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STATE OF ALASKA

William A. Egan, Governor

ANNUAL REPORT OF PROGRESS, 1969 - 1970

FEDERAL AID IN FISH RESTORATION PROJECT F-9-2

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME

Wallace H. Noerenberg, Commissioner

DIVISION OF SPORT FISH

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INTRODUCTION

This report of progress consists of Job Segment Reports from the State of Alaska, Federal Aid In Fish Restoration, Project F-9-2, "Sport Fish Investigations of Alaska".

The studies reported herein are investigations evaluating the sport fish resources of the state. Recreational and other impacts on the fishery resources necessitates a continuous endeavor of ascertaining facts and knowledge of the fisheries. The 24 jobs reported on are of a continuing nature. The investigations are composed of 11 projects involved with the inventory and cataloging of the sport fish waters of the state, sport fishery creel censuses, and access. Fish species that received special investigational effort include: Dolly Varden, anadromous fish, grayling, sheefish, whitefish, pike, char, and salmon. The information gathered from the combined studies provides necessary background data for a better understanding of management problems and constitutes a basis for necessary future investigations.

The subject matter contained in these reports is incomplete, and the findings and interpretations subject to re-evaluation as work progresses.

RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-9-2 *Name:* Sport Fish Investigations of Alaska.

Job No.: 14-A *Title:* **Inventory and Cataloging of Sport Fish and Sport Fish Waters of the Copper River and Prince William Sound Drainages and the Upper Susitna River.**

Period Covered: July 1, 1969 to June 30, 1970.

ABSTRACT

Eleven lakes presently under management were test netted to determine both the condition of the fish stocks and the result of experimental fish stockings.

Sixteen previously unchecked lakes were surveyed. Physical and biological data, including samples of fish, were taken.

Creel census of silver salmon, Oncorhynchus kisutch, anglers in Valdez Bay revealed a catch rate of 0.33 fish per hour as compared to 0.14 fish per hour in 1968.

Dissolved oxygen determinations were made in 26 lakes. In some waters the Arctic grayling, Thymallus arcticus, demonstrate a remarkable resistance to low dissolved oxygen concentrations.

Winter fishing for burbot, Lota lota, increased in 1969. The use of snow machines for both transportation and recreational fishing is the greatest single influence on this increase.

Observations of alignment surveys by the Trans-Alaska Pipeline System were monitored and a list of waters that might be affected was prepared.

Three Alaska Department of Highways projects were monitored to insure protection of the fisheries resources.

Lengths of angler-caught whitefish, Coregonus clupeaformis, were recorded from the Slana River and compared with samples collected annually since 1964. No apparent change in mean length of whitefish has occurred during the five-year period.

During grayling egg-taking operations at Bessie Creek, 1,086,000 eggs were secured for experimental stocking. The number of grayling utilizing the spawning area has decreased from 2,257 in 1967 to an estimated 641 in 1969.

OBJECTIVES

1. To record the environmental characteristics of existing and potential recreational fishing waters of

the job area, and where practical, obtain estimates of the sport fish harvest and angler participation rates.

2. To determine the current status and public availability of the recreational fishing waters within the job area. To assist, as required, in the investigation of public access studies and make recommendations for segregation of recreational access sites.

3. To evaluate multiple-use, water development projects (public and private) and the effects on the area's streams and lakes for the protection of the resource.

4. To locate sport fish egg sources and to conduct egg takes as required for experimental hatching and stocking.

5. To determine stocking measures and to formulate recommendations for the management of area waters and direct the course of future studies.

6. To determine and develop plans for the enhancement of anadromous fish stocks.

TECHNIQUES USED

Fish populations were sampled with 125' x 6' variable mesh (3/4" - 2" bar measure) nylon, sinking, gill nets.

Fork length measurements in millimeters were taken on all fish.

A Hach, Model OX-2-P, kit was used for determining dissolved oxygen.

A portable Ross sounder was used to determine lake depths. Some modification of the depth sounding techniques was used to record under-ice depths.

RECOMMENDATIONS

1. It is recommended that the present job objectives be continued, with expansion of cataloging and inventory surveys of off-highway waters within the job area with special emphasis in the Valdez-Cordova areas.

2. It is recommended that cataloging and inventory of lakes and streams along the Chitina-McCarthy Trail be expanded in view of the ultimate automobile access to the area.

3. The program of winter dissolved oxygen determinations in selected lakes should be continued to determine minimum requirements for various species of fish.

4. Continued effort should be made to increase the winter recreational use of the available fisheries.

5. Because of the increase in winter fishing, the collection of creel census information and data on burbot age-length relationships should be continued.

6. Monitoring of the Trans-Alaska Pipeline System activities should be continued in order to afford maximum protection to the fishery resource.

FINDINGS

Test-Net Evaluations - Experimental Stockings

Arizona Lake was stocked with grayling fry, Thymallus arcticus, in July, 1968. One year later, 16 grayling averaging 236 mm in fork length were taken with a test net (Table 1). This lake had been previously stocked, unsuccessfully, with rainbow trout, Salmogairdneri. No other fish were present. Winter dissolved oxygen concentrations have ranged from 1.0 - 3.0 ppm since 1965.

Kenny Lake was stocked in 1968 with grayling fry. Test netting in 1969 indicated no survival. The dissolved oxygen concentration in April, 1969, was 1.0 ppm (Table 4).

Pippin Lake has been experimentally stocked with grayling three times since 1961. Fish survived the first year but were unable to live through the second winter. Oxygen concentrations in Pippin Lake have ranged from 1.0 - 1.6 ppm in late winter. No further stocking of this lake is planned.

