest.

Ephemerally fixed, hydro-geomorphically dynamic barriers ($n = 11$) occurred in a variety of channel types. One such barrier was the result of a large debris flow, 2 were the result of the current retreat of the Martin River glacier, 5 were the result of the dynamics of large glacial outwash floodplains, 2 were the result of small off-channel pool dynamics, and 1 was the result of the abandonment of the northern outlet of West Berg Lake (my interim name for the large unnamed lake immediately downstream from Berg Lake). Aerial photo analysis (photos dated 8/23/74 and 9/6/94) suggests the northern outlet of West Berg Lake was abandoned during the past 20 years. Where once flowed the highly turbid waters of the West Berg Lake outlet stream, now a clear, groundwater-fed series of pools provides excellent sockeye salmon spawning habitat.

The Rosgen waterbody classification did not reliably discriminate between observed fish presence or absence. Coho salmon, for example, were present in 13 different waterbody types—including channels with gradients in excess of 10%, yet were absent in some streams with apparently ideal habitats and gradients less than 1%. The absence of coho salmon from apparently ideal habitats is probably the result of undetected downstream migratory barriers. The U. S. Forest Service’s (USFS) Tongass National Forest channel typing system (USFS 1992) may

improve fish presence predictability. If we continue with the Rosgen classification scheme, we should further subdivide the current Aa+ class into 3 subclasses, one with gradients from 10 – 20% to account for observed coho salmon rearing at these slopes, a second with gradients from 20 – 35% to account for observed (other surveys) Dolly Varden at these slopes, and a third with gradients >35% where fish presence becomes unlikely. With currently available tools and information, we believe there is no substitute for field surveys to map the distribution of fish.

FUTURE SURVEYS

We were not able to fully survey all potential fish habitats, but we did explicitly identify a number of locations where we should direct future efforts. These areas include:

- the extensive beaver dam complex in the Canyon Creek floodplain between stations 04A03 and 04A06.
- Steele Creek downstream of Station 03A04.
- the 7.5 ha ice-margin lake northwest of Station 01A05, created between 1974 and 1994 by downwasting and retreat of the Martin River Glacier. Additional glacial retreat may make the lake accessible to sockeye salmon.
- the stream flowing to the head of Lake Charlotte at Station 01B01. Retreat of Martin River Glacier lobe north of Lake Charlotte may create new anadromous fish habitat.
- western tributaries to Shepard Creek between stations 03B04 and 03B07.
- Small floodplain channels and distributaries adjacent to Shepard and Clear creeks.

Tract most recently in May 1994 (B. Molnia, United States Geological Survey, Reston, Virginia, personal communication). Flood waters filled the Bering River valley and Berg Lake's

- Trout Creek downstream of Station 05A01.

HYDROLOGIC/FISH HABITAT HAZARD AREAS

While not a specific objective of our survey, we did note several areas of current or potential hydrogeomorphic instability warranting closer inspection. These include:

- Clear Creek near station 05B02 (channel bank instability).
- Portions of Shepard Creek between Maxwell and Carbon creeks (channel bank instability).
- Berg Lake and areas downstream (glacial lake outbreak flooding).
- Canyon Creek braided outwash plain (lateral channel instability).
- Kushtaka Glacier outwash plain (lateral channel instability).
- Stillwater Creek banks (locally eroding cutbanks).
- Eastern tributaries to Lake Charlotte, south of and including Station 01A04. (debris flows descending from Charlotte Ridge).

In areas where channels are laterally unstable and where banks are actively eroding, riparian buffers and structures (e.g., road beds) will be at risk. We recommend careful evaluation of these areas prior to designing harvest unit and road layouts. Along steep hillsides with channels subject to debris flows, road prisms and crossing structures will be at risk. Again, we recommend careful evaluation of road locations and crossing structures to minimize these risks. Lastly, failure of an ice dam at the outlet of Berg Lake catastrophically flooded downslope areas in the southeast corner of the surface elevation rapidly subsided approximately 100 m. Stellar Glacier advanced more than 100 m in June and July 1999, contacting bedrock north of Berg Lake's outlet. In spite of this

activity, recent observations suggest that Stellar Glacier is downwasting near its terminus. This thinning will reduce the probability of the creation of an effective ice dam at the outlet of Berg Lake comparable to that prior to May 1994 (B. Molnia, United States Geological Survey, Reston, Virginia, personal communication).

WILDLIFE

Wildlife observations were incidental to our survey and we have not thoroughly assessed the wildlife resources of the Tract. Based on our limited efforts to date, bald eagles, mountain goats, and brown bears will likely be among the species of special concern to the ADF&G. Bald eagles will be impacted by activities disrupting successful nesting and disruption of their prey base. Following existing guidelines (USFWS *Undated*) for seasonal and spatial restrictions will help limit impacts to bald eagles. Our current understanding of mountain goat distribution within the Tract (R. Nowlin, Alaska Department of Fish and Game, Fairbanks, personal communication) suggests that most goat habitat is concentrated in areas outside the core commercial timber stands. On the valley slopes east of Canyon Creek, however, timber harvest and harvest activities may disturb goats and impact winter habitat. Impacts to brown bears will probably be a focus of ADF&G's future wildlife concerns and comments. Impacts to brown bears will be an inevitable outcome of large scale timber harvest in this area. The impacts will be of two general types: (1) direct impacts to individual bears resulting from bear/human encounters, and (2) indirect impacts resulting from habitat alteration and equipment (on- and off-road machinery) use. Further detail is beyond the scope of this report; we suggest the landowner and ADF&G meet to develop methods to limit impacts to brown bears and mountain goats.

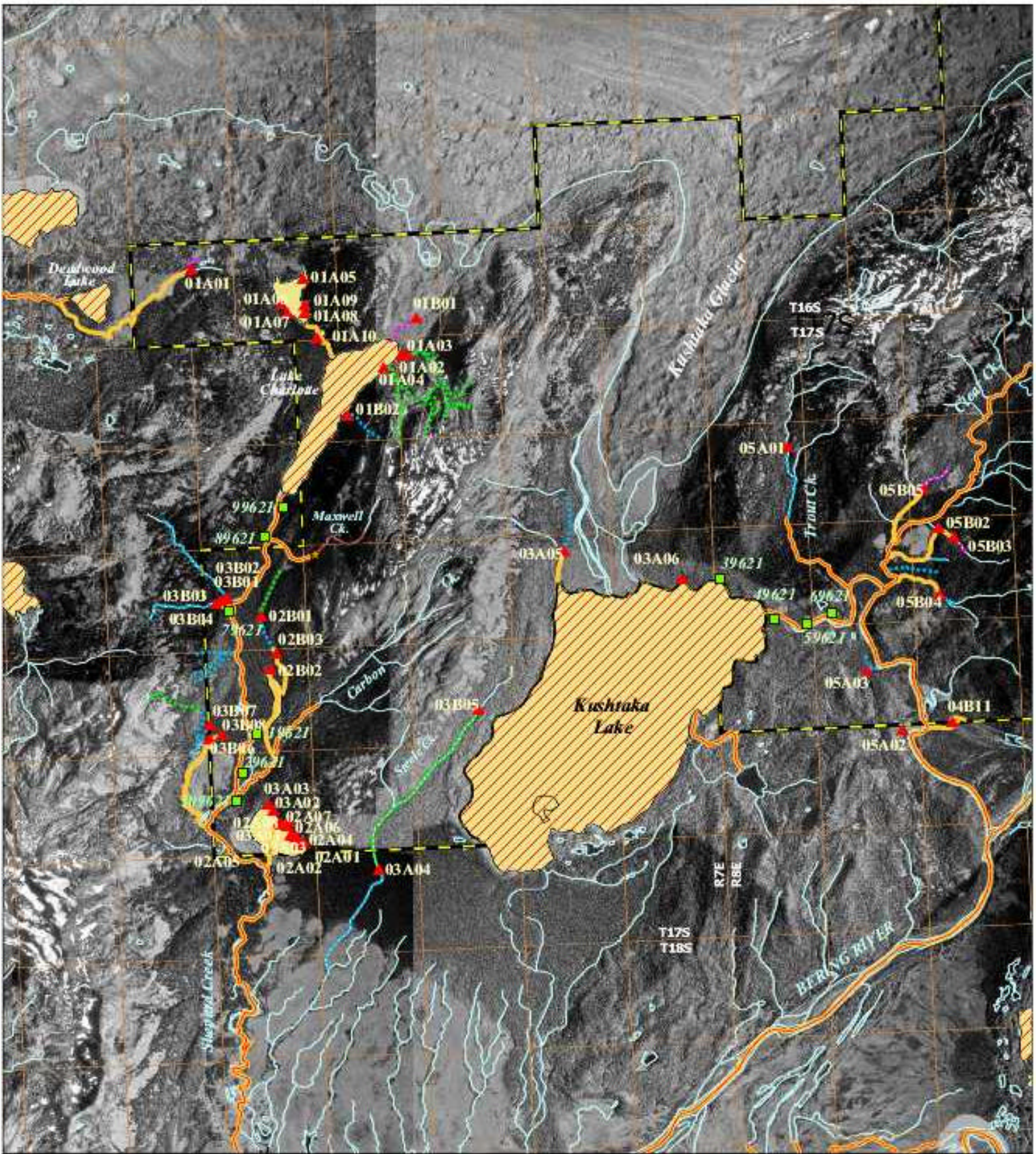
ACKNOWLEDGEMENTS

I thank the members of the field crew—Mike Thompson, Rick Jandreau, Mark Stahl, and Mike Hoyt—who worked steadily and well in exceedingly damp conditions and Ed Weiss who provided logistical support in Cordova. Jan Gundersen, ERA Helicopters, skillfully and safely took us to all our desired locations, in spite of often rotten weather. Frank Wallis put in many extra hours developing the database framework and links to the GIS project. Francis Inoue led the digital cartographic development and prepared all maps. Janet Schempff and Ellen Fritts were ADF&G liaisons to the Environmental Protection Agency (EPA) and initiated and coordinated the state-wide stream survey and mapping program. Steve Albert helped initiate the project and was our landowner liaison. Lance Trasky and Don McKay provided overall project direction and support. Jeff Davis, Wayne Dolezal, and Joe Meehan provided valuable comments on the original manuscript—all remaining errors are mine alone. The report format used in this document was developed by the ADF&G Division of Sport Fish, Research and Technical Services (Mills et al. 1995). The EPA (Chris Meade), provided Clean Water Act, Section 319 funding to the Alaska Department of Environmental Conservation (Jim Ferguson and Carl Schrader); a portion of that funding was in turn forwarded to ADF&G to support this work. Finally I thank Chugach Alaska Corporation, the Tract landowner, and Koncor Forest Products, their agent, for their cooperation and permission to access their private lands.

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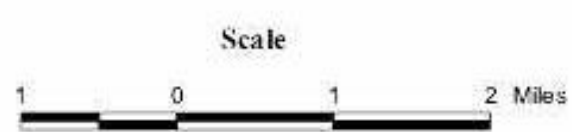
APPENDIX A. CARBON MOUNTAIN TRACT MAPS

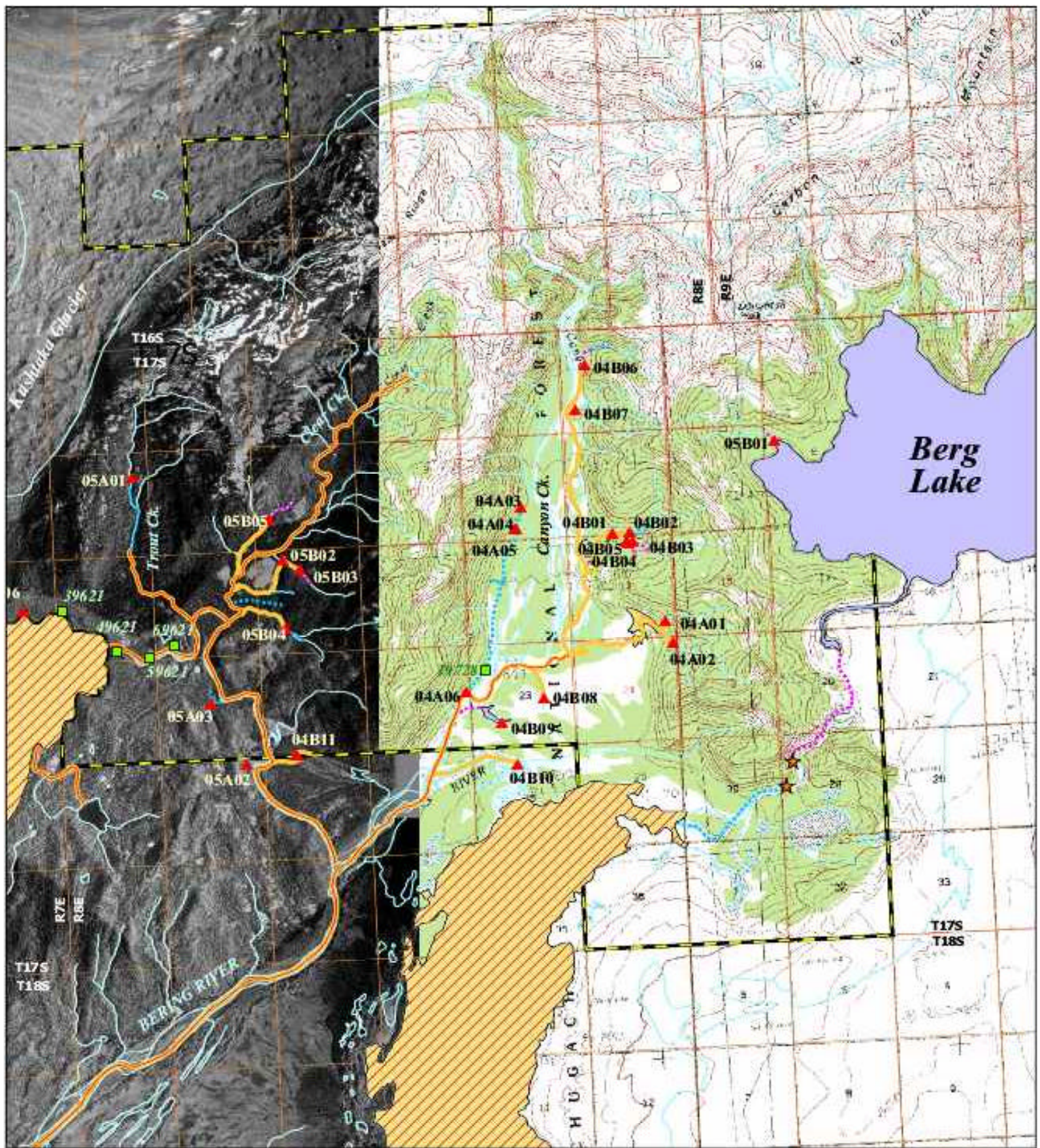


MAP 1. CARBON MOUNTAIN 1998 FISH HABITAT SURVEY - WESTERN HALF

Legend

- ▲ 1998 Survey Stations
- 1998 Anadromous Waters Catalog Coverage
- Currently Documented Anadromous Fish Distribution
- Resident Fish Waterbody
- ~ Additional Fish Survey Needed
- ~ Fish Not Observed
- Eagle Nest Site
- ★ Falls
- Carbon Mountain Tract Boundary

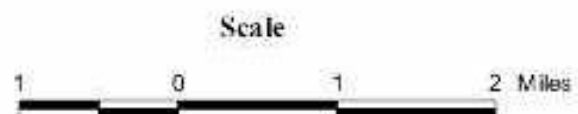




MAP 2. CARBON MOUNTAIN 1998 FISH HABITAT SURVEY - EASTERN HALF

Legend

- ▲ 1998 Survey Stations
- 1998 Anadromous Waters Catalog Coverage
- Currently Documented Anadromous Fish Distribution
- Resident Fish Waterbody
- Additional Fish Survey Needed
- Fish Not Observed
- Eagle Nest Site
- Falls
- Carbon Mountain Tract Boundary



APPENDIX B. FISH MIGRATION BARRIERS

Appendix B1.-Classification of barriers to fish migration.

