

Technical Report No. 96-8

MIDDLE COPPER RIVER DRAINAGE PRELIMINARY FISH HABITAT SURVEY

by Michael Wiedmer



December 1996

Alaska Department of Fish and Game

Habitat and Restoration Division

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by

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ABSTRACT

On August 2, 1995, staff from the Alaska Department of Fish and Game, Habitat and Restoration Division, conducted a preliminary fish habitat survey of selected eastern tributaries to the Copper River between the Chitina and Klawasi rivers, a region of ongoing and proposed timber harvest programs. Recent heavy rains created high, turbid waters in most tributaries. Heavy rains and sudden glacial lake discharge in the Tazlina River watershed created a bankfull discharge in the Copper River mainstem. These conditions reduced overall survey efficiency. Fish were collected with a backpack electrofisher at eight locations on six streams. Anadromous fish (rearing coho salmon *Oncorhynchus kisutch*) were collected at two locations (Klawasi River and Strelna Creek, a tributary of the Kuskulana River). A rearing chinook salmon *O. tshawytscha* was tentatively identified on the lower Chetaslina River, but was not collected. Resident fish were collected at a total of six locations: Dolly Varden *Salvelinus malma* at five locations, round whitefish *Prosopium cylindraceum* and Arctic grayling *Thymallus arcticus* at one location, and sculpin *Cottus sp.* at one location. Eleven potential anadromous fish habitats were identified by low-level aerial observations. These habitats, as well as several of the ground-sampled locations, should be (re)surveyed to determine actual anadromous and resident fish use.

INTRODUCTION

The Anadromous Fish Act (AS 16.05.870) and the Alaska Forest Resources and Practices Act (FRPA, AS 41.17.010 - 41.17.950) mandate protection of anadromous fish habitat. Alaska statutes (AS 16.05.840) also require maintenance of fish passage in all resident fish streams. To ensure appropriate protection under these laws, anadromous and resident fish habitat must be identified by the Alaska Department of Fish and Game (ADF&G) prior to resource development. Because of Alaska's vast size and lack of ready access, most of the state's fish habitat has not been thoroughly surveyed. Where the ADF&G has systematically surveyed fish habitat in southcentral Alaskan watersheds, the department has doubled or tripled previously documented numbers of anadromous fish water bodies (Wiedmer and Brna 1989, Sundberg 1992).

The ADF&G Habitat and Restoration Division (H&R Division) produces a catalog and atlas (ADF&G 1994a, b) of all documented anadromous fish water bodies (AS 16.05.870(a)). H&R Division reviews and authorizes all construction and development activities below the ordinary high water of documented anadromous fish streams (AS 16.05.870(b-d)), reviews projects in resident fish streams to ensure continued fish passage (AS 16.05.840), and provides fish and wildlife comments and recommendations on timber harvest proposals (AS 41.17.098).

Prior to August 1995, H&R Division had conducted only one systematic fish habitat survey in the Copper River basin. This August 1992 survey was confined to western tributaries of the lower Copper River between the Tiekkel River and Childs Glacier (Gilleland et al. 1992). The 1992 survey documented rearing coho salmon *Oncorhynchus kisutch* in slow moving clearwater tributaries, rearing sockeye salmon *O. nerka* in clear Copper River floodplain sloughs, and rearing chinook salmon *O. tshawytscha* along the margins of the Copper River mainstem and in the deltas of many small, fast-flowing tributaries. Rearing chinook salmon collected in tributary deltas commonly were found in swift, turbid waters with cobble- to boulder-sized substrates and no vegetative cover. Comparable habitats were thought to occur among eastern tributaries to the Copper River between the Chitina River and Copper Center.

Most land between the Copper River and the Alaska-Canada border is within Wrangell-St. Elias National Park. Immediately east of the Copper River, however, much land is privately held, with the State of Alaska owning selected areas. This private and state land along the middle portion

of the Copper River, from the Chitina River in the south to Copper Center in the north, currently supports both active and proposed timber harvest programs. FRPA-required Detailed Plans of Operations submitted by private timber operators, and five-year timber harvest schedules submitted by the state, describe proposals to harvest over 10,000 acres (4,000 ha) of timber and to construct over 50 miles (80 km) of road each year in this area. To date, however, this area has not received a thorough fish habitat survey. Coho, chinook, and sockeye salmon and steelhead trout *O. mykiss* are known to use the middle Copper River as a migratory corridor (ADF&G 1994b). Use of the mainstem or its tributaries for rearing or spawning has been inadequately investigated. This report describes an initial fish habitat reconnaissance of the area designed to direct further systematic field work.

METHODS

On August 2, 1995, selected fish habitats were surveyed along eastern tributaries to the Copper River from Strelna Creek in the south to the Klawasi River in the north. Prior to the survey, permission to conduct ground-based sampling was requested and received from the major non-state landowners. A Trans-Alaska Helicopters Bell 206B II Jet Ranger piloted by Dave Shepler transported a two-person H&R Division crew (Michael Wiedmer and Mark Fink, Habitat Biologists, Region II, Anchorage). Within the survey area, representative streams were aerially observed at low altitudes between their mouths and the suspected upper-most reaches of accessible anadromous fish habitats. At specific sites appearing to provide suitable anadromous fish habitat and where landing sites were available, the survey crew landed and collected representative samples of extant fish species and age-classes and recorded general fish habitat characteristics.

Fish were collected with a Smith-Root Model 12 battery-powered backpack electrofisher equipped with Programmable Output Waveforms. Output voltages and waveforms were selected to maximize capture efficiency while minimizing risk of injury or death to the fish present. The selected output voltages and waveforms varied from site to site based on aquatic parameters influencing the fundamental performance of the electrofisher (e.g., conductivity and water depth) and physical characteristics influencing capture efficiency (e.g., turbidity, velocity, and debris concentration). Fish were identified to species and fork lengths (FL) measured to the nearest millimeter. After identification, measurement, and a period of recuperation in slack water, fish were released at their collection site.

Recorded fish habitat characteristics included water temperature, conductivity, clarity, and velocity; channel width and depth (at both banks and at mid-channel); channel type (*sensu* Rosgen 1994); and substrate composition. Fish and fish habitat data were recorded on Fish Habitat Survey Forms (Figure 1). These forms were surplus from a previous survey and bear the heading "CRESCENT RIVER FISH HABITAT SURVEY FORM." Channel diagrams illustrating typical cross sections, bed and bank morphology, and riparian vegetation were sketched on the data forms. Opportunistic wildlife observations were also noted. Ground and aerial photographs were taken of each sample site using a 35 mm Nikon FM2 with a 35 to 135 mm Nikkor zoom lens and 200 ASA Kodacolor film. Sample sites were located on 1:63,360 United States Geological Survey (USGS) maps. The latitudes and longitudes of samples sites were recorded to the nearest hundredth or thousandth of a minute using a Trimble TNL 2000

Figure 1.-Fish Habitat Survey Form Example

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 6/20/95

STATION NO: _____ DATE: _____ TIME: _____

OBSERVERS: _____ TEAM: A B STREAM NO: _____

GPS COORDINATES: Lat. _____ Long. _____

WEATHER:	STREAM STAGE:	PRECIP:
CLEAR _____	HIGH _____	TODAY _____
PRT. CLDY. _____	MEDIUM _____	YESTERDAY _____
CLOUDY _____	LOW _____	THIS WEEK _____

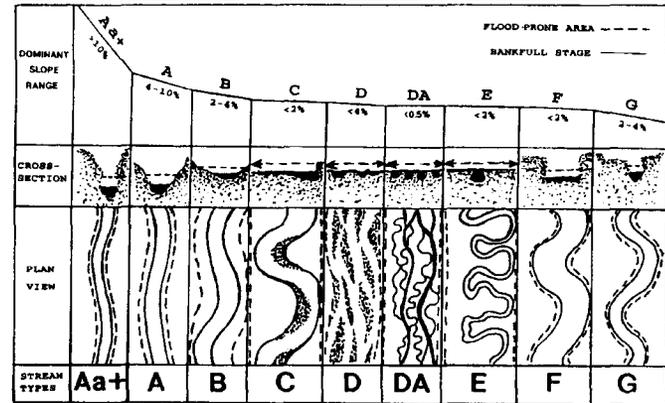
TEMP: AIR _____ WATER _____ STREAM GRADIENT: _____ %

WATER CLARITY:	SUBSTRATE COMPOSITION (%):	STREAM DIMENSIONS (ft):
CLEAR _____	MUD _____	WIDTH _____
STAINED _____	SAND _____	DEPTH, LEFT BANK _____
TURBID _____	GRAVEL _____	DEPTH, RIGHT BANK _____
MUDDY _____	COBBLE _____	DEPTH, MID-CHANNEL _____
MURKY _____	BLDR/B-ROCK _____	VELOCITY: None Slow Medium Fast
	100%	fps 0 0-1 1-3 3+

CHANNEL DIAGRAM (INCLUDE BANK & STREAM FEATURES, VEGETATION):

CIRCLE DOMINANT CHANNEL TYPE:

Dominant Substrate Material	A	B	C	D	DA	E	F	G
1								
2								
3								
4								
5								
6								
ENTR/H	<1.4	1.4-2.2	>2.2	N/A	>2.2	>2.2	<1.4	<1.4
SIN.	<12	>12	>14	<1.1	1.1-1.6	>1.5	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	>12	<12
SLOPE	.04-.099	.02-.039	<.02	<.02	<.005	<.02	<.02	.02-.039



FISH SAMPLING GEAR: _____ TIME: _____ AREA: _____ EFFIC: _____ %
 CONDUCTIVITY: _____ μmhos

CO									
K									
S									
P									
CH									
DV									

WILDLIFE OBSERVATIONS:

ROLL NO. _____ FRAME NOS. _____

Global Positioning System. Unique alphanumeric values were assigned to each sample site. All sample site identifiers began with the letter “A” followed by a number representing the sequential order in which the site was sampled (i.e., the first site sampled was A-1, the last site sampled was A-8).