Code	Description	Definition
EBD	Ephemerally Beaver Dam	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by a beaver dam. Used where the location of the barrier is known within 100 m.
EDJ	Ephemerally Debris Jam	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by a debris jam. This category is restricted to small scale (≥ 10 m) features that do not dramatically alter the overall channel type. Larger mass-wasting created barriers fall in the EGD category. Used where the location of the barrier is known within 100 m.
ELF	Ephemerally Low Flow	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by low stream flow, but where evidence indicates that at higher stream flow, the given species could ascend further up the channel. Used where the location of the barrier is known within 100 m.
EGD	Ephemerally Hydro- Geomorphically Dynamic	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by current hydrological or geomorphic conditions but where evidence indicates that these landscape-scale conditions are in flux over brief (decades) geologic time. Used in areas of recent or ongoing geomorphic alteration (e.g., glacial advance or retreat, mass wasting, tectonic movements, dynamic channel modification). Used where the location of the barrier is known within 100 m.
EOT	Ephemerally Other	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by a non-permanent barrier other than those listed immediately above. Used where the location of the barrier is known within 100 m.
GWG	Geologically Waterfall/High Gradient	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling or other on-site analysis, to be blocked by a waterfall, cascade, or other similar geologically-fixed barrier. Used where the location of the barrier is known within 100 m.
GSL	Geologically Stream Limit	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling or on-site analysis, to be limited to the presence of surface water, and where that presence of surface water appears to be fixed in space and stable in time (compare to ELF). Spring-fed headwall pools are examples. Used where the location of the barrier is known within 100 m.
GLK	Geologically Lake Shore	Fixed, Where the upstream movements of a given species appear, based on sufficient sampling or on-site analysis, to be limited by the perimeter of a geologically-stable lake shore. Used where the location of the barrier is known within 100 m.
GOT	Geologically Other	Fixed, Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling or on site analysis, to be blocked by a geologically-fixed barrier other than those listed immediately above. Used where the location of the barrier is known within 100 m.
HCU	Human, Culvert	Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by a culvert through a road bed, a railroad bed, a runway, or through other types of fill. This code includes culverts of all materials (e.g., metal, plastic, wood) and shapes (e.g., round, arched, bottomless). Used where the location of the barrier is known within 100 m.

- continued -

Appendix B1.-Page 2 of 2.

Code	Description	Definition
HDM	Human, Dam	Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by a dam, weir, head gate, or other cross-channel structure that intentionally impounds, filters, or diverts stream flow. This code includes structures of all materials (e.g., earth, concrete, rip rap, metal, wood). Used where the location of the barrier is known within 100 m.
HDB	Human, Debris	Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by debris placed or deposited in the stream as the direct result of human activities but where that material was not intentionally placed to impound, filter, or divert stream flow. Examples include woody debris from logging activities and debris flows from failed road prisms. Used where the location of the barrier is known within 100 m.
HOT	Human, Other	Where the upstream movements of a given species appear, based on sufficient upstream and downstream sampling, to be blocked by a human-created structure other than those listed immediately above. Used where the location of the barrier is known within 100 m.
UNK	Unknown	No distributional information exists upstream of a sample station. Typically where a given species is collected at a station and no additional sampling or survey occurs upstream and no barriers are identified.
SBU	Specific Barrier Unknown	Where a given species is collected at a downstream station and not at an upstream station but where no specific barrier is known between the 2 stations. Used where the distributional limits are not known within 100 m.
NON	None	Where a site survey reveals no physical features blocking upstream movements.

APPENDIX C. GIS LAYERS

Appendix C1.-Carbon Mountain GIS layers.

Cmsites - 1998 ADF&G Survey Sites (Photos and additional data on each site are linked to theme)

Cmlak - Anadromous lakes documented in the 1998 Anadromous Waters Catalog

Cmfalls - Waterfalls within the study area blocking fish migration

Cmanad99 - Anadromous streams and lakes documented during 1998 ADF&G survey within the study area; the point theme shows mouth and upper reaches and includes stream number, legal description and species data; the arc theme shows the anadromous stream course and records length

Cmanad98 - Anadromous streams documented in the 1998 Anadromous Waters Catalog; the point theme shows mouth and upper reaches and includes stream number and legal description; the arc theme shows the anadromous stream course and records length

Cmspec98 – Species data for documented streams and lakes in the 1998 Anadromous Waters Catalog (Point theme)

Eagle – Eagle nest sites within the study area (USFWS data)

Cmresfis – Documented resident fish streams within the study area

Cmndsur – Streams that require additional fish surveys within the study area

Cmfnoobs – Streams in which fish were not observed within the study area

Cmresflk – Resident fish lake

Cmlake99 – Currently documented anadromous fish lakes (1998 Anadromous Waters Catalog plus anadromous fish lakes found during 1998 ADF&G survey)

Cmbndry – Study area boundary

Cmtnsecf – Township and range section grid

Corb1 – Hydrography for Cordova B-1 obtained from USGS

Berb8 – Hydrography for Bering Glacier B-8 obtained from USGS

C160144a.bil, C160144b.bil, C160144c.bil, C160144d.bil – Orthophotos of quad Cordova B-1

Berg1.tif – DRG of Bering Glacier B-8

Cord.tif – DRG of Cordova B-1

APPENDIX D. SELECTED DATA

Appendix D1.-Summary of fish collected at survey stations. Upper case represents suspected life history: A = Anadromous; U = Unknown; R = Resident; Y = category present at station. Subscript represents life stage: _{juv} = juvenile, _{joa} = juvenile or adult; _{asp} = adult spawning; _{adt} = adult. See Table 2 for definitions.

Station	coho salmon	cutthroat trout	Dolly Varden	sockeye salmon	threespine stickleback	sculpin	unidentified salmonid	no fish collected or observed	Habitat observation only
01A01	A _{juv}		U _{joa}						
01A02	A _{juv}			A _{asp}					
01A03							Y		
01A04								Y	
01A05				A _{asp}					
01A06				A _{asp}					
01A07				A _{asp}					
01A08				A _{asp}					
01A09				A _{asp}					
01A10				A _{asp}					
01B01			U _{juv}						
01B02			U _{joa}						
02A01	A _{juv}								
02A02	A _{juv}					R _{joa}			
02A03	A _{juv}								
02A04			U _{juv}						
02A05	A _{juv}								
02A06								Y	
02A07	A _{juv}		U _{juv}						
02A08	A _{juv}								
02B01								Y	

- continued -

Appendix D1.-Page 2 of 3.

Station	coho salmon	cutthroat trout	Dolly Varden	sockeye salmon	threespine stickleback	sculpin	unidentified salmonid	no fish collected or observed	Habitat observation only
02B02	A _{juv}								
02B03	A _{juv}		U _{juv}						
03A01									Y
03A02								Y	
03A03								Y	
03A04								Y	
03A05			U _{juv}	A _{asp}					
03A06								Y	
03B01	A _{juv}		U _{juv}						
03B02	A _{juv}								
03B03								Y	
03B04	A _{juv}		U _{joa} , U _{adt} , U _{juv}						
03B05								Y	
03B06	A _{juv}								
03B07	A _{juv}								
03B08									Y
04A01	A _{juv}	U _{juv}	U _{joa}						
04A02	A _{juv}		U _{juv}						
04A03								Y	
04A04								Y	
04A05								Y	
04A06								Y	

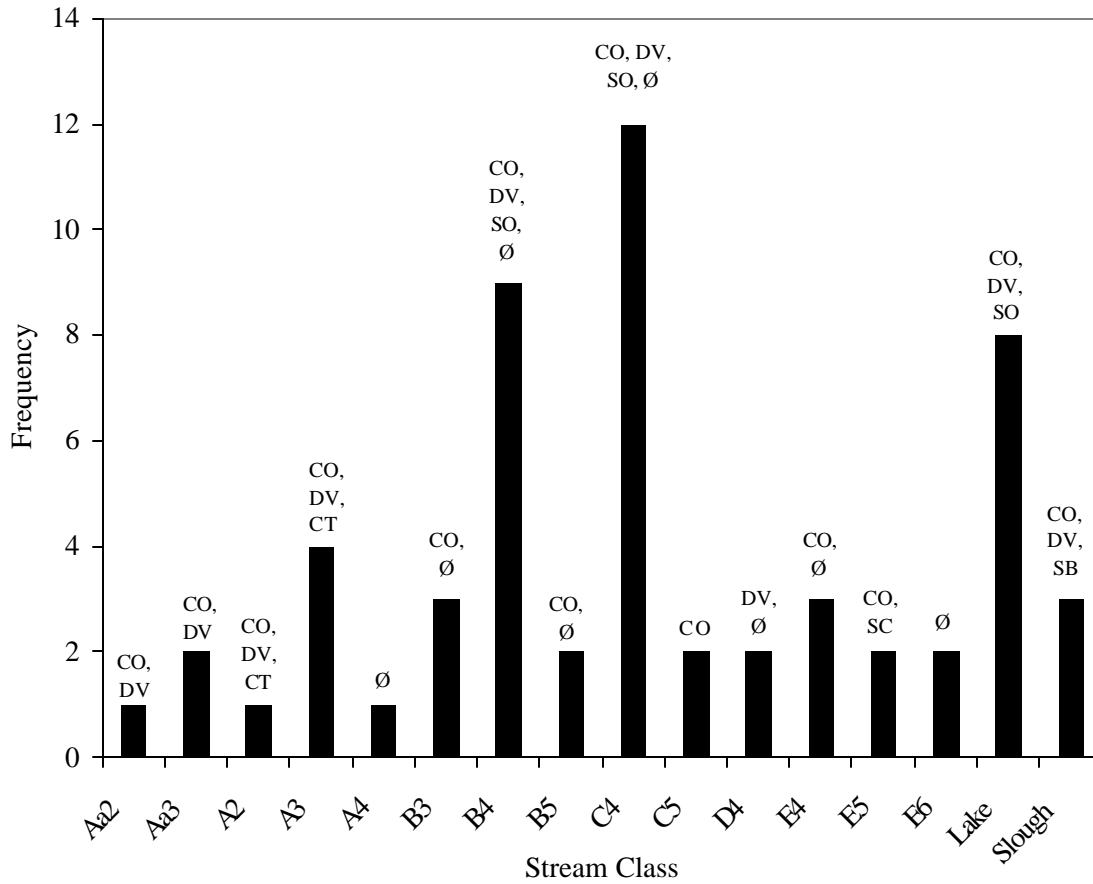
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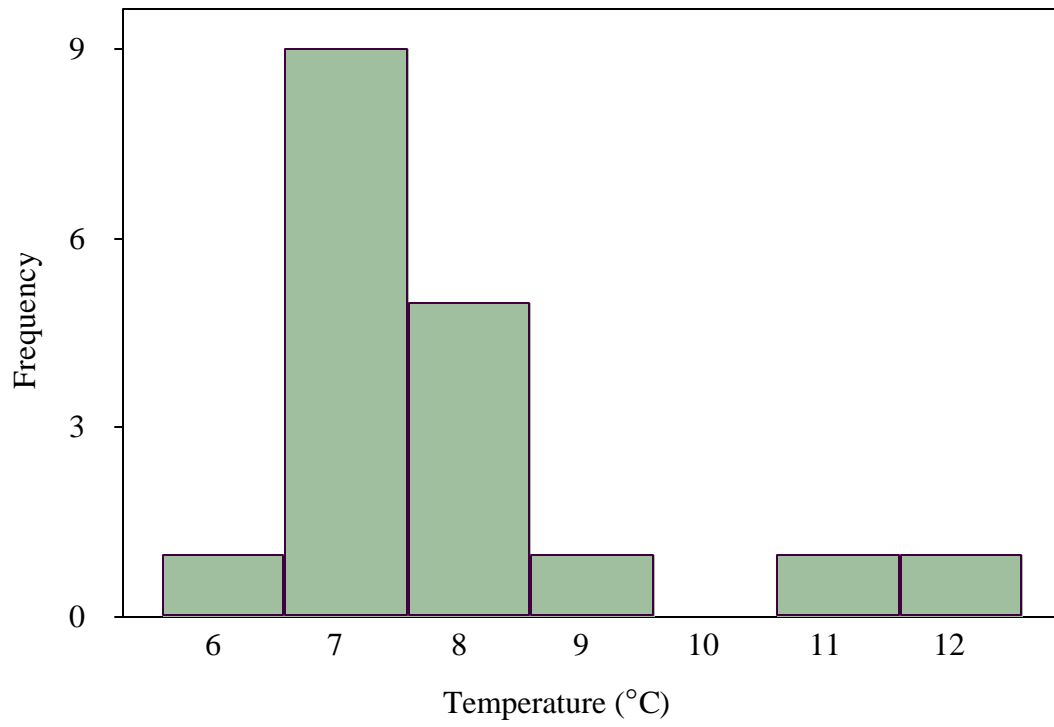
Appendix D1.-Page 3 of 3.

Station	coho salmon	cutthroat trout	Dolly Varden	sockeye salmon	threespine stickleback	sculpin	unidentified salmonid	no fish collected or observed	Habitat observation only
04B01	A _{juv}			A _{adt}					
04B02	A _{juv}		U _{juv}						
04B03	A _{juv}		U _{juv}						
04B04			U _{juv}						
04B05	A _{juv}	U _{juv}	U _{juv}						
04B06	A _{juv}		U _{adt} , U _{juv}						
04B07								Y	
04B08	A _{juv}			A _{asp}					
04B09					R _{joa}				
04B10				A _{asp}					
04B11	A _{juv}								
05A01								Y	
05A02								Y	
05A03								Y	
05B01			R _{joa}						
05B02	A _{juv}								
05B03	A _{juv}		U _{juv}						
05B04	A _{juv}		U _{juv}						
05B05	A _{juv}		U _{juv}						

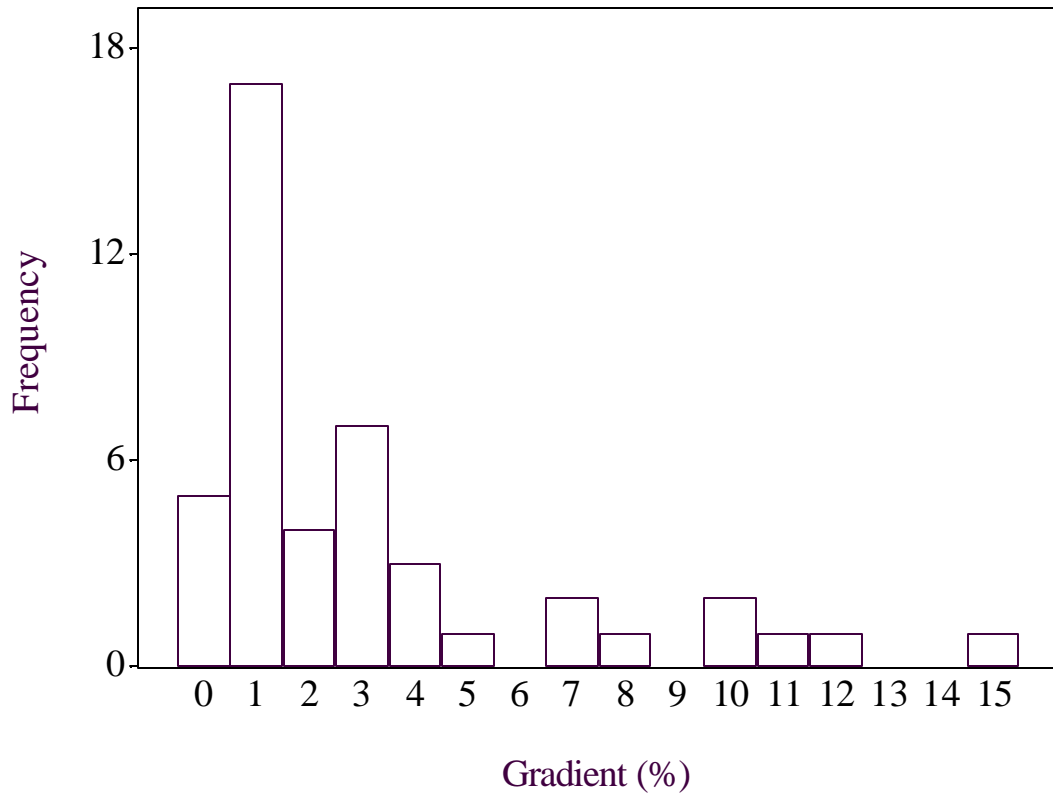
Appendix D2.-Frequency distribution of surveyed waterbody types. Abbreviations indicate species collected at least once in specified waterbody type: CO = coho salmon, DV = Dolly Varden, CT = cutthroat trout, SO = sockeye salmon, SC = sculpin, SB = threespine stickleback, Ø = no fish collected at least once in stream type.



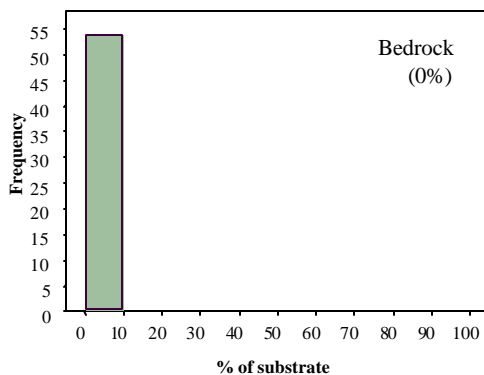
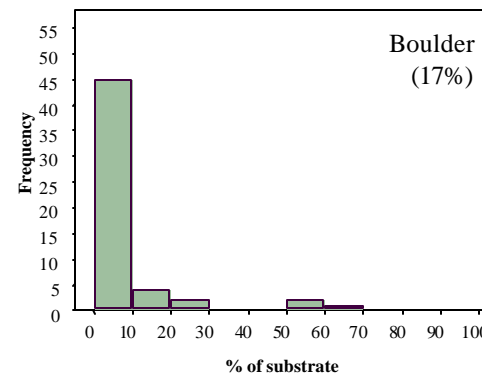
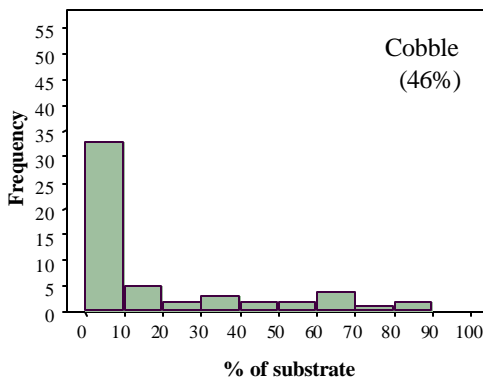
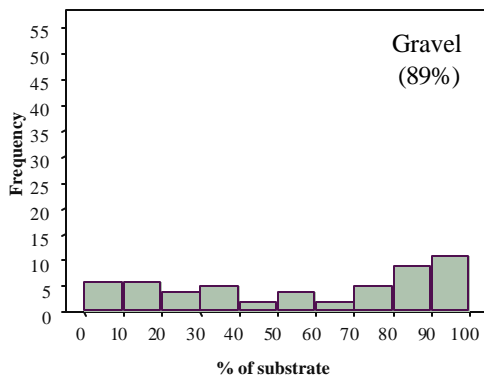
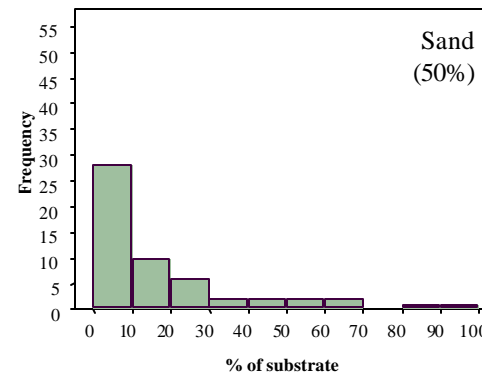
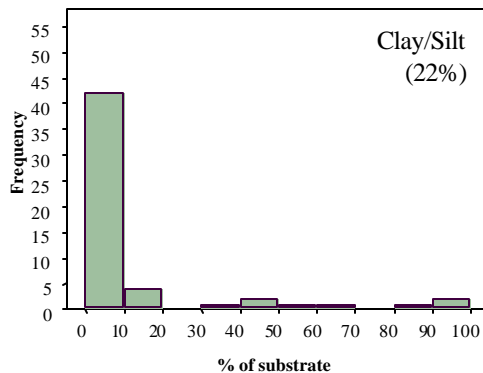
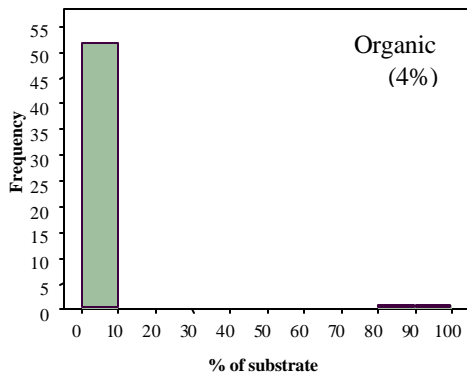
Appendix D3.-Frequency distribution of water temperatures.



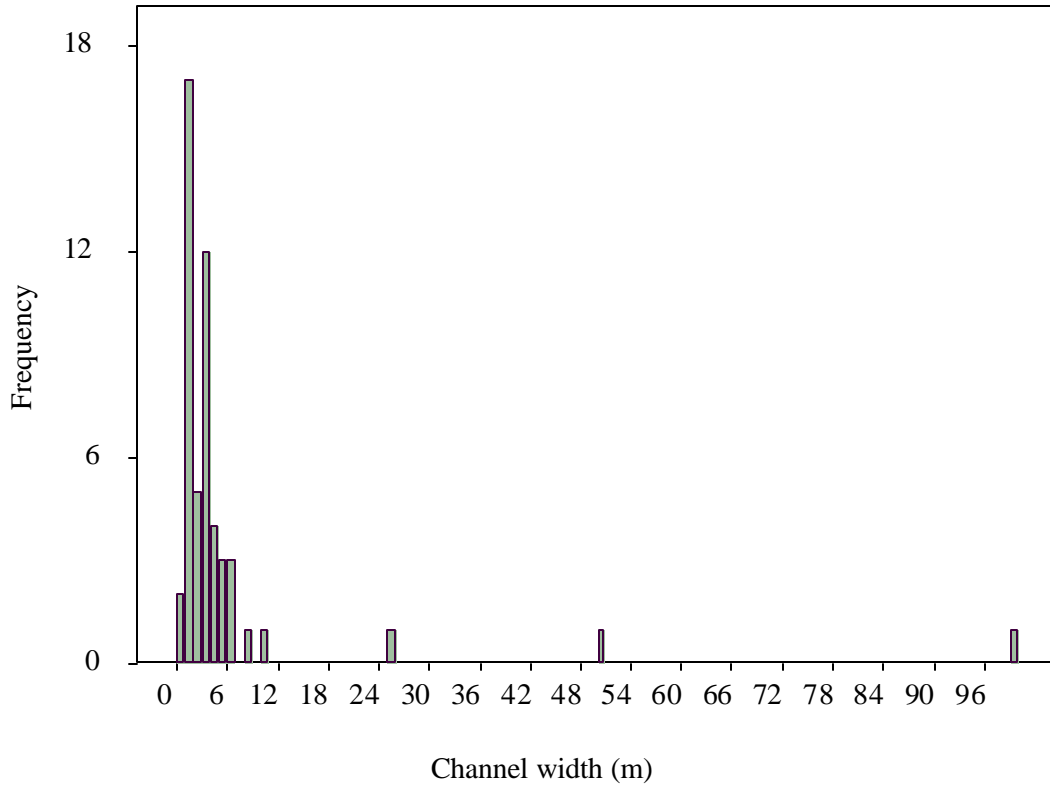
Appendix D4.- Frequency distribution of channel gradients.



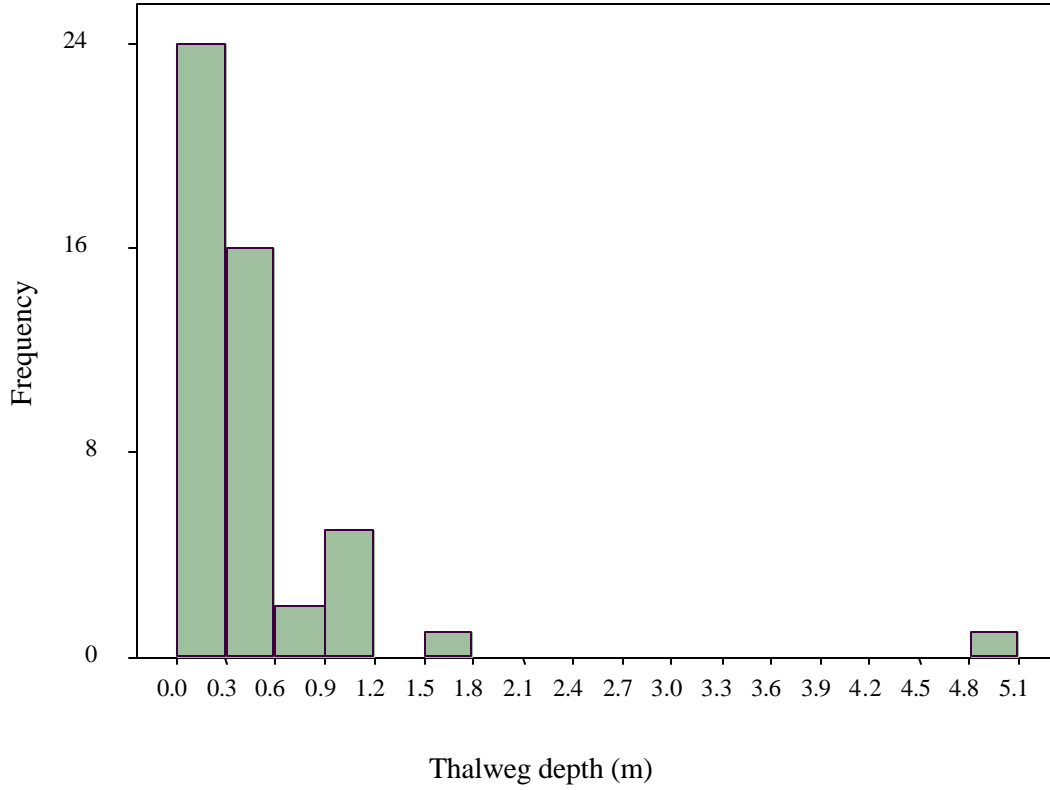
Appendix D5.-Frequency distributions of substrate classes. Total measurements = 54. Value in parentheses = % occurrence of substrate type at all stations.



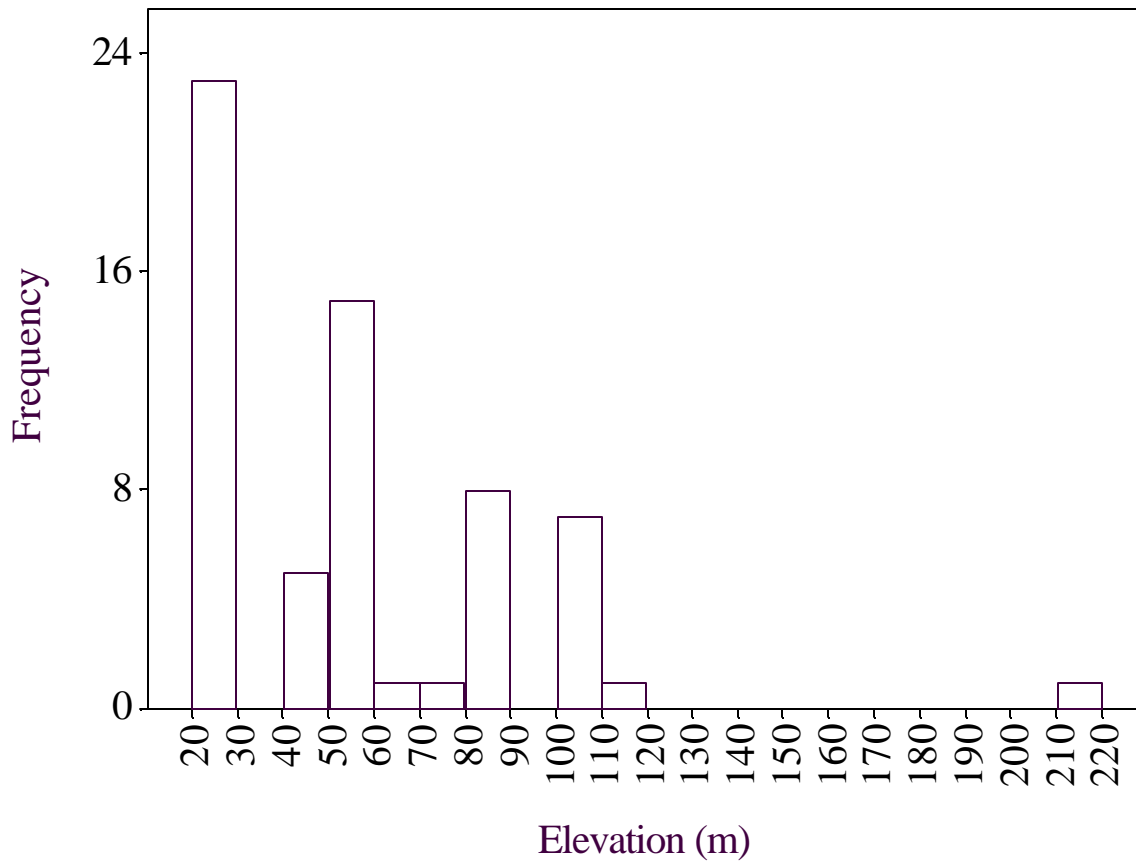
Appendix D6.-Frequency distribution of waterbody widths. Values shown include widths of sloughs that are not included in channel width calculations provided in text.