In addition to sites sampled on the ground, the survey crew identified other potential anadromous fish habitats based on physical characteristics visible from the helicopter. These habitats were also located on 1:63,360 USGS maps.

RESULTS

Heavy rains in late July raised water levels and increased turbidity in many eastern Copper River tributaries. Additionally, a sudden breach in a glacial dam, which had impounded a lake in the Tazlina Glacier system, created floodwaters in the Tazlina River and a bankfull discharge in the mainstem Copper River downstream of the Tazlina River mouth. The bankfull discharge eliminated helicopter landing sites along the Copper River mainstem (Appendix B2). The high water and elevated turbidity decreased sampling efficiency throughout much of the survey area.

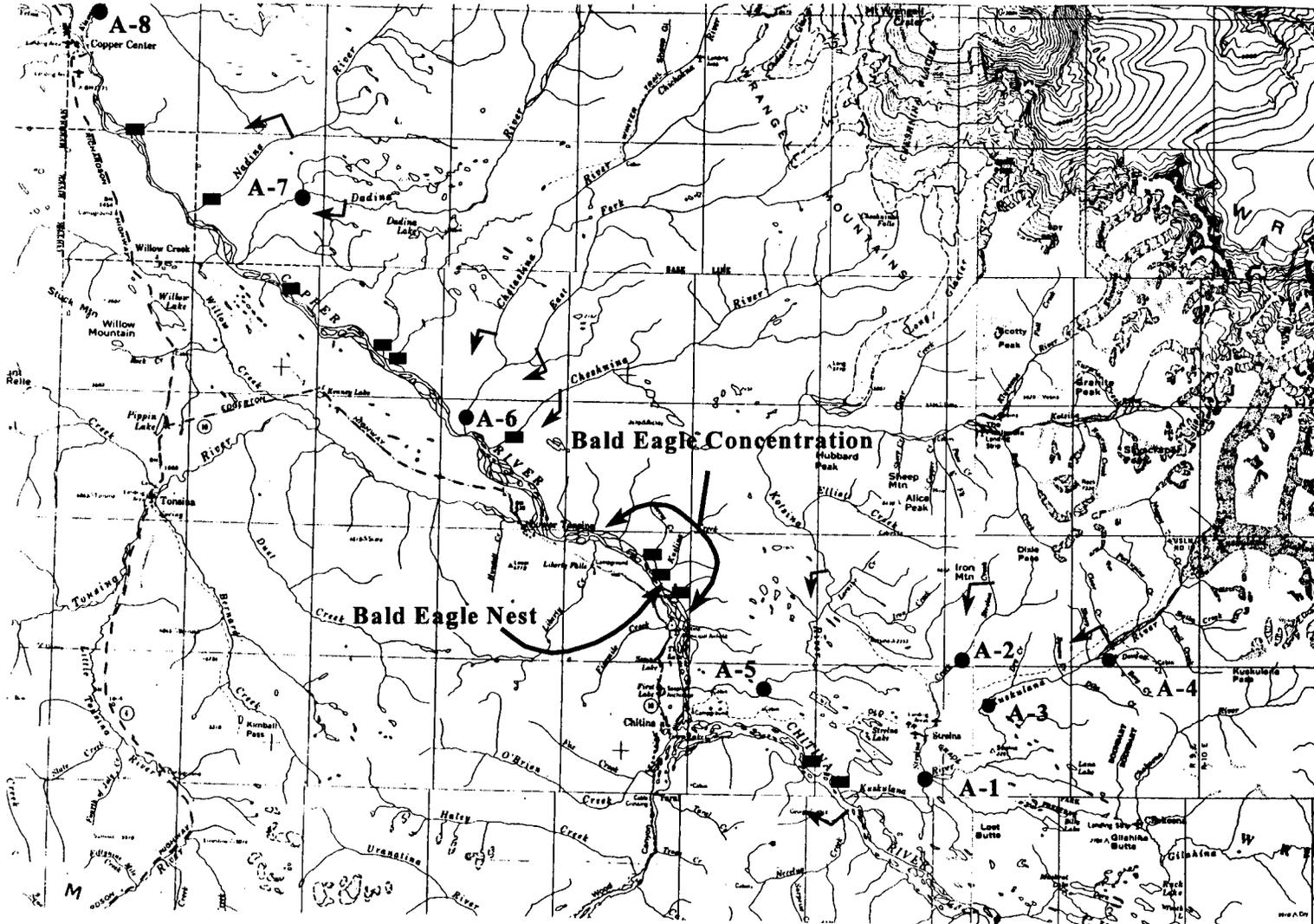
Eight sites on six streams were surveyed on the ground (Figure 2). Anadromous fish (rearing coho salmon), were collected at two sites: at the Strelna Creek—Kuskulana River confluence and in the mainstem of the Klawasi River, 1.25 aerial miles (2 km) upstream of the Copper River (Table 1).

Table 1.-Fish species collected at survey stations with backpack electrofisher, August 2, 1995.

Station	Stream	Fish species collected				
		Coho	Dolly Varden	Round whitefish	Arctic grayling	sculpin
A-1	Strelna Ck. (mouth)	x				
A-2	Strelna Ck. (upper)		x			
A-3	Kuskulana R. trib.		x			
A-4	MacDougall Ck.		x			
A-5	Kotsina R. trib.		x			
A-6	Chetaslina R.					
A-7	Dadina R.		x	x	x	
A-8	Klawasi R.	x				x

A salmonid, the size and appearance of an age-1. chinook salmon, was briefly observed in the lower Chetaslina River, but was not captured due to high water velocity, extreme turbidity, and

Figure 2.-Fish habitat survey sample sites and potential anadromous fish habitats. Ground survey sample locations identified with solid circles and alpha-numeric values. Potential anadromous fish habitats (determined by aerial observations) identified with solid rectangles. Extent of aerial observations identified with arrows. Anadromous fish (rearing coho salmon) collected at A-1 and A-8 (rearing chinook salmon suspected at A-6); resident fish only collected at other locations. Grid squares are 6 miles to a side.



in-water debris. Resident fish were collected at six sites. Resident Dolly Varden *Salvelinus malma* were collected at five sites, sculpin (*Cottus sp.*; probably *C. cognatus* (slimy sculpin)) were collected at one site, and round whitefish *Prosopium cylindraceum* and Arctic grayling *Thymallus arcticus* were collected at one site. Water temperatures ranged from 40° F (4° C) at sample site A-3 (spring-fed tributary to the middle Kuskulana River) to 53° F (12° C) at sample site A-8 (mainstem of the Klawasi River). Collected fish species counts and lengths, incidental wildlife observations, and fish habitat characteristics are provided in Appendix A. Selected photographs are presented in Appendix B.

At the mouth of Strelna Creek (sample site A-1), apparent age-0. (young-of-the-year) coho salmon (each 53 mm FL) were collected in a clearwater off-channel pool at the extreme northern edge of the Kuskulana floodplain (Appendix B3). The barren gravel surrounding most of the pool suggests the site is flooded at regular intervals by the Kuskulana River. This sample site was located approximately 6.0 river miles (9.6 km) upstream from the confluence of the Kuskulana and Chitina rivers. No other available clear, slack water habitats were noted along the Kuskulana mainstem downstream of site A-1 or upstream prior to sample site A-3.

The Upper Strelna Creek sample site (A-2) provided little slow water or off-channel habitat typically used by rearing coho salmon. The current was fast and water slightly turbid (Appendix B4). The substrate was composed primarily of cobbles and boulders. Dolly Varden only were collected at this site.

Sample site A-3 was a small, mostly clearwater, spring-fed tributary to the middle Kuskulana River. The site was located entirely within the floodplain of the mainstem; however, established vegetation adjacent to the tributary suggests that frequent flooding of the site is infrequent. Only resident Dolly Varden were collected. Brief sampling along the margin of the Kuskulana mainstem produced no fish. This site was located immediately upstream of a 5.5 mile (8.8 km) long steep-walled, narrow canyon. No off-channel habitat was observed through this portion of the Kuskulana mainstem (Appendix B5).

Sample site A-4 was located on MacDougall Creek, immediately adjacent to the upper Kuskulana River floodplain. The sample site was approximately 5.2 miles (8.4 km) downstream from the Kuskulana Glacier, the origin of the river. MacDougall Creek provides a clean gravel/cobble substrate, clear water, and adequate rearing habitat, but overwintering pool habitat appears scarce (Appendix B6). Resident Dolly Varden only were collected at the site. A relatively small moose *Alces alces* antler, apparently shed last winter, and fresh young-of-the-year moose tracks were observed within the riparian zone. Riparian willows had also been browsed, apparently by moose.

Sample site A-5 was located on a clearwater tributary to the Kotsina River approximately 4.0 miles (6.4 km) upstream of the confluence of the Kotsina and Copper rivers. The site was located entirely within the floodplain of the mainstem; however, established vegetation adjacent to the tributary suggested that major flooding of the site is infrequent (Appendix B7). The site provides a clean gravel/cobble substrate, clear water, and adequate rearing habitat. One large, deep pool was identified in the tributary. While no anadromous fish were observed, the tributary did support a large population of robust Dolly Varden (high girth-to-length ratio). Older bear scat, not identified to species, was observed on the gravel bar separating the tributary and

mainstem. Little or no other off-channel habitats were observed along the Kotsina River from site A-5 to a point approximately 9.0 miles (14.4 km) upstream. This portion of the Kotsina River flows through a steep-walled, narrow canyon.

Sample site A-6 was located on a side channel and on the mainstem of the Chetaslina River approximately 0.5 miles (0.8 km) upstream its confluence with the Copper River. Water levels, turbidity, and velocities were high. The stream substrate was composed primarily of cobbles and boulders (Appendix B8). A small salmonid, tentatively identified as a rearing chinook salmon, was briefly stunned and visible at close range on the water surface but was not collected for positive identification. Perhaps due to difficult fish collecting conditions, no other fish were collected. A large bull bison *Bison bison* remained, undisplaced by helicopter overflights, in the riparian zone a short distance from the landing site throughout the duration of the sampling session.