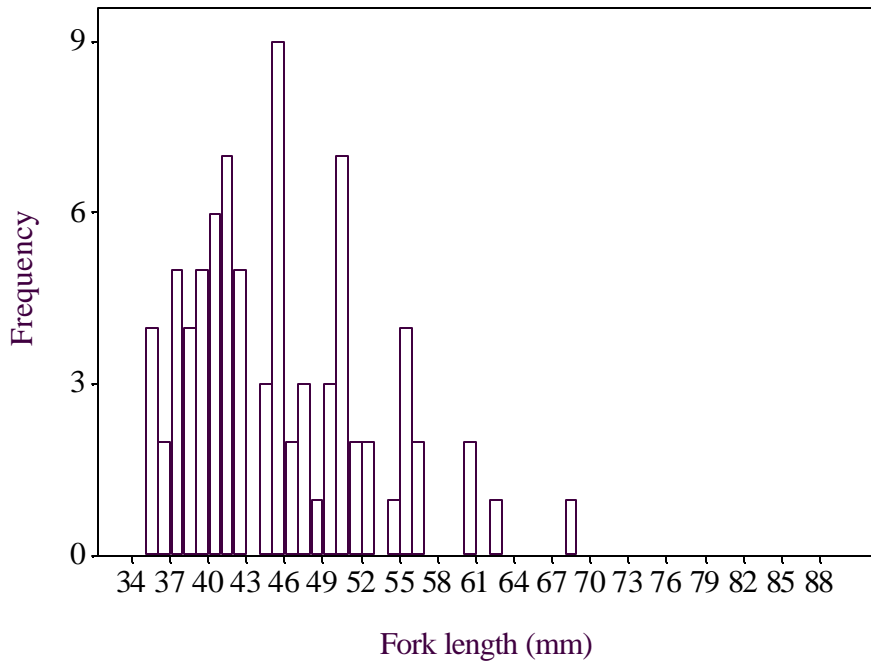
Appendix D7.-Frequency distribution of thalweg depths. Values shown include depths of sloughs that are not included in channel thalweg depth calculations provided in text.



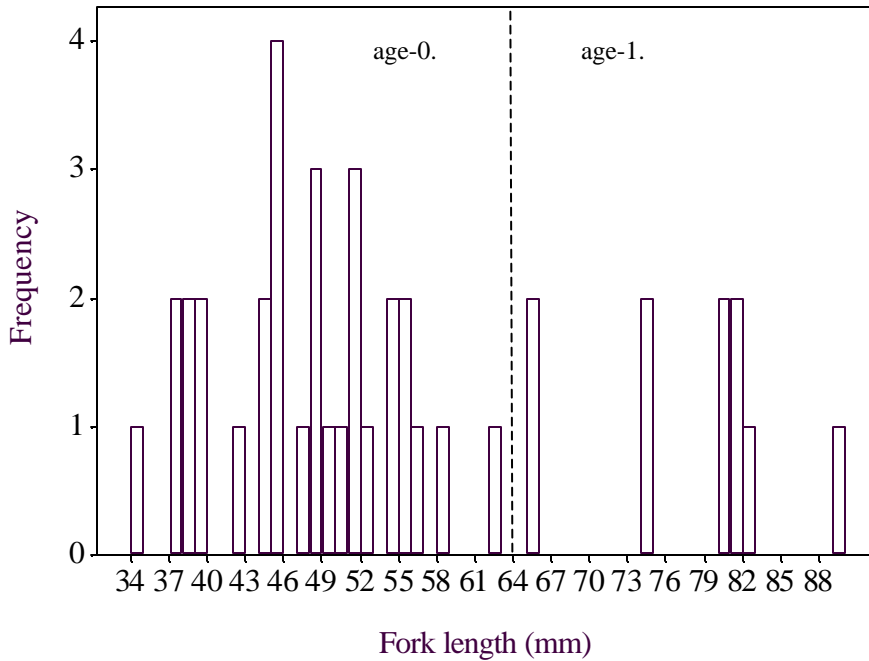
Appendix D8.- Frequency distribution of station elevations ($n = 62$, mean = 59 m, SD = 34.6).



Appendix D9.-Frequency distributions of juvenile coho salmon fork lengths.

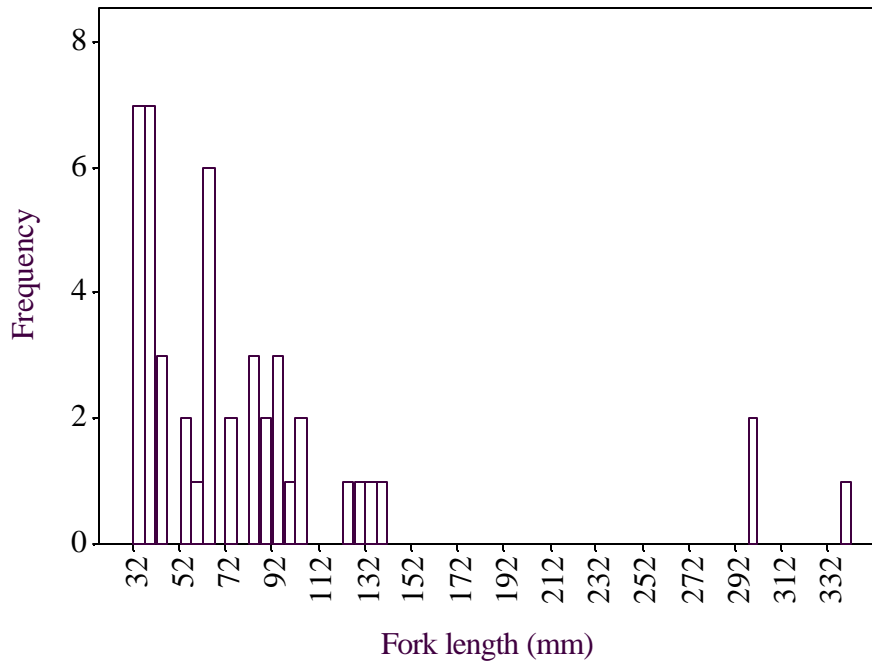


Frequency distribution of Carbon Mountain juvenile coho salmon lengths.



Frequency distribution of Montague Island juvenile coho salmon lengths and age distribution. Lengths and ages represented here are from a fish habitat survey conducted on Montague Island, Prince William Sound, August 15-19, 1988. Ages determined by scale pattern analysis (Wiedmer *unpublished*).

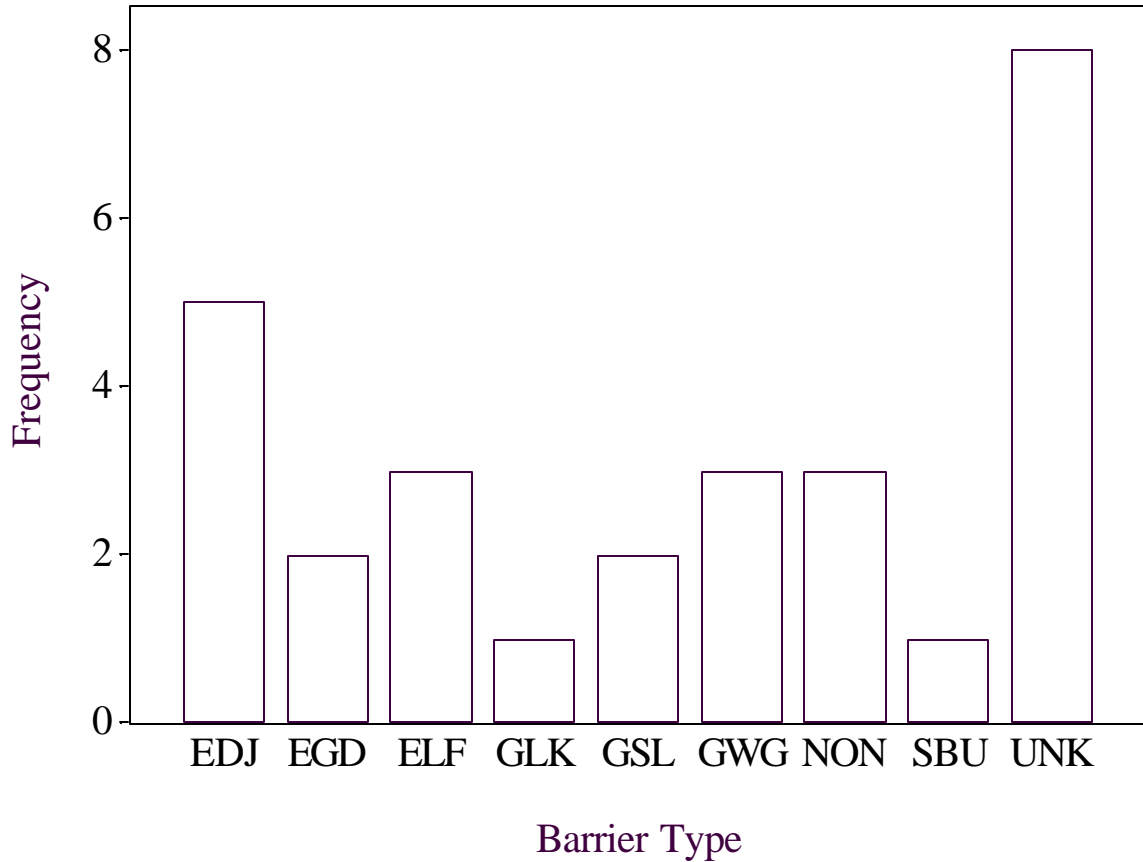
Appendix D10.-Frequency distribution of Carbon Mountain Dolly Varden fork lengths.



Appendix D11.-Barriers to fish migration by species.

Species	Ephemeral, Debris Jam	Ephemeral, Hydro- Geomorphically Dynamic	Ephemeral, Low Flow	Geologically Fixed, Lake Shore	Geologically Fixed, Stream Limit	Geologically Fixed, Waterfall/High Gradient	None	Specific Barrier Unknown	Unknown
coho salmon	5	2	3	1	2	3	3	1	8
cutthroat trout									2
Dolly Varden	1	3			1		1		17
sockeye salmon		4		6				1	
threespine stickleback		1							
sculpin							1		
Total	6	10	3	7	3	3	5	2	27

Appendix D12.-Frequency distribution of juvenile coho salmon migratory barriers (*n* = 28). EDJ = Ephemeral, debris jam; EGD = Ephemeral, hydrogeomorphically dynamic; ELF = Ephemeral, low flow; GLK = Geologically fixed, lake shore; GSL = Geologically fixed, stream limit; GWG = Geologically fixed, waterfall/high gradient; NON = None; SBU = Specific barrier unknown; UNK = Unknown. See Appendix B1 for detailed barrier classification.



APPENDIX E. STATION REPORTS

Appendix E1.-Station Reports.

Station: 01A01 **Survey Date:** 8/24/98 **Survey Time:** 1:00:00 PM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 31, T. 16 S., R. 7 E., C.R.M. Rick Jandreau
Name of Waterway: Mike Thompson

Latitude: 60.44629 **Longitude:** -144.22638 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 105
Anadromous Water Catalog Number: 212-20-10040-2080-3100 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** Medium
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 0	Stream width (m): 3	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.1	Clay/Silt (%):	100
Water Color/Clarity: Clear	Right bank depth (m): 0.4	Sand (%):	
Velocity (m/s): 0	Thalweg depth (m): 1	Gravel (%):	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Riparian Veg: Forbs/shrubs and conifers; Station at confluence of clear and glacial streams.

Wildlife Comments: Bald Eagle

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile/Adult **Life History:** Unknown

Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 133 130 45

Barrier: Unknown

Comments: Collected primarily in glacial waters.

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 47 55 55

Barrier: Unknown

Comments: Collected in clear water.

Sampling Time (s): 166

Area (sq. m): 13

Efficiency (%): 50

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Station: 01A02 **Survey Date:** 8/24/98 **Survey Time:** 3:05:00 PM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 3, T. 17 S., R. 7 E., C.R.M. Mark Stahl

Name of Waterway: Lake Charlotte

Latitude: 60.43303 **Longitude:** -144.16783 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 90

Anadromous Water Catalog Number: 200-20-10110-2031-3032-0010 **Number Status:** Catalog

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** Medium

'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	0	Stream width (m):	N/A
Water temperature (°C):	7	Left bank depth (m):	N/A
Water Color/Clarity:	Glacial	Right bank depth (m):	N/A
Velocity (m/s):	0	Thalweg depth (m):	N/A
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	50
		Cobble (%):	50
		Boulder (%):	
		Bedrock (%):	

Station Comments: Mature spruce and hemlock canopy

Wildlife Comments: Indications of bald eagle and bear feeding on adult sockeye salmon.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 47 52 **Barrier:** Geologically Fixed, Lake Shore

Comments: Collected in clear water lake edge associated with floating debris.

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous

Count: **Fish Sampling/Observation Method:** Visual Observation, Ground

Fork lengths (mm): **Barrier:** Geologically Fixed, Lake Shore

Comments: Several adults in apparent spawning aggregation at stream outlet.