Sample site A-7 was located on the Dadina River approximately 5.0 river miles (8.0 km) upstream of its confluence with the Copper River. The area sampled included the Dadina mainstem and side channels and the mouth of a clearwater tributary (Appendix B9). In the mainstem of the Dadina, water velocities were fast and water turbid. The tributary provided slow, deep, and clear water. One Arctic grayling and one Dolly Varden were collected within the tributary. Two round whitefish and one Dolly Varden were collected at the interface between the tributary's clear water and the mainstem's turbid water. Brown bear *Ursus arctos*, bison, mink *Mustela vison*, and red squirrel *Tamiasciurus hudsonicus* tracks were all observed within the Dadina River floodplain.

Sample site A-8 was located on the mainstem of the Klawasi River approximately 1.5 river miles (2.4 km) upstream of its confluence with the Copper River. Water velocities were moderate, water clarity was good but humic-stained, substrate was composed primarily of clean gravel and cobble, and bank vegetative and instream cover were fair to good (Appendix B10). Deep overwintering pools were identified within the sampled area. Two age-1. coho salmon (juveniles having overwintered in freshwater as free-swimming fish, each 68 mm FL) and four sculpin (slimy?) were collected. The rearing coho salmon were collected along the river banks beneath overhanging vegetation and within instream woody debris; sculpins were collected from substrate interstitial spaces across the entire channel width.

In addition to the eight sites sampled on the ground, the survey crew also identified, based on aerial observations, eleven potential anadromous fish habitats. These sites appeared accessible to fish from known anadromous fish waters. Their physical characteristics appeared comparable to other locations along the Copper River where anadromous fish have been documented. Four of the eleven sites were clearwater side sloughs adjacent to the mainstem of the Copper and Chitina rivers. Two sites were on larger rivers (Nadina and Cheshnina) where lack of time and/or lack of landing sites prevented ground sampling. Five sites were located on smaller tributaries where deltas or lower reaches of each stream may provide anadromous (primarily chinook salmon rearing) fish habitat.

While not a focus of this survey, we also noted a particularly high concentration of mature and immature bald eagles *Haliaeetus leucocephalus* along the steep bluffs above the eastern bank of the Copper River north of the Kotsina River (Figure 2). This concentration of approximately 20

birds (approximately 3.3 birds/mile (2.1 birds/km)) extended along the eastern bluffs from 4.0 miles upstream of the Kotsina River mouth to 3.5 miles downstream of the mouth of the Tonsina River. The highest density of eagles was in the downstream third of this range. One active nest was observed on the south bank of Kuslina Creek at its confluence with the Copper River (Figure 2).

DISCUSSION

Three salmon species: coho, chinook, and sockeye; and one anadromous trout: steelhead (*Oncorhynchus mykiss*); are known to migrate through the Copper River past the survey area. The major eastern tributaries to the Copper River within the survey area: the Kuskulana, Kotsina, Cheshnina, Chetaslina, Dadina, and Nadina; do not appear to provide extensive reaches of typical spawning or rearing habitat for these anadromous fish. All are turbid (at least seasonally), have relatively steep gradients, exhibit high bedload movement, flow most of their lengths through confined to very confined valleys or canyons, and provide little off-channel, slow, clearwater habitats. Note however that this survey was conducted in early August after extensive rains. Turbidity in some rivers may decrease considerably in fall as temperatures decline and runoff decreases¹.

In southcentral Alaska, H&R Division surveys have demonstrated that coho salmon tend to spawn in smaller streams accessible to typical rearing habitats. Common coho salmon rearing habitats are dominated by slow to moderate water velocities, clear or humic-stained waters, extensive pool habitats, and available riparian or aquatic cover. Within the region discussed in this report, these habitats were few in number, small in size, and widely scattered. While rearing coho salmon were found at two locations within the survey area, their distribution is probably restricted and populations are probably limited. As no other typical rearing coho salmon habitat was observed near Strelna Creek, and as the fish collected were young-of-the-year, it is probable that coho salmon spawn in Strelna Creek. The current survey did not establish the upper limit of coho salmon distribution in Strelna Creek. As much of Strelna Creek between sites A-1 and A-2 is accessible by the McCarthy Road or the side road that parallels the creek north of the McCarthy Road, this stream can be efficiently sampled *via* road vehicle.

H&R Division's August 1992 Lower Copper River survey documented rearing sockeye salmon in clearwater side sloughs of the Copper River mainstem. Only one comparable site, A-5, a Kotsina River tributary, was sampled during the present survey. No sockeye salmon were observed at A-5, but the size of the side slough was limited, the site was relatively isolated, and the habitat was populated by a dense concentration of Dolly Varden ranging in size from 50 mm FL to 210 mm FL. Many of the Dolly Varden present at the site were large enough to effectively prey upon juvenile sockeye salmon. Other clearwater side sloughs along both the Chitina and Copper rivers were identified from the air but were not sampled. These sites should be surveyed to determine their use by anadromous fish.

During the August 1992 survey, rearing chinook salmon were collected from quiet, less turbid niches along the margins of the Copper River mainstem and from cobble- and boulder-strewn

¹ The author has observed that by early November, turbidity levels in the Copper and Chitina rivers visibly decline; however, the turbidity level of the Kotsina River remains high.

deltas of snow- and glacier-fed tributaries. Because of the bankfull discharge in the Copper River during the 1995 survey, comparable habitats along the Copper River mainstem were not accessible and were not sampled. Aerial observations indicated that comparable habitats were present along the mainstem and should be surveyed to determine their use by anadromous fish. A rearing chinook salmon was believed to have been briefly observed near the mouth of the Chetaslina River, but was not collected nor positively identified. The Lower Chetaslina River does provide habitat similar to sites along the Lower Copper River where rearing chinook salmon were observed. This site, and sites along the lower reaches of nearby rivers (e.g., Cheshnina, Dadina, Nadina), should be (re)surveyed when conditions allow.

Steelhead are known to use the Copper River as a migratory corridor between marine waters and clearwater tributaries such as the Gulkana River. Rearing or resident steelhead/rainbow trout are thought to generally avoid chronically turbid water. Steelhead/rainbow trout tend to spawn in clear water with moderately fast current (ADF&G 1986). H&R Division surveys in Southcentral Alaska suggest that rearing steelhead/rainbow trout occur in clearwater or slightly turbid streams larger and faster than those used by rearing coho salmon. Such habitats were rare within the surveyed area.

H&R Division fish habitat surveys in southcentral Alaska have demonstrated that Dolly Varden are the most widely distributed salmonid and are often found in what initially appears to be marginal habitat. In the current study, Dolly Varden were found in four of six streams sampled. While Dolly Varden appear to prefer less turbid waters, they will utilize turbid water as cover, particularly along the interface between clear and turbid water areas. Results from this study, as well as other H&R Division surveys, suggest that resident Dolly Varden utilize the majority of clear to slightly turbid waters over a wide range of velocities and gradients. Where natural step pools occur, Dolly Varden may use channels with gradients in excess of 20 percent. In southcentral Alaska, available information indicates that the most frequent immediate impact of timber harvest activities on fish are blockages of Dolly Varden movements through improperly installed logging road culverts, particularly where channel gradients exceed 1 percent.

ACKNOWLEDGMENTS

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APPENDIX A. FISH HABITAT SURVEY FORMS

Appendix A1.-Sample Site A-1 Fish Habitat Survey Form.

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 6/20/95

STATION NO: A-1 DATE: 8/2/95 TIME: 1200

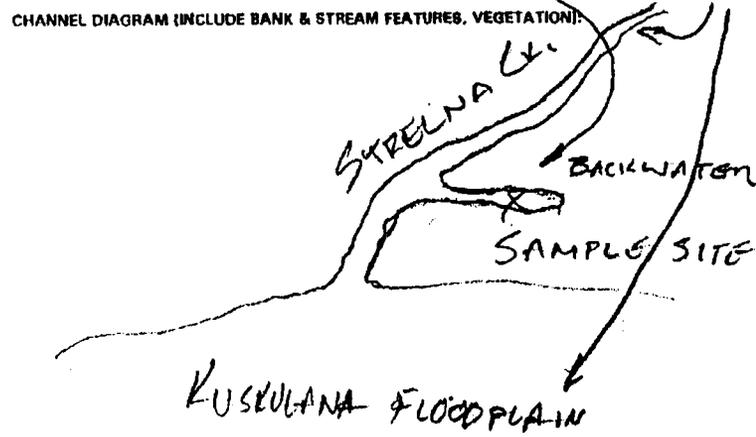
OBSERVERS: MUMF TEAM: A B STREAM NO: _____

GPS COORDINATES: Lat. 61° 29' 02" Long. 144° 04' 10.2"

WEATHER: CLEAR _____ PRT. CLDY. _____ CLOUDY _____
 STREAM STAGE: HIGH _____ MEDIUM _____ LOW _____
 PRECIP: TODAY _____ YESTERDAY _____ THIS WEEK _____

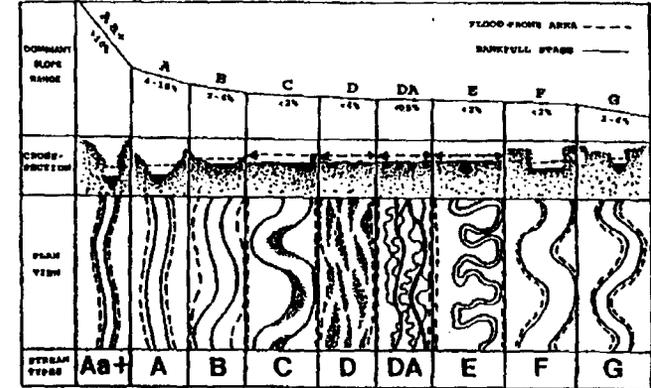
TEMP: AIR _____ WATER 43.0 F STREAM GRADIENT: _____ %