Sampling Time (s): 39 **Area (sq. m):** 5 **Efficiency (%):** 50

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Station: 01A03 **Survey Date:** 8/24/98 **Survey Time:** 3:20:00 PM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 3, T. 17 S., R. 7 E., C.R.M. Mark Stahl

Name of Waterway:

Latitude: 60.43299 **Longitude:** -144.16582 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 90
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4070 **Number Status:** Resident
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** Medium
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	3	Stream width (m):	2	Organic (%):	
Water temperature (°C):	6	Left bank depth (m):	0.08	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.1	Sand (%):	10
Velocity (m/s):	1	Thalweg depth (m):	0.1	Gravel (%):	50
				Cobble (%):	30
				Boulder (%):	10
				Bedrock (%):	

Station Comments: Spruce, hemlock, devils club, ovalleaf blueberry, strawberryleaf raspberry, salmonberry, ferns, moss

Wildlife Comments:

Fish Observations

Species: salmon, trout, char, grayling or whitefish, **Life Stage:** Juvenile/Adult **Life History:** N/A
undif.

Count: 2 **Fish Sampling/Observation Method:**

Fork lengths (mm): **Barrier:** Unknown

Comments: Two small salmonids seen, not captured. Believed to be Dolly Varden.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 01A04 **Survey Date:** 8/24/98 **Survey Time:** 4:10:00 PM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 4, T. 17 S., R. 7 E., C.R.M. Mark Stahl

Name of Waterway:

Latitude: 60.43138 **Longitude:** -144.17265 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 90
Anadromous Water Catalog Number: **Number Status:**
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** Medium
'96 Rosgen Channel Type: B3 Moderate gradient, moderate entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 7	Stream width (m): 3	Organic (%):	
Water temperature (°C): 7	Left bank depth (m): 0.01	Clay/Silt (%):	
Water Color/Clarity: Glacial	Right bank depth (m): 0.01	Sand (%):	
Velocity (m/s): 1	Thalweg depth (m): 0.3	Gravel (%):	20
		Cobble (%):	30
		Boulder (%):	50
		Bedrock (%):	

Station Comments: Upstream channel instability indicated, large volumes of recent bedload/debris transport at station.

Wildlife Comments: Bear trails along lake shore: diet of salmonberries and sockeye.

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A
Count: **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Ephemeral Fixed,
Hydro-Geomorphically Dynamic
Comments: Channel unstable. No evidence of current fish use.
Sampling Time (s): 54 **Area (sq. m):** 5 **Efficiency (%):** 75

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Station: 01A05 **Survey Date:** 8/24/98 **Survey Time:** 2:00:00 PM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 32, T. 16 S., R. 7 E., C.R.M. Mike Thompson
Name of Waterway: Rick Jandreau

Latitude: 60.44444 **Longitude:** -144.19458 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 105
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4061-0008 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** N/A
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	N/A	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Glacial	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	N/A	Thalweg depth (m):	N/A	Gravel (%):	
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Lake shore near margin of retreating glacier. Drainage patterns evolving.

Wildlife Comments: Bald eagles throughout area.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: **Fish Sampling/Observation Method:** Visual Observation, Air
Fork lengths (mm): **Barrier:** Ephemeral Fixed,
Hydro-Geomorphically Dynamic
Comments: Apparent aggregation of spawning sockeye salmon in embayment. Helicopter observation.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 01A06 **Survey Date:** 8/24/98 **Survey Time:** 2:05:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 32, T. 16 S., R. 7 E., C.R.M. Mike Thompson
Name of Waterway: Rick Jandreau

Latitude: 60.44111 **Longitude:** -144.20114 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 105
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4061-0008 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** N/A
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	N/A	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Glacial	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	N/A	Thalweg depth (m):	N/A	Gravel (%):	
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments: Bald eagles throughout area.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: **Fish Sampling/Observation Method:** Visual Observation, Air
Fork lengths (mm): **Barrier:** Geologically Fixed, Lake Shore
Comments: Apparent aggregation of spawning sockeye salmon in embayment.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 01A07 **Survey Date:** 8/24/98 **Survey Time:** 2:10:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 32, T. 16 S., R. 7 E., C.R.M. Mike Thompson
Name of Waterway: Rick Jandreau

Latitude: 60.43977 **Longitude:** -144.19936 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 105
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4061-0008 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** N/A
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	N/A	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Glacial	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	N/A	Thalweg depth (m):	N/A	Gravel (%):	
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments: Bald eagles throughout area.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: **Fish Sampling/Observation Method:** Visual Observation, Air
Fork lengths (mm): **Barrier:** Geologically Fixed, Lake Shore
Comments: Apparent aggregation of spawning sockeye salmon in embayment.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 01A08 **Survey Date:** 8/24/98 **Survey Time:** 2:15:00 PM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 32, T. 16 S., R. 7 E., C.R.M. Mike Thompson
Name of Waterway: Rick Jandreau

Latitude: 60.43955 **Longitude:** -144.1945 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 105
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4061-0008 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** N/A
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	N/A	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Glacial	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	N/A	Thalweg depth (m):	N/A	Gravel (%):	
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments: Bald eagles throughout area.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: **Fish Sampling/Observation Method:** Visual Observation, Air
Fork lengths (mm): **Barrier:** Geologically Fixed, Lake Shore
Comments: Apparent aggregation of spawning sockeye salmon in embayment.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 01A09 **Survey Date:** 8/24/98 **Survey Time:** 2:20:00 PM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 32, T. 16 S., R. 7 E., C.R.M. Mike Thompson
Name of Waterway: Rick Jandreau

Latitude: 60.4407 **Longitude:** -144.19469 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 105
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4061-0008 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** N/A
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	N/A	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Glacial	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	N/A	Thalweg depth (m):	N/A	Gravel (%):	
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments: Bald eagles throughout area.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: **Fish Sampling/Observation Method:** Visual Observation, Air
Fork lengths (mm): **Barrier:** Geologically Fixed, Lake Shore
Comments: Apparent aggregation of spawning sockeye salmon in embayment.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 01A10 **Survey Date:** 8/24/98 **Survey Time:** 2:25:00 PM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 32, T. 16 S., R. 7 E., C.R.M. Mike Thompson
Name of Waterway: Rick Jandreau

Latitude: 60.4361 **Longitude:** -144.19125 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 105
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4061-0002 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** N/A
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	N/A	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Glacial	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	N/A	Thalweg depth (m):	N/A	Gravel (%):	
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments: Bald eagles throughout area.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: **Fish Sampling/Observation Method:** Visual Observation, Air
Fork lengths (mm): **Barrier:** Geologically Fixed, Lake Shore
Comments: Apparent aggregation of spawning sockeye salmon in embayment.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 01B01 **Survey Date:** 8/24/98 **Survey Time:** 2:16:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 33, T. 16 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.4383 **Longitude:** -144.16286 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 90
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4075 **Number Status:** Resident
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	2	Stream width (m):	8	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.2	Clay/Silt (%):	30
Water Color/Clarity:	Glacial	Right bank depth (m):	1	Sand (%):	
Velocity (m/s):	0.5	Thalweg depth (m):	1	Gravel (%):	20
				Cobble (%):	40
				Boulder (%):	10
				Bedrock (%):	

Station Comments: Glacial outwash. Early seral vegetation colonizing site after glacial retreat. Alder and mosses.
Wildlife Comments:

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 103 83 102 **Barrier:** Ephemeral Fixed,
Hydro-Geomorphically Dynamic

Comments: Current position of glacier marks upper limit of fish distribution.

Sampling Time (s): 209 **Area (sq. m):** 40 **Efficiency (%):** 65

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Station: 01B02 **Survey Date:** 8/24/98 **Survey Time:** 3:20:00 PM **Team:** Mike Thompson
Legal Description: SW 1/4 Section 4, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.42494 **Longitude:** -144.18352 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 90
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4057 **Number Status:** Resident
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Moderate **Stream Stage:** Medium
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 5	Stream width (m): 2	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.15	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): 0.15	Sand (%):	
Velocity (m/s): 1	Thalweg depth (m): 0.3	Gravel (%):	80
		Cobble (%):	20
		Boulder (%):	
		Bedrock (%):	

Station Comments: Spruce, hemlock, salmonberry, and alder.

Wildlife Comments: Bear activity (feeding on adult sockeye)

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 32 33 35 **Barrier:**
Comments:

Species: Dolly Varden **Life Stage:** Juvenile/Adult **Life History:** Unknown
Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 124 **Barrier:** Ephemeral Fixed, Debris Jam
Comments: Evidence of sockeye salmon spawning along lake shore at mouth of stream.

Sampling Time (s): 340 **Area (sq. m):** 24 **Efficiency (%):** 75

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Station: 02A01 **Survey Date:** 8/25/98 **Survey Time:** 3:02:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36489 **Longitude:** -144.20096 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** High
'96 Rosgen Channel Type: E4 Low gradient, deep, highly meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	1.5	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	1.1	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	1.1	Sand (%):	40
Velocity (m/s):	0.15	Thalweg depth (m):	1.1	Gravel (%):	60
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Spruce, hemlock, grass and shrubs

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 46 55 55 **Barrier:** Unknown
Comments: Additional sampling required to locate upper limit of fish distribution. Stream may extend beyond property boundary onto Forest Service land.

Sampling Time (s): 126 **Area (sq. m):** 25 **Efficiency (%):** 100

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Station: 02A02 **Survey Date:** 8/25/98 **Survey Time:** 3:51:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36479 **Longitude:** -144.20288 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: E5 Low gradient, deep, highly meandering, sand channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	1.2	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.5	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.5	Sand (%):	50
Velocity (m/s):	0.3	Thalweg depth (m):	0.5	Gravel (%):	50
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: In large bog; grasses and shrubs.

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 50 45 50 **Barrier:** Unknown

Comments: Upper limit not confirmed.

Species: sculpin, undifferentiated **Life Stage:** Juvenile/Adult **Life History:** Resident

Count: 2 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** None

Comments:

Sampling Time (s): 107 **Area (sq. m):** 18 **Efficiency (%):** 100

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Station: 02A03 **Survey Date:** 8/25/98 **Survey Time:** 3:47:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36588 **Longitude:** -144.20374 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: E4 Low gradient, deep, highly meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	N/A	Stream width (m):	1
Water temperature (°C):	N/A	Left bank depth (m):	0.15
Water Color/Clarity:	Clear	Right bank depth (m):	0.15
Velocity (m/s):	0.3	Thalweg depth (m):	0.15
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	10
		Gravel (%):	90
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Small tributary to stream with Station 02A03. Grass changing to willows and spruce near toe of slope.

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 6 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 37 51 40 50 45 35 **Barrier:** Geologically Fixed, Waterfall/High Gradient

Comments: Upstream distribution of coho salmon at toe of slope.

Sampling Time (s): 120 **Area (sq. m):** 30 **Efficiency (%):** 80

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Station: 02A04 **Survey Date:** 8/25/98 **Survey Time:** 4:09:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36583 **Longitude:** -144.20308 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	3	Stream width (m):	1.5	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.15	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.15	Sand (%):	10
Velocity (m/s):	0.3	Thalweg depth (m):	0.15	Gravel (%):	80
				Cobble (%):	10
				Boulder (%):	
				Bedrock (%):	

Station Comments: Spruce, hemlock, alder, devils club, salmonberry.

Wildlife Comments:

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 2 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 35 35 **Barrier:** Unknown
Comments: No apparent barrier to fish passage.

Sampling Time (s): 53 **Area (sq. m):** 35 **Efficiency (%):** 80

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Station: 02A05 **Survey Date:** 8/25/98 **Survey Time:** 4:25:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36608 **Longitude:** -144.20506 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: B5 Moderate gradient, moderate entrenched sand channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	3	Stream width (m):	1.6	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.1	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.2	Sand (%):	60
Velocity (m/s):	0.15	Thalweg depth (m):	0.2	Gravel (%):	40
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 50 60 **Barrier:** Geologically Fixed, Stream Limit
Comments: Distribution of fish currently appears to end downstream of toe of slope. More coho observed than sampled.

Sampling Time (s): 34 **Area (sq. m):** 12 **Efficiency (%):** 100

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Station: 02A06 **Survey Date:** 8/25/98 **Survey Time:** 4:40:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36742 **Longitude:** -144.20564 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: B5 Moderate gradient, moderate entrenched sand channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	3	Stream width (m):	0.5	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.1	Clay/Silt (%):	10
Water Color/Clarity:	Clear	Right bank depth (m):	0.1	Sand (%):	60
Velocity (m/s):	0.15	Thalweg depth (m):	0.1	Gravel (%):	30
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Tributary to the stream with Station 02A01. Grass, shrubs, spruce, hemlock

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A
Count: **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:**
Comments: No specific barriers observed. May not be occupied because of insufficient depth.

Sampling Time (s): 22 **Area (sq. m):** 50 **Efficiency (%):** 100

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Station: 02A07 **Survey Date:** 8/25/98 **Survey Time:** 4:55:00 PM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.3669 **Longitude:** -144.20596 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: LAK Lake/Pond

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	10	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.3	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.25	Sand (%):	10
Velocity (m/s):	0	Thalweg depth (m):	1	Gravel (%):	90
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Grass, spruce, and hemlock. Upstream channel terminus a groundwater-fed pool.

Wildlife Comments:

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 2 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 95 85 **Barrier:** Geologically Fixed, Stream Limit

Comments:

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 45 45 35 50 **Barrier:** Geologically Fixed, Stream Limit

Comments:

Sampling Time (s): 151 **Area (sq. m):** 150 **Efficiency (%):** 80

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Station: 02A08 **Survey Date:** 8/25/98 **Survey Time:** 5:27:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36783 **Longitude:** -144.20824 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C5 Low gradient, meandering, sand channel

Channel/Water Parameters

Stream Gradient (%): 1 **Stream width (m):** 3
Water temperature (°C): N/A **Left bank depth (m):** 0.05
Water Color/Clarity: Clear **Right bank depth (m):** 0.05
Velocity (m/s): 0.15 **Thalweg depth (m):** 0.06

Substrate Composition

Organic (%):
Clay/Silt (%): 50
Sand (%): 50
Gravel (%):
Cobble (%):
Boulder (%):
Bedrock (%):

Station Comments: Riparian grass

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 35 **Barrier:** Unknown
Comments: Sampling halted to return to helicopter. Upstream limit of fish distribution not determined.

Sampling Time (s): 9 **Area (sq. m):** 1 **Efficiency (%):** 100

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Station: 02B01 **Survey Date:** 8/25/98 **Survey Time:** 3:30:00 PM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 17, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.39704 **Longitude:** -144.2108 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 60

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 1	Stream width (m): 1	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.2	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): 0.2	Sand (%):	
Velocity (m/s): 0.5	Thalweg depth (m): 0.2	Gravel (%): 100	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: alder, Pacific red elder, salmonberries, ferns, devils club, spruce, hemlock, cow parsnip.

Wildlife Comments: Bear trails

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Specific Barrier Unknown

Comments: Excellent salmonid rearing habitat. Suspect blockage between 02B01 and 02B03.