WATER CLARITY: CLEAR _____ STAINED _____ TURBID _____ MUDDY _____ MURKY _____
 SUBSTRATE COMPOSITION (%): MUD 50 SAND 25 GRAVEL 25 BLDG/B-ROCK _____
 STREAM DIMENSIONS (ft): WIDTH _____ DEPTH, LEFT BANK _____ DEPTH, RIGHT BANK _____ DEPTH, MID-CHANNEL _____
 VELOCITY: None 0 Slow 0-1 Medium 1-3 Fast 3+



ROLL I, FRAMES 28, 27 ROLL II FRAMES
 ROLL NO. I, II FRAME NOS. _____ 1-3

CIRCLE DOMINANT CHANNEL TYPE:



Profile	A	B	C	D	DA	E	F	G
1				KUSKULANA R.				
2				STE				
3								
4								
5								
6								
ENTR:	<1.4	1.4-2.2	>2.2	N/A	>2.2	>2.2	<1.4	<1.4
BNL	<1.2	>1.2	>1.4	<1.1	1.1-1.6	>1.6	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	>12	<12
SLOPE	.04-.069	.02-.048	<.02	<.02	<.066	<.02	<.02	.02-.031

FISH SAMPLING GEAR: EF TIME: 85 AREA: 10ft² EFFIC: 90 %
 CONDUCTIVITY: 65 umhos 36T @ 500 K 13

CO	<u>4 @</u>	<u>53 MM</u>							
K									
S									
P									
CH									
DV									

WILDLIFE OBSERVATIONS:

Appendix A2.-Sample Site A-2 Fish Habitat Survey Form.

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 6/20/86

STATION NO: A-2 DATE: 8/2/95 TIME: 1300

OBSERVERS: MJM TEAM: A B STREAM NO: _____

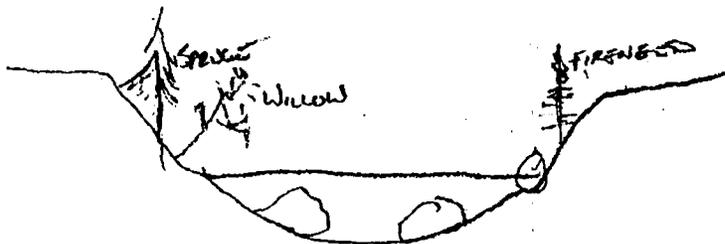
GPS COORDINATES: Lat. 61° 35' 635 Long. 144° 01.54

WEATHER: CLEAR PRT. CLOY. CLOUDY
 STREAM STAGE: HIGH MEDIUM LOW
 PRECIP: TODAY YESTERDAY THIS WEEK

TEMP: AIR _____ WATER 44° F STREAM GRADIENT: 2 %

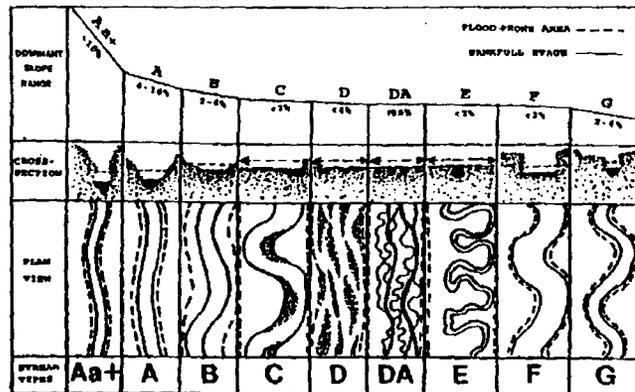
WATER CLARITY: CLEAR STAINED TURBID MUDDY MURKY
 SUBSTRATE COMPOSITION (%): MUD SAND GRAVEL COBBLE BLDR/B-ROCK
 STREAM DIMENSIONS (ft): WIDTH DEPTH, LEFT BANK DEPTH, RIGHT BANK DEPTH, MID-CHANNEL VELOCITY: None Slow Medium Fast

CHANNEL DIAGRAM (INCLUDE BANK & STREAM FEATURES, VEGETATION):



ROLL NO. II FRAME NOS. 5-8

CIRCLE DOMINANT CHANNEL TYPE:



Section	A	B	C	D	DA	E	F	G
1	[Sketch]							
2	[Sketch]							
3	[Sketch]							
4	[Sketch]							
5	[Sketch]							
6	[Sketch]							
ENTRN	<1.4	1.4-2.3	>2.3	N/A	>2.3	>2.3	<1.4	<1.4
SR	<1.2	>1.2	>1.4	<1.1	1.1-1.8	>1.5	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	>12	<12
SLOPE	.04-.089	.02-.038	.02	<.02	<.008	<.02	<.02	.02-.038

FISH SAMPLING GEAR: EF TIME: 100 AREA: 100 EFFIC: 75 %
 CONDUCTIVITY: 77 umhos FAST CURRENT

CO								
K								
S								
P								
CH								
DV	5	@	53 mm	5	RANGING FROM 100 - 180 mm			

WILDLIFE OBSERVATIONS:

Appendix A3.-Sample Site A-3 Fish Habitat Survey Form.

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 6/20/95

STATION NO: A-3 DATE: 8/2/95 TIME: 1345

OBSERVERS: MW, MF TEAM: A B STREAM NO: _____

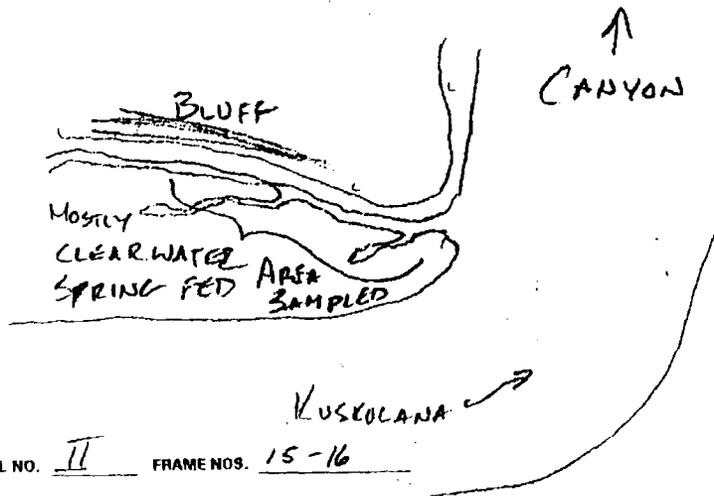
GPS COORDINATES: Lat. 61° 32.13 Long. 143° 59.07

WEATHER: CLEAR PRT. CLDY. CLOUDY
 STREAM STAGE: HIGH MEDIUM LOW
 PRECIP: TODAY YESTERDAY THIS WEEK

TEMP: AIR _____ WATER 40°F STREAM GRADIENT: 1 %

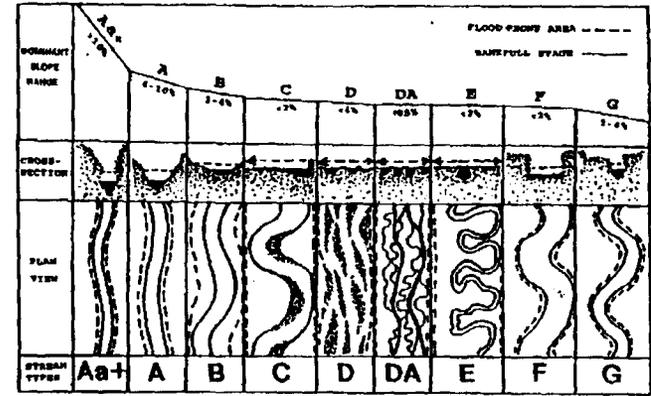
WATER CLARITY: CLEAR STAINED TURBID MUDDY MURKY
 SUBSTRATE COMPOSITION (%): MUD SAND GRAVEL COBBLE BLDR/B-ROCK
 STREAM DIMENSIONS (ft): WIDTH DEPTH, LEFT BANK DEPTH, RIGHT BANK DEPTH, MID-CHANNEL VELOCITY: None Slow Medium Fast

CHANNEL DIAGRAM (INCLUDE BANK & STREAM FEATURES, VEGETATION):



ROLL NO. II FRAME NOS. 15-16

CIRCLE DOMINANT CHANNEL TYPE:



	A	B	C	D	DA	E	F	G
1								
2					TRIB			
3								
4								
5								
6								
ENTRFL	<1.4	1.4-2.2	>2.2	N/A	>2.2	>2.2	<1.4	<1.4
BFL	>1.2	>1.2	>1.4	<1.1	1.1-1.8	>1.5	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	>12	<12
SLOPE	.04-.009	.02-.039	<.02	<.03	<.006	<.03	<.02	.02-.038

FISH SAMPLING GEAR: EF TIME: 60S AREA: 75ft² EFFIC: 75 %
 CONDUCTIVITY: 30 μ mhos

CO								
K								
S								
P								
CH								
DV	S BETWEEN 120 & 170							

WILDLIFE OBSERVATIONS: BEGINNING TO DEVELOP SPAWNING COLORS

Appendix A5.-Sample Site A-5 Fish Habitat Survey Form.