Sampling Time (s): 166 **Area (sq. m):** 30 **Efficiency (%):** 80

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Station: 02B02 **Survey Date:** 8/25/98 **Survey Time:** 4:50:00 PM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 20, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.38952 **Longitude:** -144.20882 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 45
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4040-5015 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

Channel/Water Parameters

Stream Gradient (%): N/A **Stream width (m):** N/A
Water temperature (°C): N/A **Left bank depth (m):** N/A
Water Color/Clarity: Clear **Right bank depth (m):** N/A
Velocity (m/s): 0.1 **Thalweg depth (m):** N/A

Substrate Composition

Organic (%):
Clay/Silt (%):
Sand (%):
Gravel (%): 100
Cobble (%):
Boulder (%):
Bedrock (%):

Station Comments: Salmonberry, Pacific red elder, alder, spruce, hemlock, cow parsnip. Groundwater fed stream.

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 60 38 44 46 **Barrier:** Ephemeral Fixed, Low Flow
Comments: Upper limit of coho distribution dependent on flow.

Sampling Time (s): 15 **Area (sq. m):** 10 **Efficiency (%):** 80

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Station: 02B03 **Survey Date:** 8/25/98 **Survey Time:** 5:20:00 PM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 20, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.39185 **Longitude:** -144.2066 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 45
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4040-5015-6006 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	1	Stream width (m):	3
Water temperature (°C):	N/A	Left bank depth (m):	0
Water Color/Clarity:	Clear	Right bank depth (m):	0.15
Velocity (m/s):	0.5	Thalweg depth (m):	0.2
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	100
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Stink current, salmonberry, devils club, cow parsnip, ovalleaf blueberry, bunchberry dogwood, fern, alder, spruce, hemlock

Wildlife Comments: Bear trails; beaver activity creating downstream pond complex.

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 38 35 **Barrier:**
Comments:

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 42 54 42 56 **Barrier:** Specific Barrier Unknown
Comments: Several not captured. Habitat remains good; potential barrier between here and 02B01.

Sampling Time (s): 210 **Area (sq. m):** 10 **Efficiency (%):** 75

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Station: 03A01 **Survey Date:** 8/26/98 **Survey Time:** 9:41:00 AM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36761 **Longitude:** -144.2075 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type:

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	1	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.1	Clay/Silt (%):	10
Water Color/Clarity:	Clear	Right bank depth (m):	0.1	Sand (%):	20
Velocity (m/s):	0.15	Thalweg depth (m):	0.1	Gravel (%):	70
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments:

Fish Observations

Species: no collection effort **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:**

Fork lengths (mm): **Barrier:**

Comments: General foot survey suggests no barriers to coho or Dolly Varden movements. Upper limit believed to be toe of slope.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 03A02 **Survey Date:** 8/26/98 **Survey Time:** 9:57:00 AM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36955 **Longitude:** -144.2097 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type:

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	0.6	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.15	Clay/Silt (%):	40
Water Color/Clarity:	Clear	Right bank depth (m):	0.15	Sand (%):	30
Velocity (m/s):	0.6	Thalweg depth (m):	0.15	Gravel (%):	30
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Grass, shrubs, hemlock, and spruce.

Wildlife Comments: Beaver dam

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Geologically Fixed, Waterfall/High Gradient

Comments: Juvenile coho salmon found downstream of beaver dam, but not upstream. Beaver dam is adjacent to toe of slope, which acts as barrier in dam absence.

Sampling Time (s): 26 **Area (sq. m):** 6 **Efficiency (%):** 100

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Station: 03A03 **Survey Date:** 8/26/98 **Survey Time:** 10:13:00 AM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 29, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.37059 **Longitude:** -144.21082 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4032-0912 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** High
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	3	Stream width (m):	1.2	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.25	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.25	Sand (%):	10
Velocity (m/s):	1	Thalweg depth (m):	0.25	Gravel (%):	80
				Cobble (%):	10
				Boulder (%):	
				Bedrock (%):	

Station Comments: Shrubs, hemlock, spruce. Flow over banks due to recent rains.

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A
Count: **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Geologically Fixed, Waterfall/High Gradient

Comments: Believe that stream to toe of slope can support fish, none observed uphill from toe of slope.

Sampling Time (s): 34 **Area (sq. m):** 15 **Efficiency (%):** 90

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Station: 03A04 **Survey Date:** 8/26/98 **Survey Time:** 12:33:00 PM **Team:** Mike Thompson
Legal Description: NE 1/4 Section 33, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.36072 **Longitude:** -144.17999 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 45
Anadromous Water Catalog Number: **Number Status:**
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** High
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	3	Stream width (m):	3
Water temperature (°C):	N/A	Left bank depth (m):	0.5
Water Color/Clarity:	Clear	Right bank depth (m):	0.5
Velocity (m/s):	0.6	Thalweg depth (m):	0.5
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	20
		Gravel (%):	80
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Flow above bankfull stage. Salmonberry, grass, hemlock, spruce
Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A
Count: **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Unknown
Comments: Excellent habitat, sampling may be influenced by high water. Recommend resampling.
Sampling Time (s): 229 **Area (sq. m):** 400 **Efficiency (%):**

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Station: 03A05 **Survey Date:** 8/26/98 **Survey Time:** 2:15:00 PM **Team:** Mike Thompson
Legal Description: NE 1/4 Section 14, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.40439 **Longitude:** -144.12364 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2451-3040 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	3	Stream width (m):	4.2
Water temperature (°C):	N/A	Left bank depth (m):	0.45
Water Color/Clarity:	Clear	Right bank depth (m):	0.45
Velocity (m/s):	0.6	Thalweg depth (m):	0.45
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	10
		Gravel (%):	90
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Foodplain of glacial outwash. Early seral vegetation: grasses, willow, alder, young spruce.
Wildlife Comments: Bear sign.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: 10 **Fish Sampling/Observation Method:** Visual Observation, Ground
Fork lengths (mm): **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic
Comments: Upper limit of sockeye distribution variable depending on water levels. Site is in geologically dynamic floodplain following glacial retreat.

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 63 **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic
Comments: Flow in stream probably variable over time as floodplain hydrology is dynamic.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 03A06 **Survey Date:** 8/26/98 **Survey Time:** 5:15:00 PM **Team:** Mike Thompson
Legal Description: NE 1/4 Section 13, T. 17 S., R. 7 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.39983 **Longitude:** -144.09019 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 25

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: E6 Low gradient, deep, highly meandering, silt/clay channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	1.2	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.2	Clay/Silt (%):	80
Water Color/Clarity:	Clear	Right bank depth (m):	0.2	Sand (%):	10
Velocity (m/s):	0.15	Thalweg depth (m):	0.2	Gravel (%):	10
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Short tributary to Kushtaka Lake.

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: No fish observed but no known blockage to fish passage. Resample if necessary.

Sampling Time (s): 172 **Area (sq. m):** 180 **Efficiency (%):** 100

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Station: 03B01 **Survey Date:** 8/26/98 **Survey Time:** 9:30:00 AM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 17, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.39981 **Longitude:** -144.22073 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4047 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type:

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 0	Stream width (m): 2	Organic (%):	
Water temperature (°C): 9	Left bank depth (m): 0	Clay/Silt (%):	100
Water Color/Clarity: Humic	Right bank depth (m): 0.2	Sand (%):	
Velocity (m/s): 0.1	Thalweg depth (m): 0.3	Gravel (%):	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Off-channel pool. Alder, spruce, hemlock, devils club. Immediately adjacent to 03B02 (the main channel station).

Wildlife Comments: Bear trail through adjacent muskeg.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 44 50 52 **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic

Comments:

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 55 **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic

Comments:

Sampling Time (s): 20 **Area (sq. m):** 5 **Efficiency (%):** 70

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Station: 03B02 **Survey Date:** 8/26/98 **Survey Time:** 10:00:00 AM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 17, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.39995 **Longitude:** -144.2202 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4047 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: B3 Moderate gradient, moderate entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	4	Stream width (m):	6	Organic (%):	
Water temperature (°C):	8	Left bank depth (m):	0.1	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.1	Sand (%):	
Velocity (m/s):	1	Thalweg depth (m):	0.45	Gravel (%):	35
				Cobble (%):	65
				Boulder (%):	
				Bedrock (%):	

Station Comments: Alder, devils club, spruce, hemlock. Main channel immediately adjacent to 03B01.

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 40 42 38 **Barrier:** Unknown
Comments: Collected along bank in slow water. Aerial survey of stream revealed no apparent barriers upstream of station. Upstream access difficult.

Sampling Time (s): 21 **Area (sq. m):** 2 **Efficiency (%):** 70

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Station: 03B03 **Survey Date:** 8/26/98 **Survey Time:** 10:20:00 AM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 17, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.39945 **Longitude:** -144.222 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 60

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: A3 Steep, entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	10	Stream width (m):	1	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.3	Clay/Silt (%):	
Water Color/Clarity:	Humic	Right bank depth (m):	0.3	Sand (%):	
Velocity (m/s):	1.5	Thalweg depth (m):	0.3	Gravel (%):	
				Cobble (%):	80
				Boulder (%):	20
				Bedrock (%):	

Station Comments: Small runoff stream with series of plunge pools

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: Sampled best appearing habitat in reach. Should sample stream beginning at confluence with Sheperd Creek.

Sampling Time (s): 8 **Area (sq. m):** 1 **Efficiency (%):** 20

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Station: 03B04 **Survey Date:** 8/26/98 **Survey Time:** 10:30:00 AM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 17, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.39925 **Longitude:** -144.22345 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 75
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4045 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: Aa2 Very steep, deeply entrenched boulder channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	12	Stream width (m):	4
Water temperature (°C):	N/A	Left bank depth (m):	0.15
Water Color/Clarity:	N/A	Right bank depth (m):	0.3
Velocity (m/s):	1.5	Thalweg depth (m):	0.4
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	10
		Cobble (%):	30
		Boulder (%):	60
		Bedrock (%):	

Station Comments: High velocities, gradients locally to 20%. Small lateral scour pools, relatively high LWD load.
Alder, devils club, salmonberry, hemlock, spruce.

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 40 **Barrier:** Unknown

Comments: Very difficult sampling conditions. Very surprising to capture an apparent 0. juvenile coho.
Small size suggests spawning in vicinity.

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 40 **Barrier:** Unknown

Comments: Spawning likely in vicinity.

Species: Dolly Varden **Life Stage:** Adult **Life History:** Unknown

Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 300 **Barrier:** Unknown

Comments:

Species: Dolly Varden **Life Stage:** Juvenile/Adult **Life History:** Unknown

Count: 2 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 128 89 **Barrier:** Unknown

Comments:

Sampling Time (s): 91 **Area (sq. m):** 4 **Efficiency (%):** 30

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Station: 03B05 **Survey Date:** 8/26/98 **Survey Time:** 1:15:00 PM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 22, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.38267 **Longitude:** -144.1497 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 85
Anadromous Water Catalog Number: **Number Status:**
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 1	Stream width (m): 3	Organic (%):	
Water temperature (°C): 8	Left bank depth (m): 0.15	Clay/Silt (%):	10
Water Color/Clarity: Clear	Right bank depth (m): 0.15	Sand (%):	10
Velocity (m/s): 0.5	Thalweg depth (m): 0.3	Gravel (%):	80
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Salmonberry, devils club, ferns, spruce, hemlock. High load of LWD, good mix of pools and riffles. Excellent spawning and rearing habitat.

Wildlife Comments: Bear trails.

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A
Count: **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Specific Barrier Unknown
Comments: Excellent appearing habitat. No observed barriers downstream. Should search for barriers upstream of extensive bog south of Kushtaka Lake.

Sampling Time (s): 181 **Area (sq. m):** 30 **Efficiency (%):** 50

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Station: 03B06 **Survey Date:** 8/26/98 **Survey Time:** 3:00:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 20, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.38009 **Longitude:** -144.2269 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4037-5026 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	3	Organic (%):	
Water temperature (°C):	7	Left bank depth (m):	0.14	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.1	Sand (%):	25
Velocity (m/s):	0.5	Thalweg depth (m):	0.3	Gravel (%):	75
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Spruce, hemlock, salmonberry, devils club, skunk cabbage, liverwort, fern, moss. Frequent
LWD.

Wildlife Comments: Brown bear observed downstream 0.5 km.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 3 **Fish Sampling/Observation Method:** Dip Net
Fork lengths (mm): 39 39 41 **Barrier:** None
Comments: Electrofisher failure; used anode net to dip fish.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 03B07 **Survey Date:** 8/26/98 **Survey Time:** 3:40:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 20, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.38075 **Longitude:** -144.22311 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2031-3032-4037-5026 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	N/A	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	N/A	Sand (%):	20
Velocity (m/s):	0.01	Thalweg depth (m):	N/A	Gravel (%):	80
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Groundwater-fed system at upper limit feeds through series of pools. Upper limit of fish distribution will vary based on stream flow.

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 10 **Fish Sampling/Observation Method:** Visual Observation, Ground
Fork lengths (mm): **Barrier:** Ephemeral Fixed, Low Flow
Comments: Electrofisher failure. Fish collected and ID confirmed with dip net.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 03B08 **Survey Date:** 8/26/98 **Survey Time:** 4:00:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 20, T. 17 S., R. 7 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.38216 **Longitude:** -144.22655 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 45

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** N/A

'96 Rosgen Channel Type:

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): N/A	Stream width (m): N/A	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): N/A	Clay/Silt (%):	
Water Color/Clarity: N/A	Right bank depth (m): N/A	Sand (%):	
Velocity (m/s): N/A	Thalweg depth (m): N/A	Gravel (%):	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Tributary viewed from helicopter at tree-top level. No observed blockages between known anadromous waters and station. Confirm with ground sampling.

Wildlife Comments:

Fish Observations

Species: no collection effort **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:**

Fork lengths (mm): **Barrier:**

Comments: Juvenile coho salmon and Dolly Varden rearing likely.

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 04A01 **Survey Date:** 8/27/98 **Survey Time:** 10:10:00 AM **Team:** Mike Thompson
Legal Description: NE 1/4 Section 24, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.39301 **Longitude:** -143.91048 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2050-3070 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: A2 Steep, entrenched boulder channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): N/A	Stream width (m): 3	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.3	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): 0.3	Sand (%):	
Velocity (m/s): 1	Thalweg depth (m): 0.3	Gravel (%):	10
		Cobble (%):	40
		Boulder (%):	50
		Bedrock (%):	

Station Comments: Large amounts of LWD forming debris jams with step pools.

Wildlife Comments:

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile/Adult **Life History:** Unknown
Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 140 **Barrier:** Unknown
Comments:

Species: cutthroat trout **Life Stage:** Juvenile **Life History:** Unknown
Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 95 **Barrier:** Unknown
Comments:

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 2 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 88 92 **Barrier:** Unknown
Comments:

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 10 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 40 45 45 45 **Barrier:** Ephemeral Fixed, Debris Jam
Comments: Debris jam forms current upper limit. Exact location of upper limit may vary depending on debris flow, but should remain in general vicinity.