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 6/20/98

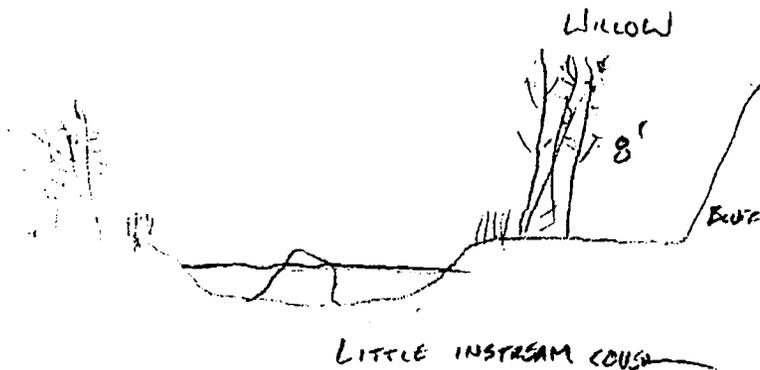
STATION NO: A-5 DATE: 8/2/95 TIME: 1615
 OBSERVERS: MF, MLJ TEAM: A B STREAM NO: _____
 GPS COORDINATES: Lat. 61° 32.300 Long. 144° 18.378

WEATHER: CLEAR _____ HIGH _____ TODAY _____
 PRE-CLOUDY _____ MEDIUM _____ YESTERDAY _____
 CLOUDY _____ LOW _____ THIS WEEK _____

TEMP: AIR _____ WATER 41°F STREAM GRADIENT: 0.1%

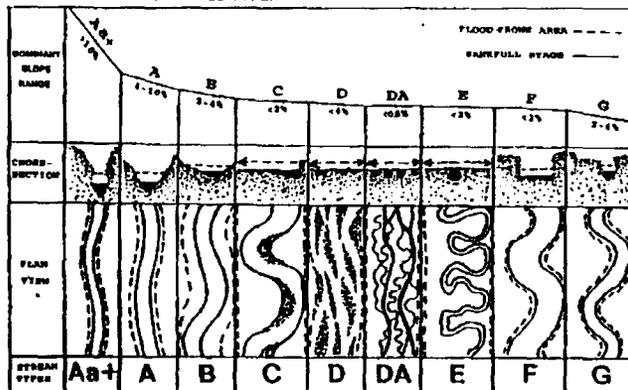
WATER CLARITY: CLEAR SUBSTRATE COMPOSITION (%): MUD 20 STREAM DIMENSIONS (ft):
 STAINED _____ SAND 50 WIDTH _____
 TURBID _____ GRAVEL _____ DEPTH, LEFT BANK _____
 MUDDY _____ COBBLE 20 DEPTH, RIGHT BANK _____
 MURKY _____ BLDR/B-ROCK 10 DEPTH, MID-CHANNEL _____
 VELOCITY: None Slow Medium Fast
 0 0-1 1-3 3+

CHANNEL DIAGRAM (INCLUDE BANK & STREAM FEATURES, VEGETATION):



ROLL NO. II III FRAME NOS. 28-92 0,1

CIRCLE DOMINANT CHANNEL TYPE:



Section	A	B	C	D	DA	E	F	G
1	[Diagram]							
2	[Diagram]							
3	[Diagram]							
4	[Diagram]							
5	[Diagram]							
6	[Diagram]							
ENTR/ft	<1.4	1.4-2.2	>2.2	N/A	>3.1	>2.2	<1.4	<1.4
SIN.	<1.2	>1.2	>1.4	<1.1	1.1-1.8	>1.5	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	>12	>12	<12
SLOPE	.04-.078	.02-.058	<0.2	<0.8	<.008	<.02	<0.2	.02-.038

FISH SAMPLING GEAR: EF TIME: 180 AREA: 200ft EFFIC: 90 %
 CONDUCTIVITY: _____ μmhos

CO					
K					
S					
P					
CH					
DV	~	20	50mm -	240mm	

WILDLIFE OBSERVATIONS:

BEAR SCAT ON BAR LG. DN PLUMP

Appendix A6.-Sample Site A-6 Fish Habitat Survey Form.

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 8/20/98

STATION NO: A-6 DATE: 8/2/95 TIME: 1745

OBSERVERS: MJ, MF TEAM: A B STREAM NO: _____

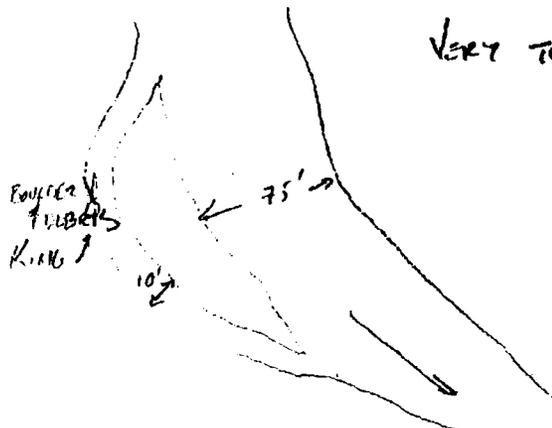
GPS COORDINATES: Lat. 61° 42.801 Long. 144° 44.158

WEATHER: CLEAR PRT. CLDY. CLOUDY
 STREAM STAGE: HIGH MEDIUM LOW
 PRECIP: TODAY Ø YESTERDAY _____ THIS WEEK _____

TEMP: AIR _____ WATER 46°F STREAM GRADIENT: 1 %

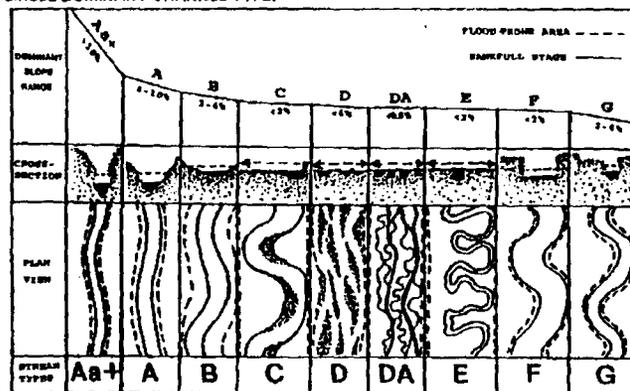
WATER CLARITY: CLEAR STAINED TURBID MUDDY MURKY
 SUBSTRATE COMPOSITION (%): MUD SAND GRAVEL COBBLE 20 BLDR/B-ROCK 80 100%
 STREAM DIMENSIONS (ft): WIDTH 75' DEPTH, LEFT BANK 0 DEPTH, RIGHT BANK 0 DEPTH, MID-CHANNEL 3'?
 VELOCITY: None Slow Medium Fast fps 0 0.1 1-3 3+

CHANNEL DIAGRAM (INCLUDE BANK & STREAM FEATURES, VEGETATION):



ROLL NO. III FRAME NOS. 10-15

CIRCLE DOMINANT CHANNEL TYPE:



Channel Type	A	B	C	D	DA	E	F	G
1								
2								
3								
4								
5								
6								
ENTRHL	<1.4	1.4-2.2	>2.2	N/A	>2.2	>2.2	<1.4	<1.4
ENL	<1.2	>1.2	>1.4	<1.1	1.1-1.6	>1.6	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	>12	<12
SLOPE	.24-.049	.02-.038	<0.2	<0.2	<0.05	<0.2	<0.2	.02-.038

FISH SAMPLING GEAR: EF TIME: 278 AREA: _____ EFFIC: 5 %
 CONDUCTIVITY: _____ μ mhos VERY TURBID FAST LATEL

CO	K	B	P	CH	DV
	<u>1</u>	<u>1</u>	<u>Ø</u>	<u>Ø</u>	<u>Ø</u>

WILDLIFE OBSERVATIONS:

1 ♂ BISON FEEDING ON GRAVEL BAR

Appendix A7.-Sample Site A-7 Fish Habitat Survey Form.

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 6/20/95

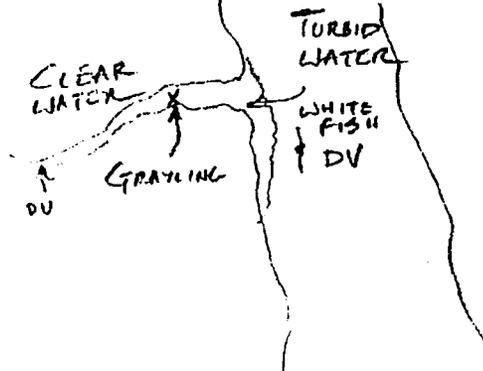
STATION NO: A-7 DATE: 8/2/95 TIME: 1915
 OBSERVERS: MF, MW TEAM: A B STREAM NO: _____
 GPS COORDINATES: Lat. 61° 51.821 Long. 144° 58.928

WEATHER: CLEAR (circled) HIGH (circled) PRECIP: TODAY 0
 PRT. CLDY. MEDIUM YESTERDAY _____
 CLOUDY LOW THIS WEEK _____

TEMP: AIR _____ WATER 50°F STREAM GRADIENT: 1-2%

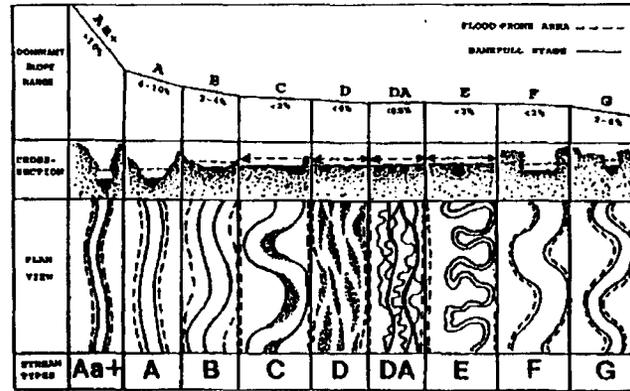
WATER CLARITY: CLEAR MUD 5 SUBSTRATE COMPOSITION (%): SAND 5 GRAVEL 20 COBBLE 30 BLDG/B-ROCK 40 100%
 STAINED TURBID MUDDY MURKY
 STREAM DIMENSIONS (ft): MAIN CHANNEL WIDTH 60' DEPTH, LEFT BANK 0 DEPTH, RIGHT BANK 0 DEPTH, MID-CHANNEL 3'?
 VELOCITY: None 0 Slow 0-1 Medium 1-3 Fast 3+

CHANNEL DIAGRAM (INCLUDE BANK & STREAM FEATURES, VEGETATION):



ROLL NO. III FRAME NOS. 17-22

CIRCLE DOMINANT CHANNEL TYPE:



Bank	A	B	C	D	DA	E	F	G
1								
2								
3								
4								
5								
6								
ENTRN	<1.4	1.4-2.2	>2.2	N/A	>2.2	>2.2	<1.4	<1.4
SRL	<1.2	>1.2	>1.4	<1.1	1.1-1.8	>1.5	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	>12	<12
SLOPE	.04-.099	.02-.039	<0.2	<0.2	<0.06	<0.2	<0.2	.02-.039

FISH SAMPLING GEAR: EF TIME: 240 AREA: 200ft² EFFIC: 50 %
 CONDUCTIVITY: _____ μmhos TURBID FAST

CD							
K							
S							
P							
CH							
DV	100	180					
	GRAYLING ~ 200 mm		ROUND WF (2)				

WILDLIFE OBSERVATIONS:
 BROWN BEAR TRACKS ~ 190 & 210
 * BISON MINK & SQUIRREL

Appendix A8.-Sample Site A-8 Fish Habitat Survey Form.

CRESCENT RIVER FISH HABITAT SURVEY FORM Rev. 6/20/95

STATION NO: A-8 DATE: 8/2/95 TIME: 2030

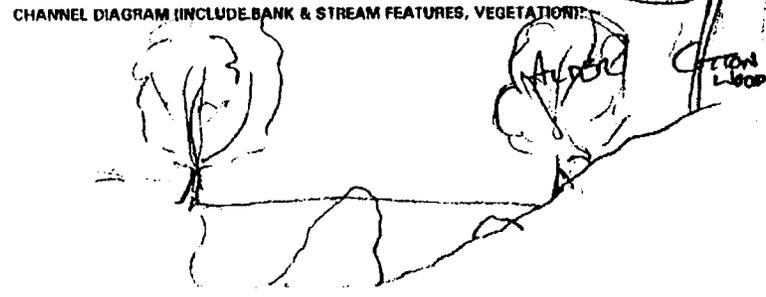
OBSERVERS: _____ TEAM: A B STREAM NO: _____

GPS COORDINATES: Lat. 61° 58.988 Long. 145° 16.537

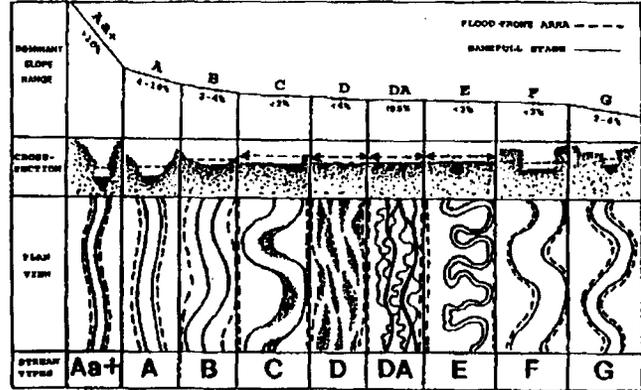
WEATHER: CLEAR PRT. CLDY. CLOUDY
 STREAM STAGE: HIGH MEDIUM LOW
 PRECIP: TODAY _____ YESTERDAY _____ THIS WEEK _____

TEMP: AIR _____ WATER 53°F STREAM GRADIENT: _____ %

WATER CLARITY: CLEAR STAINED TURBID MUDDY MURKY
 SUBSTRATE COMPOSITION (%): MUD _____ SAND 10 GRAVEL 50 COBBLE 20 BLDG/B-ROCK 20 VELOCITY: None Slow Medium Fast
 STREAM DIMENSIONS (ft): WIDTH 20' DEPTH, LEFT BANK 0.9 DEPTH, RIGHT BANK 0 DEPTH, MID-CHANNEL 3.0'



CIRCLE DOMINANT CHANNEL TYPE:



Channel bed material	A	B	C	D	DA	E	F	G
1								
2								
3								
4								
5								
6								
ENTRHL	<1.4	1.4-2.2	>2.2	N/A	>2.2	>2.2	<1.4	<1.4
BNL	<1.2	>1.2	>1.4	<1.3	1.1-1.6	>1.6	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	>12	<12
SLOPE	.84-.688	.52-.538	<0.2	<.85	<.008	<.02	<.02	.82-.538

FISH SAMPLING GEAR: EF TIME: 300 AREA: 300ft² EFFIC: 50 %
 CONDUCTIVITY: 37 μ mhos

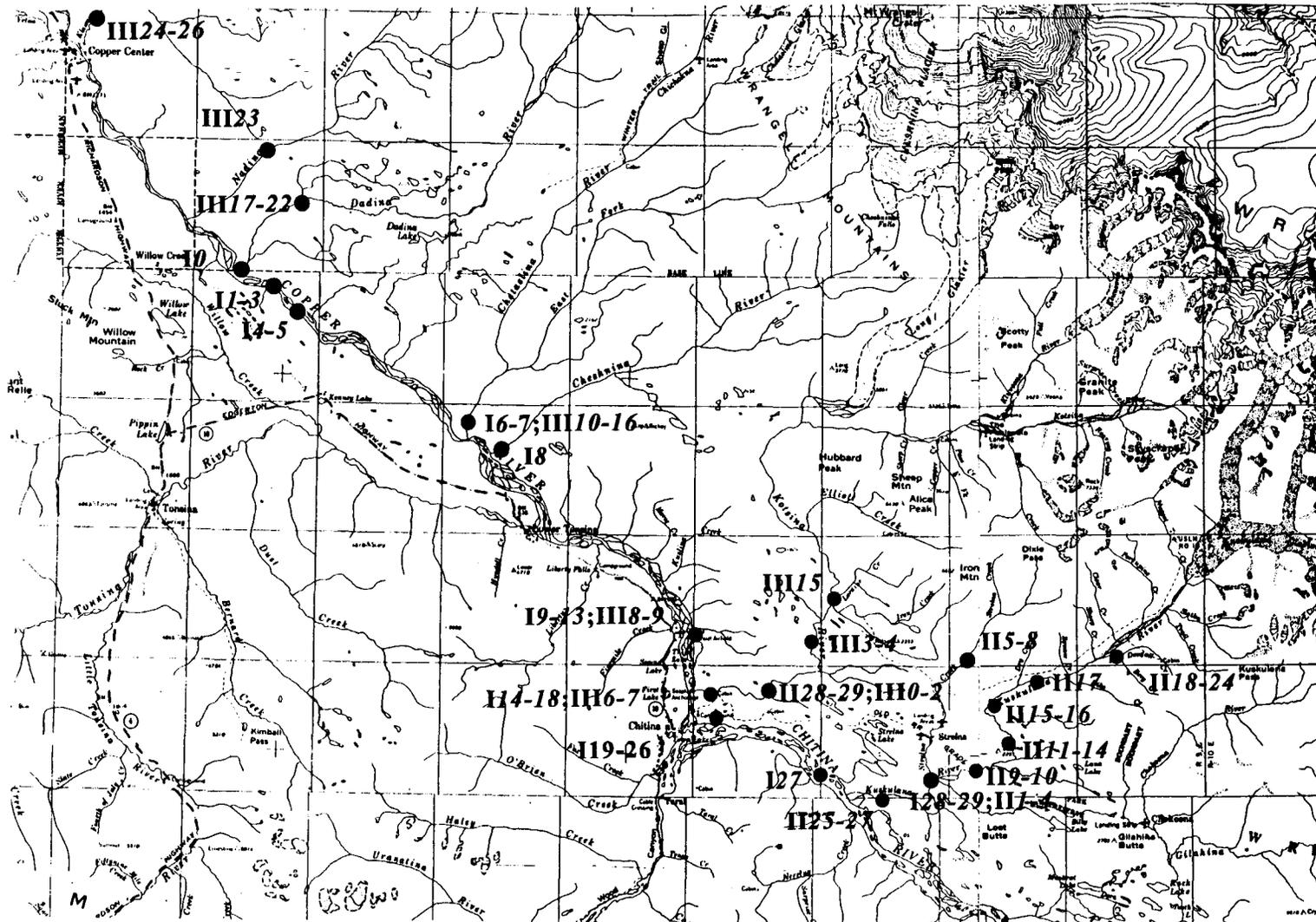
CO	<u>2 @ 60</u>							
K								
S								
P								
CH								
DV	<u>Sculpin (4)</u>							

WILDLIFE OBSERVATIONS:

ROLL NO. III FRAME NOS. 24-26

APPENDIX B. SELECTED PHOTOS

Appendix B1.-General locations where photographs were taken. Roman numerals refer to roll numbers (I = P1039; II = P1040; III = P1041). Italic arabic numerals refer to frame numbers. Grid squares are 6 miles to a side.



Appendix B2.-Copper River corridor photographs.

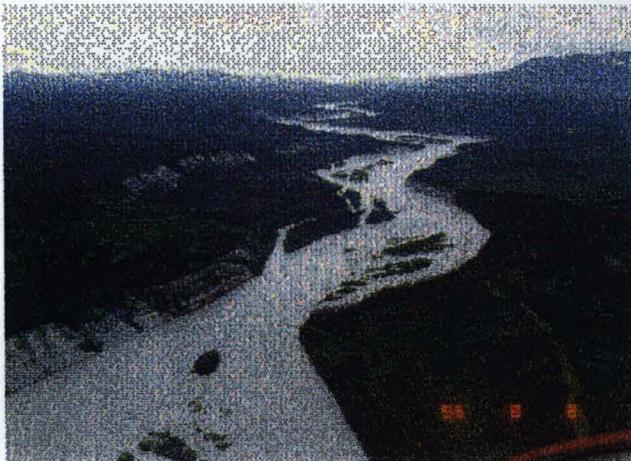


Photo I1; View downstream Copper R. mainstem.



Photo I4; East bank of Copper R. Off-channel habitat, extensive spruce mortality, and patches of blowdown/breakage.