Sampling Time (s): 263 **Area (sq. m):** **Efficiency (%):** 60

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Station: 04A02 **Survey Date:** 8/27/98 **Survey Time:** 11:00:00 AM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 13, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.39281 **Longitude:** -143.91122 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2050-3070-4019 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type:

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): N/A	Stream width (m): N/A	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): N/A	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): N/A	Sand (%):	
Velocity (m/s): N/A	Thalweg depth (m): N/A	Gravel (%):	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Large amounts of LWD. High gradient except in lower reaches.

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 30 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 45 50 40 **Barrier:** Ephemeral Fixed, Debris Jam
Comments: Debris jam forms temporary barrier, but increasing gradient will probably restrict coho distribution to general area.

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 2 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 95 72 **Barrier:** Unknown
Comments: Upper limit of Dolly Varden distribution unknown.

Sampling Time (s): 374 **Area (sq. m):** **Efficiency (%):** 80

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Station: 04A03 **Survey Date:** 8/27/98 **Survey Time:** 2:15:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 11, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.4113 **Longitude:** -143.94913 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 60

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: D4 Wide braided channel, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	1.5	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.25	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.25	Sand (%):	10
Velocity (m/s):	1	Thalweg depth (m):	0.25	Gravel (%):	80
				Cobble (%):	10
				Boulder (%):	
				Bedrock (%):	

Station Comments: Channel follows the western slope of the Canyon Creek floodplain. Flow originates from very steep runoff streams and from floodplain groundwater.

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: No fish from toe of slope to confluence of next tributary downstream.

Sampling Time (s): 200 **Area (sq. m):** **Efficiency (%):** 100

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Station: 04A04 **Survey Date:** 8/27/98 **Survey Time:** 2:45:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 11, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.40829 **Longitude:** -143.95122 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 55

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: A4 Steep, entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	1.2	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.15	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.15	Sand (%):	20
Velocity (m/s):	1	Thalweg depth (m):	0.15	Gravel (%):	80
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Tributary to main channel.

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Geologically Fixed, Waterfall/High Gradient

Comments: If anadromous fish do periodically use the main channel, they could not ascend this tributary beyond ~30 m from toe of slope (10 m waterfall)

Sampling Time (s): 127 **Area (sq. m):** **Efficiency (%):** 100

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Station: 04A05 **Survey Date:** 8/27/98 **Survey Time:** 3:05:00 PM **Team:** Mike Thompson
Legal Description: SE 1/4 Section 11, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.40818 **Longitude:** -143.95084 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 55

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	N/A	Stream width (m):	1.5	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.15	Clay/Silt (%):	10
Water Color/Clarity:	Clear	Right bank depth (m):	0.15	Sand (%):	20
Velocity (m/s):	0.6	Thalweg depth (m):	0.15	Gravel (%):	70
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments:

Wildlife Comments: Bear trail along toe of slope. Beaver dam complex.

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: No specific blockages noted except for beaver dams.

Sampling Time (s): 187 **Area (sq. m):** **Efficiency (%):** 100

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Station: 04A06 **Survey Date:** 8/27/98 **Survey Time:** 4:47:00 PM **Team:** Mike Thompson
Legal Description: NW 1/4 Section 14, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.38587 **Longitude:** -143.96706 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 15

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): N/A	Stream width (m): 5	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.2	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): 0.2	Sand (%):	30
Velocity (m/s): 0.6	Thalweg depth (m): 0.2	Gravel (%):	70
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments:

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: No fish observed in system. No clear explanation for absence. Should resample.

Sampling Time (s): 158 **Area (sq. m):** **Efficiency (%):** 100

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Station: 04B01 **Survey Date:** 8/27/98 **Survey Time:** 9:45:00 AM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 12, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.40693 **Longitude:** -143.92369 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 55
Anadromous Water Catalog Number: 200-20-10110-2050-3100 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 1	Stream width (m): 2.5	Organic (%):	
Water temperature (°C): 7	Left bank depth (m): 0.3	Clay/Silt (%):	
Water Color/Clarity: Humic	Right bank depth (m): 0	Sand (%):	10
Velocity (m/s): 0.5	Thalweg depth (m): 0.3	Gravel (%):	90
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Alder, willow, salmonberry, grass

Wildlife Comments: Brown bear scat containing salmonberry seeds and skunk cabbage. Partially eaten sockeye carcass. No evidence of moose browse on 3-m tall willows.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 14 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 56 49 42 39 **Barrier:** None

Comments: 39 mm fish recently buttoned-up suggests adjacent spawning.

Species: sockeye salmon **Life Stage:** Adult **Life History:** Anadromous

Count: 3 **Fish Sampling/Observation Method:** Visual Observation, Ground

Fork lengths (mm): **Barrier:** Specific Barrier Unknown

Comments: Several eaten carcasses along channel.

Sampling Time (s): 6 **Area (sq. m):** 0.5 **Efficiency (%):** 75

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Station: 04B02 **Survey Date:** 8/27/98 **Survey Time:** 10:15:00 AM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 12, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.40699 **Longitude:** -143.91896 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2050-3100-4023 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: Aa3 Very steep, deeply entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	11	Stream width (m):	3
Water temperature (°C):	7	Left bank depth (m):	0
Water Color/Clarity:	Humic	Right bank depth (m):	0
Velocity (m/s):	1	Thalweg depth (m):	0.2
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	20
		Cobble (%):	60
		Boulder (%):	20
		Bedrock (%):	

Station Comments: Cascading stream w/ steps to 0.7 m. Extensive LWD forming lateral and plunge pools.

Wildlife Comments: Extensive recent brown bear activity between 04B02 and 04B01

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 2 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 85 46 **Barrier:** None

Comments: No known barrier to Dolly Varden distribution.

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 22 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 41 37 **Barrier:** Unknown

Comments: Small size of coho and character of stream suggests spawning. Similar gradient and stream character continues upstream. Access difficult.

Sampling Time (s): 20 **Area (sq. m):** **Efficiency (%):** 50

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Station: 04B03 **Survey Date:** 8/27/98 **Survey Time:** 11:20:00 AM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 13, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.40568 **Longitude:** -143.9183 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 70
Anadromous Water Catalog Number: 200-20-10110-2050-3100 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: A3 Steep, entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	10	Stream width (m):	3	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	Humic	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	1	Thalweg depth (m):	N/A	Gravel (%):	20
				Cobble (%):	80
				Boulder (%):	
				Bedrock (%):	

Station Comments: Series of LWD and debris jams form cascading step pools. Photo shows one currently blocking coho passage. Devils club, salmonberry, alder, hem/ spruc

Wildlife Comments: Brown bear scat and trail

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 5 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: Collected above and below debris jam. Upper limit of distribution unknown.

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 15 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Ephemeral Fixed, Debris Jam

Comments: Fish collected in plunge pool immediately below debris jam. Multiple debris jams downstream did not create barriers.

Sampling Time (s): 40 **Area (sq. m):** 10 **Efficiency (%):** 30

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Station: 04B04 **Survey Date:** 8/27/98 **Survey Time:** 11:30:00 AM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 13, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.40582 **Longitude:** -143.92012 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2050-3100-4026 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: Aa3 Very steep, deeply entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	15	Stream width (m):	1.2	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	0.1	Clay/Silt (%):	
Water Color/Clarity:	Humic	Right bank depth (m):	0.1	Sand (%):	
Velocity (m/s):	1	Thalweg depth (m):	0.2	Gravel (%):	30
				Cobble (%):	70
				Boulder (%):	
				Bedrock (%):	

Station Comments: Small tributary immediately downstream of 04B03. No photo taken.

Wildlife Comments:

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Unknown
Comments: No distinct barriers observed. Upstream distribution of Dolly Varden unknown, coho may periodically use lower reach.

Sampling Time (s): 15 **Area (sq. m):** 50 **Efficiency (%):** 50

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Station: 04B05 **Survey Date:** 8/27/98 **Survey Time:** 11:45:00 AM **Team:** Michael Wiedmer
Legal Description: NE 1/4 Section 13, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.40561 **Longitude:** -143.91945 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2050-3100-4024 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: A3 Steep, entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 7	Stream width (m): 2	Organic (%):	
Water temperature (°C): 8	Left bank depth (m): 0	Clay/Silt (%):	
Water Color/Clarity: Humic	Right bank depth (m): 0	Sand (%):	
Velocity (m/s): 1	Thalweg depth (m): 0.15	Gravel (%):	50
		Cobble (%):	50
		Boulder (%):	
		Bedrock (%):	

Station Comments: Small tributary. Frequent LWD, gradient increases to 20% 200m upstream of confluence.

Wildlife Comments: Brown bear scat and trails.

Fish Observations

Species: cutthroat trout **Life Stage:** Juvenile **Life History:** Unknown

Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments:

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 36 **Barrier:** Geologically Fixed, Waterfall/High Gradient

Comments:

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 37 37 45 **Barrier:** Unknown

Comments:

Sampling Time (s): 20 **Area (sq. m):** 5 **Efficiency (%):** 30

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Station: 04B06 **Survey Date:** 8/27/98 **Survey Time:** 1:40:00 PM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 1, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.43059 **Longitude:** -143.92973 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 90
Anadromous Water Catalog Number: 200-20-10110-2050-3170 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C4 Low gradient, meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	2	Stream width (m):	4
Water temperature (°C):	7	Left bank depth (m):	0
Water Color/Clarity:	N/A	Right bank depth (m):	0.45
Velocity (m/s):	1	Thalweg depth (m):	0.3
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	75
		Cobble (%):	25
		Boulder (%):	
		Bedrock (%):	

Station Comments: Station is in Canyon Creek floodplain. Channel steepens significantly as it ascends valley slopes. Early seral stage vegetation (flood prone).

Wildlife Comments:

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 41 37 40 **Barrier:** Geologically Fixed, Waterfall/High Gradient

Comments: Upper limit of coho distribution thought to be Canyon Creek floodplain. Spawning highly suggested by small size and absence of adj. spawning habitat.

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown
Count: 20 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Unknown

Comments: Lengths range from 35-90 mm. Upper limit of Dolly Varden undetermined.

Species: Dolly Varden **Life Stage:** Adult **Life History:** Unknown
Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 340 **Barrier:** Unknown

Comments: Large Dolly Varden bright silver. Possible anadromous form.

Sampling Time (s): 50 **Area (sq. m):** 10 **Efficiency (%):** 50

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Station: 04B07 **Survey Date:** 8/27/98 **Survey Time:** 2:45:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 1, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.42447 **Longitude:** -143.93262 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 85

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 2	Stream width (m): 4	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0	Clay/Silt (%):	
Water Color/Clarity: Humic	Right bank depth (m): 0	Sand (%):	
Velocity (m/s): 0.5	Thalweg depth (m): 0.15	Gravel (%):	80
		Cobble (%):	10
		Boulder (%):	10
		Bedrock (%):	

Station Comments: Good fish habitat in stream reach within Canyon Creek floodplain. Stream steeply descends from valley slopes to floodplain.

Wildlife Comments: Brown bear tracks on Canyon Creek gravel bar.

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: Good habitat comparable to 04B06. No explanation for absence of fish. Suggest resampling.

Sampling Time (s): 80 **Area (sq. m):** 20 **Efficiency (%):** 70

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Station: 04B08 **Survey Date:** 8/27/98 **Survey Time:** 3:30:00 PM **Team:** Michael Wiedmer
Legal Description: SE 1/4 Section 23, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.38438 **Longitude:** -143.94521 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 25
Anadromous Water Catalog Number: 200-20-10110-2050-3068-0001 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: *SLU* Slough

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	0	Stream width (m):	25
Water temperature (°C):	N/A	Left bank depth (m):	0
Water Color/Clarity:	Clear	Right bank depth (m):	0
Velocity (m/s):	0	Thalweg depth (m):	1.6
		Organic (%):	80
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	10
		Cobble (%):	10
		Boulder (%):	
		Bedrock (%):	

Station Comments: Slough in Canyon Creek/archaic Bering River floodplain. Early seral veg: willow, alder, stunted

spruce. Railroad bed adjacent to site.

Wildlife Comments: Moose tracks.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 22 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 68 39 **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic

Comments: Electrofishing limited to avoid disturbing spawning sockeye. Coho spawning likely because of juvenile size and absence of alternative habitat.

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: 40 **Fish Sampling/Observation Method:** Visual Observation, Ground

Fork lengths (mm): **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic

Comments: Slough likely provides rearing habitat, although no juvenile sockeye were observed.

Sampling Time (s): 4 **Area (sq. m):** 2 **Efficiency (%):** 50

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Station: 04B09 **Survey Date:** 8/27/98 **Survey Time:** 5:05:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 23, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.38125 **Longitude:** -143.95718 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 25
Anadromous Water Catalog Number: 200-20-10110-2050-3064-0010 **Number Status:** Resident
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: *SLU* Slough

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 0	Stream width (m): 100	Organic (%): 100	
Water temperature (°C): 11	Left bank depth (m): 0	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): 0	Sand (%):	
Velocity (m/s): 0	Thalweg depth (m): 1	Gravel (%):	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Early seral vegetation: willow, grass. Sedge and Equisetum on slough margin. Fewer springs than 04B08.

Wildlife Comments: Trumpeter swan pair. Moose tracks, browsed willow.

Fish Observations

Species: threespine stickleback **Life Stage:** Juvenile/Adult **Life History:** Resident
Count: 3 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic
Comments: Beaver dam at outlet to Canyon Ck. may block entrance. High methane levels may limit habitat value. Specimens were collected dead (Schistocephalus?)

Sampling Time (s): 20 **Area (sq. m):** 10 **Efficiency (%):** 50

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Station: 04B10 **Survey Date:** 8/27/98 **Survey Time:** 5:30:00 PM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 26, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.37543 **Longitude:** -143.95345 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 25
Anadromous Water Catalog Number: 200-20-10110-2050-3060 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: *SLU* Slough

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	0	Stream width (m):	50	Organic (%):	
Water temperature (°C):	N/A	Left bank depth (m):	N/A	Clay/Silt (%):	
Water Color/Clarity:	N/A	Right bank depth (m):	N/A	Sand (%):	
Velocity (m/s):	0	Thalweg depth (m):	N/A	Gravel (%):	100
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Slough complex occupying relict Bering River stream channel. Previous outlet of West Berg Lake abandoned. Channel now filled with groundwater.

Wildlife Comments: Brown bear sow and cub fishing for adult sockeye salmon.

Fish Observations

Species: sockeye salmon **Life Stage:** Adult Spawning **Life History:** Anadromous
Count: 100 **Fish Sampling/Observation Method:** Visual Observation, Air
Fork lengths (mm): **Barrier:** Ephemeral Fixed, Hydro-Geomorphically Dynamic
Comments: Over 100 spawners in series of interconnected pools within abandoned river channel (channel occupied in 1974 aerial photos).