Photo I8; Lower reach of Cheshnina R. at confluence with Copper R. No available helicopter landing sites near river.

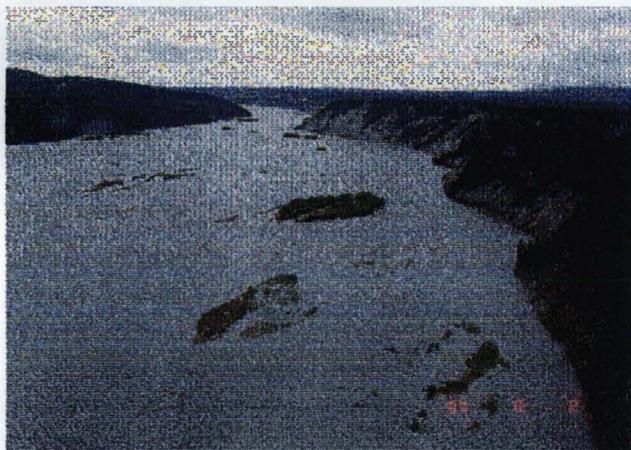


Photo III9; Upstream on Copper R. north of Kotsina R. mouth. Recent heavy rains and floodwaters originating from the collapse of a glacial dam in the Tazlina R. watershed caused above bankfull flows in Copper R.



Photo I12; Recent timber harvest east of the Copper R. opposite Chitina. Kotsina R. in middle-ground and Chitina R. in background.

Appendix B3.-Confluence of Strelna Creek and Kuskulana River photographs; Sample Site A-1.



Photo I29; Young-of-the-year (age-0.) coho salmon collected in off-channel habitat shown in Photo III.

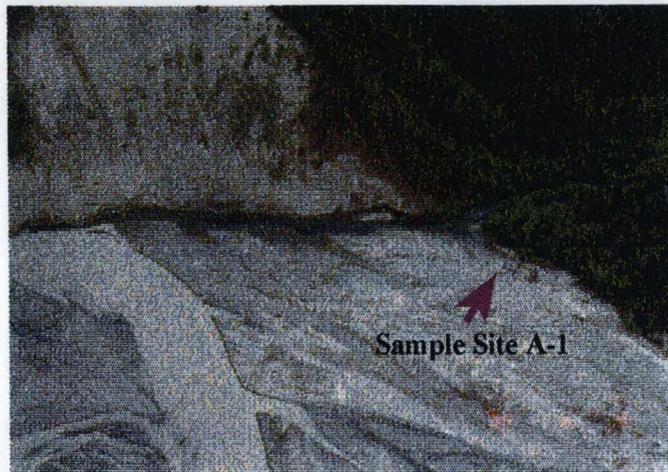


Photo I28; Sample site A-1 at confluence of Strelna Creek and Kuskulana River.



Photo II3; Off-channel sample site A-1 at mouth of Strelna Creek.



Photo III; Off-channel sample site A-1 at mouth of Strelna Creek.

Appendix B4.-Upper Strelna Creek photographs; Sample Site A-2.



Photo II5; Sample site A-2 on upper Strelna Creek. Resident Dolly Varden only captured.

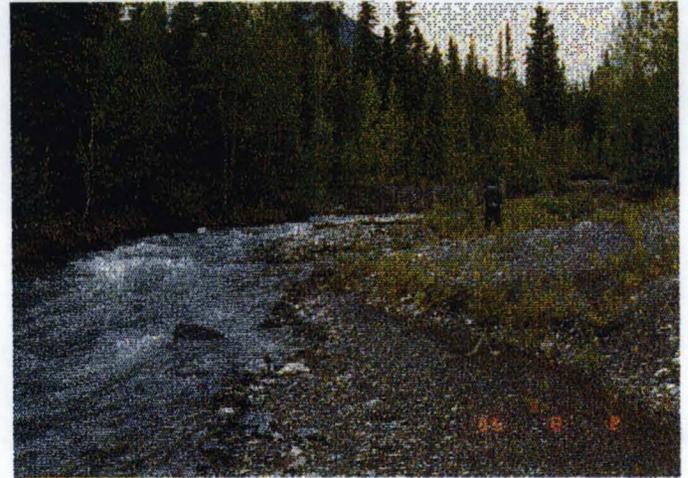


Photo II6; Upstream view at sample site A-2.



Photo II7; Aerial view of sample site A-2.



Photo II8; Aerial view of upper Strelna Creek at sample site A-2. Resident Dolly Varden only.

Appendix B5.-Middle Kuskulana River photographs; Sample Site A-3.



Photo III13; Kuskulana River Canyon downstream of sample site A-3. No anadromous fish collected above this reach.



Photo III14; Kuskulana River Canyon. No off-channel habitat for approximately 5.5 miles.



Photo III15; Clearwater tributary to Kuskulana River immediately upstream of canyon. Sample site A-3.



Photo III16; Sample site A-3. Available habitat located entirely within Kuskulana R. floodplain. Resident Dolly Varden (developing spawning colors) only collected.

Appendix B6.-MacDougall Creek, Upper Kuskulana River drainage photographs; Sample Site A-4.

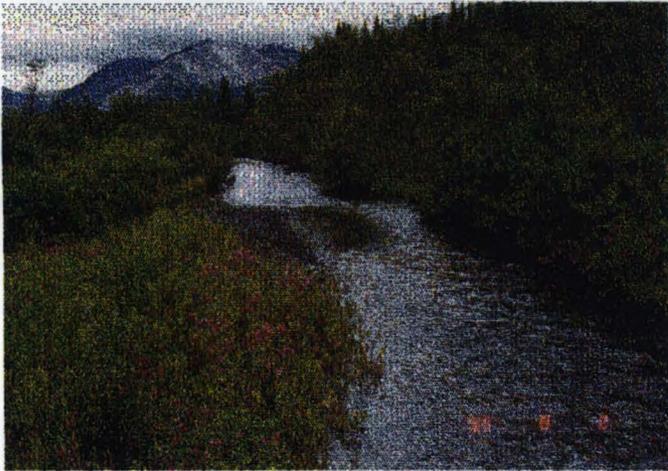


Photo II20; Sample site A-4 on MacDougall Creek. Resident Dolly Varden only collected.



Photo II19; Resident Dolly Varden (up to 210 mm FL) collected at sample site A-4 on MacDougall Creek in upper Kuskulana River drainage.



Photo II22; Aerial view of MacDougall Creek. Sample site A-4



Photo II23; MacDougall Creek in foreground, upper Kuskulana River floodplain in background.

Appendix B7.-Middle Kotsina River drainage photographs; Sample Site A-5.

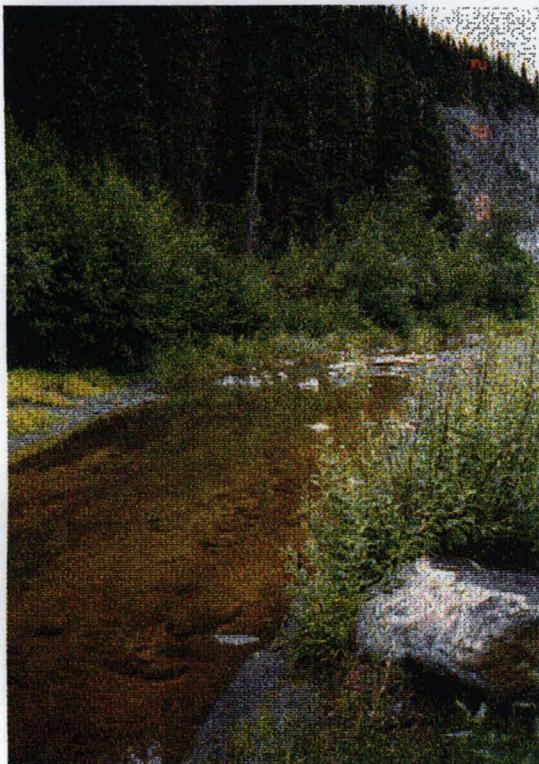


Photo II28; Sample site A-5 on unnamed tributary to Kotsina River.

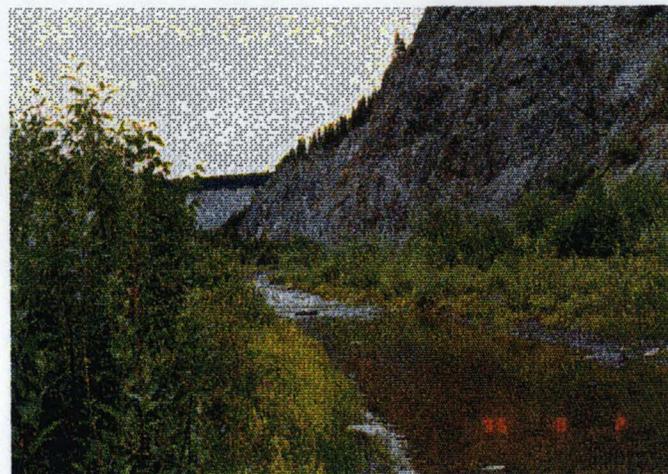


Photo II29; Sample site A-5. Resident Dolly Varden only collected.

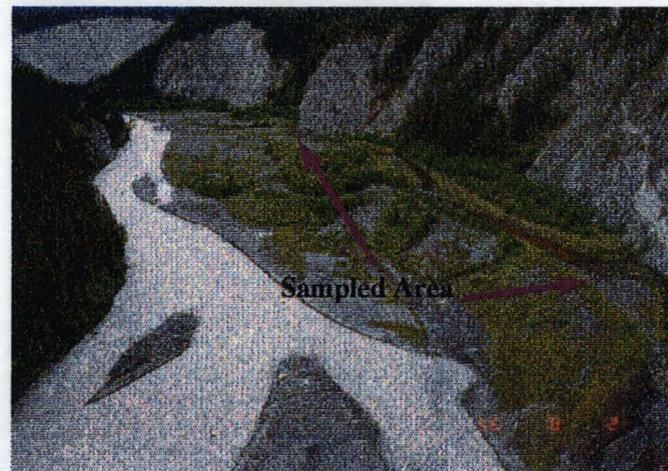


Photo III2; Aerial view of sample site A-5. Entire available habitat located within Kotsina River floodplain.

Appendix B8.-Chetaslina River photographs; Sample Site A-6.

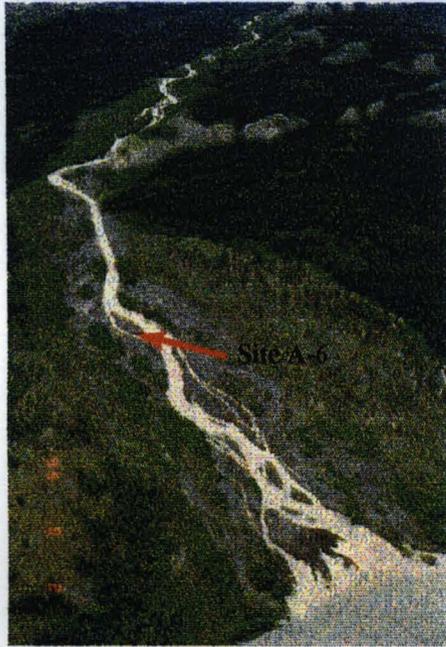


Photo I6; Lower Chetaslina River.



Photo III15; Sample site A-6 (side channel). Suspected juvenile chinook salmon observed but not captured.

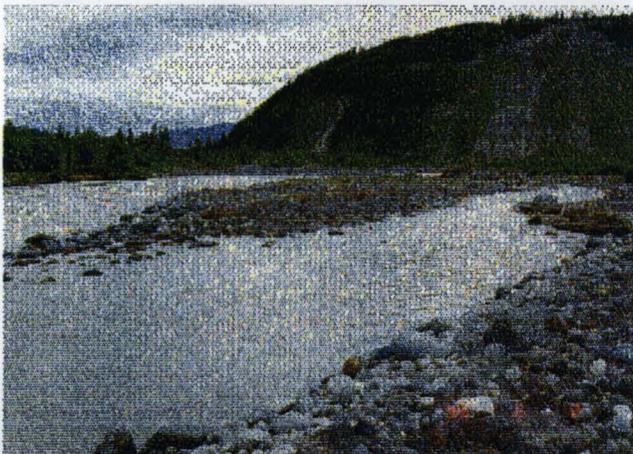


Photo III10; Upstream end of side channel shown in Photo III15.

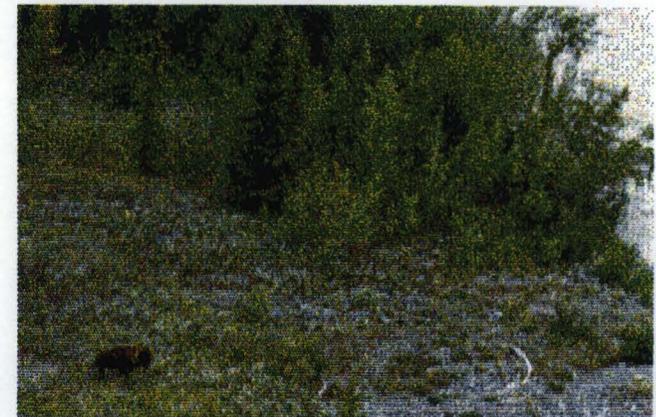


Photo III13; Adult male bison in riparian area.

Appendix B9.-Dadina River photographs; Sample Site A-7.



Photo I0; Lower reach of Dadina R., Copper R. at far left. Highly turbid, low gradient stream.



Photo III17; 200mm grayling collected at sample site A-7 (within clear-water tributary).



Photo III18; 200mm round whitefish collected at interface between clear and turbid water.

29

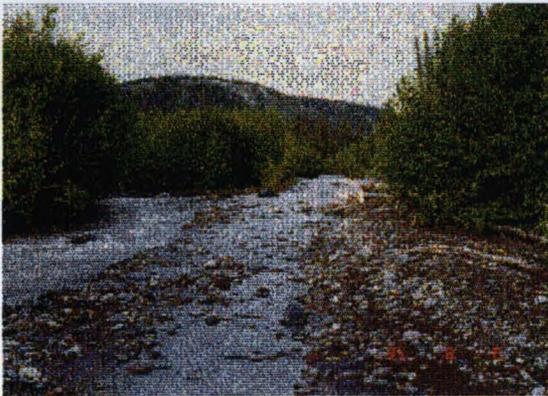


Photo III19; Portion of Dadina R. at sample site.

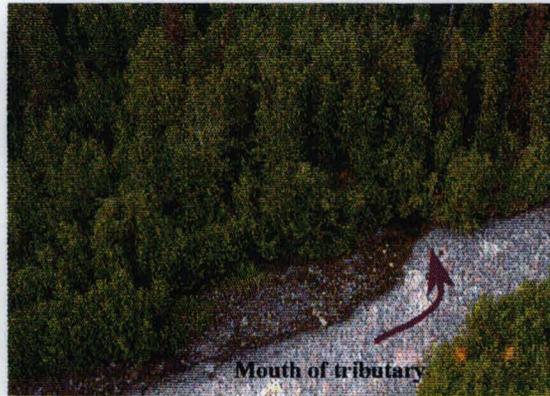


Photo III20; Round whitefish and Dolly Varden collected at interface between clear and turbid water. Grayling and Dolly Varden collected in clear water.



Photo III22; Dadina R. downstream of sample site A-7.

Appendix B10.-Klawasi River photographs; Sample Site A-8.

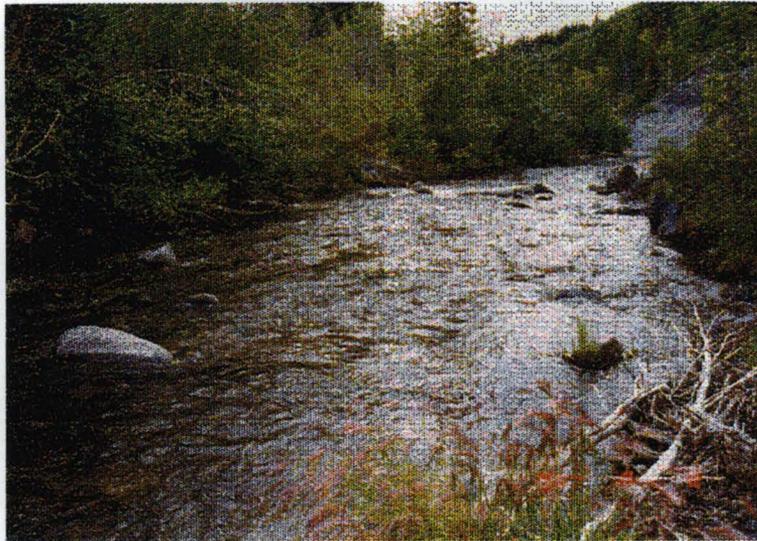


Photo III24; Sample site A-8. View downstream on Klawasi River. Rearing coho salmon and sculpin collected.

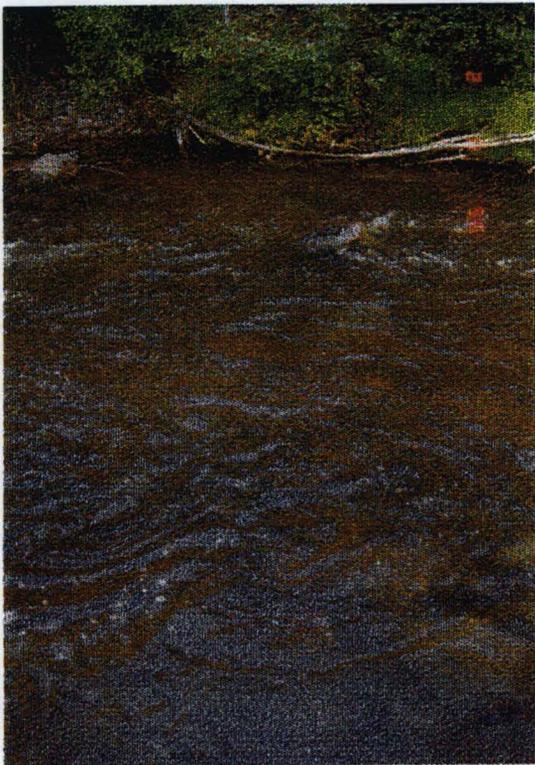


Photo III25; Sample site A-8. View of coho salmon rearing habitat along far bank.

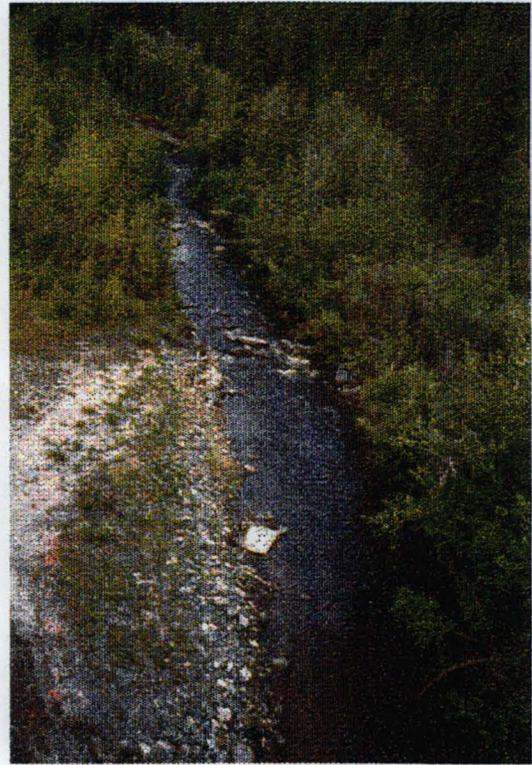


Photo III26; Aerial view of Klawasi River sample site A-8.