Sampling Time (s): 0 **Area (sq. m):** **Efficiency (%):**

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Station: 04B11 **Survey Date:** 8/27/98 **Survey Time:** 5:45:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 21, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.378 **Longitude:** -144.01527 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 25
Anadromous Water Catalog Number: 200-20-10110-2151-3008 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: E5 Low gradient, deep, highly meandering, sand channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	1.25	Organic (%):	
Water temperature (°C):	12	Left bank depth (m):	0.2	Clay/Silt (%):	
Water Color/Clarity:	Humic	Right bank depth (m):	0.2	Sand (%):	90
Velocity (m/s):	0.5	Thalweg depth (m):	0.2	Gravel (%):	10
				Cobble (%):	
				Boulder (%):	
				Bedrock (%):	

Station Comments: Stream drains bog 300 m upstream.

Wildlife Comments: Moose scat and browse activity. Heavily used bear trails in vicinity.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 23 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 51 62 44 **Barrier:** Ephemeral Fixed, Low Flow
Comments: Upstream limit of coho distribution in bog upstream of station. Exact location dependent on flow stage.

Sampling Time (s): 40 **Area (sq. m):** 10 **Efficiency (%):** 20

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Station: 05A01 **Survey Date:** 8/28/98 **Survey Time:** 11:00:00 AM **Team:** Mike Thompson
Legal Description: NE 1/4 Section 7, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway: Trout Creek

Latitude: 60.4178 **Longitude:** -144.05823 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 115

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: B3 Moderate gradient, moderate entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): N/A	Stream width (m): 3	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.15	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): 0.2	Sand (%):	
Velocity (m/s): 0.6	Thalweg depth (m): 0.2	Gravel (%):	40
		Cobble (%):	60
		Boulder (%):	
		Bedrock (%):	

Station Comments: Confined canyon; difficult access.

Wildlife Comments:

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: No specific barriers noted. Resample reach for fish and barriers.

Sampling Time (s): 265 **Area (sq. m):** **Efficiency (%):** 100

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Station: 05A02 **Survey Date:** 8/28/98 **Survey Time:** 1:25:00 PM **Team:** Mike Thompson
Legal Description: NE 1/4 Section 29, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.3771 **Longitude:** -144.02939 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 25

Anadromous Water Catalog Number: **Number Status:**

Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium

'96 Rosgen Channel Type: E6 Low gradient, deep, highly meandering, silt/clay channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 1	Stream width (m): 1	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.3	Clay/Silt (%):	60
Water Color/Clarity: Clear	Right bank depth (m): 0.3	Sand (%):	40
Velocity (m/s): 0.15	Thalweg depth (m): 0.3	Gravel (%):	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Stream flows along toe of slope through meadow.

Wildlife Comments: Excellent moose habitat and signs of bear use.

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A

Count: **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): **Barrier:** Unknown

Comments: No fish or barriers observed. Resample.

Sampling Time (s): 215 **Area (sq. m):** 270 **Efficiency (%):** 100

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Station: 05A03 **Survey Date:** 8/28/98 **Survey Time:** 2:50:00 PM **Team:** Mike Thompson
Legal Description: NE 1/4 Section 20, T. 17 S., R. 8 E., C.R.M. Mike Hoyt

Name of Waterway:

Latitude: 60.3858 **Longitude:** -144.03876 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 25
Anadromous Water Catalog Number: **Number Status:**
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: E4 Low gradient, deep, highly meandering, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): N/A	Stream width (m): 1.2	Organic (%):	
Water temperature (°C): N/A	Left bank depth (m): 0.6	Clay/Silt (%): 40	
Water Color/Clarity: Clear	Right bank depth (m): 0.6	Sand (%):	
Velocity (m/s): 0.15	Thalweg depth (m): 0.6	Gravel (%): 60	
		Cobble (%):	
		Boulder (%):	
		Bedrock (%):	

Station Comments: Tributary to Stillwater. Flows through meadow/bog vegetation.
Wildlife Comments: Significant bear sign in area: trails and extensive use of vegetation.

Fish Observations

Species: no fish collected or observed **Life Stage:** Not Applicable **Life History:** N/A
Count: **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): **Barrier:** Unknown
Comments: No fish or barriers observed. Resample.

Sampling Time (s): 194 **Area (sq. m):** **Efficiency (%):**

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Station: 05B01 **Survey Date:** 8/28/98 **Survey Time:** 9:45:00 AM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 8, T. 17 S., R. 9 E., C.R.M. Mike Thompson
Name of Waterway: Rick Jandreau

Latitude: 60.41879 **Longitude:** -143.87732 **USGS Quad:** BERING GLACIER B-8 **Elevation (m):** 215
Anadromous Water Catalog Number: 200-20-10110-2030-3141 **Number Status:** Resident
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: D4 Wide braided channel, gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%): 2	Stream width (m): 6	Organic (%):	
Water temperature (°C): 7	Left bank depth (m): 0	Clay/Silt (%):	
Water Color/Clarity: Clear	Right bank depth (m): 0	Sand (%):	5
Velocity (m/s): 0.5	Thalweg depth (m): 0.15	Gravel (%):	90
		Cobble (%):	5
		Boulder (%):	
		Bedrock (%):	

Station Comments: Tributary to East Berg Lake upstream of several large waterfalls. East Berg Lake subject to periodic glacial advances and retreats.

Wildlife Comments:

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile/Adult **Life History:** Resident
Count: 1 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 66 **Barrier:** Unknown
Comments: Lake level recently dropped 50-100 m. Channel appears relatively sterile. Other fish seen rising in lake.

Sampling Time (s): 30 **Area (sq. m):** 15 **Efficiency (%):** 75

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Station: 05B02 **Survey Date:** 8/28/98 **Survey Time:** 10:20:00 AM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 16, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.40539 **Longitude:** -144.01668 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 25
Anadromous Water Catalog Number: 200-20-10110-2151-3012-4010 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: C5 Low gradient, meandering, sand channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>			
Stream Gradient (%):	1	Stream width (m):	6	Organic (%):	
Water temperature (°C):	7	Left bank depth (m):	0.6	Clay/Silt (%):	
Water Color/Clarity:	Clear	Right bank depth (m):	0.6	Sand (%):	80
Velocity (m/s):	0.5	Thalweg depth (m):	0.7	Gravel (%):	15
				Cobble (%):	5
				Boulder (%):	
				Bedrock (%):	

Station Comments: Channel destabilized from beaver activity. Riparian spruce inundated and dying. Willow and skunk cabbage.

Wildlife Comments: Recent bear tracks (today). Signs of brown bear sow and cub eating skunk cabbage and salmonberries. Stellar jays.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous
Count: 20 **Fish Sampling/Observation Method:** Portable Electrofisher
Fork lengths (mm): 38 36 35 37 **Barrier:** None
Comments: Anadromous barrier upstream at 05B03.

Sampling Time (s): 2 **Area (sq. m):** 1 **Efficiency (%):** 90

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Station: 05B03 **Survey Date:** 8/28/98 **Survey Time:** 11:30:00 AM **Team:** Michael Wiedmer
Legal Description: NW 1/4 Section 16, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.40402 **Longitude:** -144.01218 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 45
Anadromous Water Catalog Number: 200-20-10110-2151-3012-4010 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: A3 Steep, entrenched cobble channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	8	Stream width (m):	5
Water temperature (°C):	7	Left bank depth (m):	0
Water Color/Clarity:	Clear	Right bank depth (m):	0
Velocity (m/s):	1	Thalweg depth (m):	0.2
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	30
		Cobble (%):	60
		Boulder (%):	10
		Bedrock (%):	

Station Comments: Frequent LWD forming step pools, controlling bedload transport.

Wildlife Comments: Bear trail in bog east of station.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 5 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 42 41 41 41 47 **Barrier:** Ephemeral Fixed, Debris Jam

Comments: Coho distribution currently blocked by specific ephemeral debris jam. Upper limit of distribution will locally vary depending on debris jam changes.

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 5 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 100 65 74 62 66 **Barrier:** Unknown

Comments: Dolly Varden collected upstream of barrier to coho movement. Dolly Varden collected for at least another 250 m upstream of station.

Sampling Time (s): 100 **Area (sq. m):** 20 **Efficiency (%):** 30

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Station: 05B04 **Survey Date:** 8/28/98 **Survey Time:** 12:50:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 16, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.39586 **Longitude:** -144.01701 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 60
Anadromous Water Catalog Number: 200-20-10110-2151-3012-4004 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	4	Stream width (m):	5
Water temperature (°C):	8	Left bank depth (m):	0
Water Color/Clarity:	Clear	Right bank depth (m):	0
Velocity (m/s):	1	Thalweg depth (m):	0.3
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	95
		Cobble (%):	5
		Boulder (%):	
		Bedrock (%):	

Station Comments: Spruce, hemlock, salmonberry, cow parsnip, devils club, fern, skunk cabbage.

Wildlife Comments: Bear trail up steep adjacent slope.

Fish Observations

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 49 45 49 41 **Barrier:** Unknown

Comments: Gradient gradually increases upstream. No specific upstream barriers observed during overflight. Anticipated upper limit within 300 m of station.

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 6 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 39 **Barrier:** Unknown

Comments: Upper limit of Dolly Varden distribution unknown. Gradient increases upstream. Access upstream difficult.

Sampling Time (s): 20 **Area (sq. m):** 10 **Efficiency (%):** 75

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Station: 05B05 **Survey Date:** 8/28/98 **Survey Time:** 3:15:00 PM **Team:** Michael Wiedmer
Legal Description: SW 1/4 Section 9, T. 17 S., R. 8 E., C.R.M. Rick Jandreau

Name of Waterway:

Latitude: 60.411 **Longitude:** -144.02029 **USGS Quad:** CORDOVA B-1 **Elevation (m):** 30
Anadromous Water Catalog Number: 200-20-10110-2151-3012-4013 **Number Status:** Pending
Air temperature (°C): N/A **48 hr. Precip/Runoff:** Heavy **Stream Stage:** Medium
'96 Rosgen Channel Type: B4 Moderate gradient, moderate entrenched gravel channel

<u>Channel/Water Parameters</u>		<u>Substrate Composition</u>	
Stream Gradient (%):	4	Stream width (m):	3
Water temperature (°C):	8	Left bank depth (m):	0
Water Color/Clarity:	Humic	Right bank depth (m):	0.15
Velocity (m/s):	1	Thalweg depth (m):	0.3
		Organic (%):	
		Clay/Silt (%):	
		Sand (%):	
		Gravel (%):	95
		Cobble (%):	5
		Boulder (%):	
		Bedrock (%):	

Station Comments: Frequent LWD forming step pools. Upstream of station channel is an A3 channel.

Wildlife Comments:

Fish Observations

Species: Dolly Varden **Life Stage:** Juvenile **Life History:** Unknown

Count: 6 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 56 65 41 32 58 37 **Barrier:** Unknown

Comments: Dolly Varden presence confirmed for 600 m upstream of station. No known barriers. A3 channel above station.

Species: coho salmon **Life Stage:** Juvenile **Life History:** Anadromous

Count: 4 **Fish Sampling/Observation Method:** Portable Electrofisher

Fork lengths (mm): 38 39 48 37 **Barrier:** Ephemeral Fixed, Debris Jam

Comments: Ephemeral debris jam currently blocks coho passage. Long term upper limit will locally vary depending on debris jam distribution.

Sampling Time (s): 180 **Area (sq. m):** 20 **Efficiency (%):** 30

APPENDIX F. GIS INSTRUCTIONS

Appendix F1.-ArcView GIS project user's instructions.

Project Overview

This CD contains spatial, tabular, and graphic information from Alaska Department of Fish and Game, Habitat and Restoration Division's August 1998 survey of fish habitats in the Carbon Mountain Tract, Bering River watershed. To use this CD you must have ESRI ArcView 3.1 (or later) and Microsoft Access 97 (or later) operating in a Microsoft Windows platform. Recommended minimum RAM: 64 MB; minimum processor: 200 MHz Pentium.

Structure

The contents of the CD are organized in 3 folders:

Cmfincov	GIS layers of the Carbon Mountain Tract, Alaska in an ESRI ArcView 3.1 project.
Database	Contents of field data in a Microsoft Access 97 database.
Photos	Scanned photos in TIFF format.

Operation

This system is designed to operate directly off the CD. You may be able to improve response time by installing the project on your hard drive. Setups for both options are described below.

Operating from the CD

Connecting to Access

Before you first run the GIS project, you must establish an ODBC link between ArcView and Access:

1. Go into Control Panel.
2. Click on the ODBC icon twice.
3. Click on the User DSN tab. Choose Add... .
4. Highlight Microsoft Access Driver (*.mdb). Then click "Finish".
5. At the Data Source Name window type: "CBM01" (do not type quote marks).
6. In the Description window type: "Carbon Mountain Database".
7. Click "Select".
8. Select the database by going to the D:\CbnMtn\Database directory and highlighting the "CRBNMTN.mdb" database.
9. Click "OK". The link is now established. These steps only need to be done before the first time you run the Carbon Mountain ArcView project, after that the link is automatic.

Running ArcView

1. Open your ArcView program (must be installed on your computer).
2. Click "Open an existing project". Click "OK".
3. Select the d: drive in the Drives window.
4. Open the cbnmtn folder (double click on cbnmtn or highlight and click "OK").
5. Open the cmfincov folder. Open the carbon_mountain.apr file; the project will load.

Use the Select Feature or Lightning Bolt tool to query the database for information about each survey station (red triangles). The Lightning Bolt tool (the isolated button near the middle of the lower tool bar) performs the functions of the Select Feature tool and adds a Hot Link to site photos. With either tool, draw a small box around the station (triangle) of interest. Data for that station will be highlighted in the 2 main data tables at the bottom of the screen. Use the Identify tool to query the attributes of stream reaches, lakes, and eagle nests (the appropriate theme must be selected).

Operating from the hard drive

1. Copy the \CbnMtn directory and its subdirectories as a whole to the hard drive (we assume C:\ in these instructions).
2. In Windows Explorer remove the Read-only attribute from each of the following two C:\ drive files:
 \CbnMtn\CMFINCOV\carbon_mountain.apr; CbnMtn\Database\CRBNMTN.mdb
3. Open a text editor (e.g., WordPad), then open the file: \CbnMtn\CMFINCOV\carbon_mountain.apr.
4. Find and replace all instances of "D:\\" with "C:\\". Save the file under the same name and format, then close the text editor.
5. Start Access. Open the hard drive copy of the "CRBNMTN.mdb" database. Click on the "Queries" tab.
6. Highlight "Photos_Query". Click on "Design". Find the "PHOTOPATH" field (last field).
7. Change the drive letter (first character inside quotation marks) from D:\ to C:\; save the query and exit Access.
8. Follow the **Connection to Access** instructions above. At Step 8, select the CRBNMTN.mdb database you copied to your hard drive (you need to (re)establish the ODBC link between ArcView and Access).
9. Open and run ArcView as described in the **Running ArcView** instructions above (in step 3 select the c: drive).