Test-Net Evaluations - Managed Lakes

Test netting in Blueberry Lake caught rainbow trout averaging 185 mm in fork length and ranging from 135 - 272 mm. This lake is heavily fished by roadside anglers during its four ice-free months. There has, however, been a gradual decrease in the average length of the fish from 290 mm in 1959 to the present 185 mm.

Crater Lake, first stocked in 1965, has produced good fishing. Test nets in 1969 caught rainbow trout ranging from 96 - 164 mm in fork length. These fish were all from a 1968 plant.

Monsoon Lake offers fly-in fishing only and consequently, receives little use. Lake trout, Salvelinus namaycush; whitefish, Coregonus clupeaformis; grayling; and burbot, Lota lota, were collected with test nets.

Moose Lake has been managed since 1960. During this period, the grayling net-capture frequency increased from 0.21 fish per net hour in 1960 to a high of 5.03 fish per net hour in 1966. Following the 1966 high, there has been a gradual decline in the net catch per hour from 2.4 in 1968 to 0.45 in 1969. The decline is attributed to several factors, namely, (1) Drought conditions in 1968 and 1969 caused a drying effect on the inlet stream two weeks after the peak of spawning migration; (2) There has been a substantial decline in winter dissolved oxygen concentrations which may contribute in part to a winter fish loss. Annual spring season dissolved oxygen concentrations have declined from 6.25 ppm in 1964 to 1.5 ppm in 1969; (3) The Moose Lake inlet has been used as a grayling egg-take site since 1967. The total effects of handling and artificial spawning have not been determined.

In 1968 and 1969 this lake was stocked with 10,000 grayling fry to compensate for the lack of natural spawning.

Tolsona Lake grayling density parallels that of Moose Lake. The drought conditions have affected grayling density peaks in both lakes. Following this high there has been a corresponding decline in relative number to 0.14 in 1967. Tolsona Lake grayling population appears to have a low grayling density similar to Moose Lake, i.e. a combination of egg-taking, poor natural spawning conditions, and winter habitat deterioration.

Stocking of grayling fry was initiated in 1968 to offset the loss caused by low water and inadequate spawning areas. The fish catch per net hour has increased from 0.14 in 1967 to 1.05 in 1969. Twenty percent of the grayling taken were age I fish.

Worthington Lake, formerly known as Summit Lake No. 1, has been stocked with rainbow trout since 1954. Evaluation records are available only since 1959. In 1959, rainbow trout averaged 241 mm in fork

length and ranged from 163 - 295 mm. In 1969, a sample of five rainbow trout averaged 285 mm in fork length and ranged from 132 - 358 mm. The net frequency in 1969 was 0.29, which is the lowest recorded since 1959. This lake is located at an altitude of 2,312 feet and is fished only three months of the year.

Thompson Lake is located at Thompson Pass near Valdez. It is a small, fertile, and shallow lake with a maximum depth of nine feet. In 1969, sixty rainbow trout were taken in one overnight gill-net set. The fish averaged 181 mm in fork length and ranged from 122 - 479 mm. The net frequency of 3.75 fish per net hour was the highest observed since test netting was initiated in 1960. The lake receives fishing pressure only during the ice-free summer months.

Tebay Lake is a fly-in lake located near Chitina, and in the past, has had a reputation for good rainbow trout fishing. In recent years, there have been reports of a steady decline in the size of fish taken.

The results of test netting in 1969 showed rainbow trout ranging in fork length from 133 - 391 mm and averaging 239 mm. Fish of this size are not highly prized by fly-in anglers. Tebay Lake has excellent spawning facilities for rainbow trout, especially in the main inlet and outlet.

In the past, the tributaries have been closed to angling during the spawning period. These fishing closures have been removed. The origin of the rainbow trout in Tebay Lake is unknown.

Dolly Varden, Salvelinus malma, trout are also present in this lake. Test netting indicates their relative numbers are slightly less than the rainbow trout. The fork length range of 30 Dolly Varden taken in the nets was 120 - 264 mm.

Many of the rainbow trout in Tebay Lake were found to be infected with adult nematodes, Philonema sp., and encysted perocercoids of the cestode, Diphyllobothrium sp. (Needham, 1957). The presence of these parasites creates an overlay of thick tissue around the organs. Spawning appeared highly unlikely in the several females examined as a result of the infestation. Two Dolly Varden examined at the same time appeared normal; no parasites were found.

Despite the presence of these parasites, the population has maintained itself at a maximum level.

Table 1 shows a summation of fish samples taken from the managed lakes of the area.

Test-Net Evaluations - New Unsurveyed Lakes

Art Lake, located four miles off the Lake Louise Road, was test netted in 1969. This lake was found to support a high population of grayling, whitefish, and suckers, Catostoma sp.

Lindy Lake, located 3/4 mile south of the Lake Louise Road, supports a population of suckers. An experimental stocking of 5,000 rainbow trout was made in 1969.

Kay Lake is a small (three acre) lake located 3/4 mile north of Mile 169, Glenn Highway. An overnight net set took 143 grayling for a net frequency of 5.95. These fish ranged from 190 - 322 mm in fork length. The lake is united with Mae West Lake by Mae West Creek, approximately one mile in length. An interchange of fish is likely.

The lake is readily accessible by an existing seismic road.

Fox Lake is a fly-in lake located in the Gakona River drainage. It has a surface area of 500 acres with a maximum depth of 20 feet. Fish present include whitefish, grayling, suckers, and burbot.

TABLE 1 Test-Net Summaries, Managed Lakes, Glennallen Area, 1969.

Name	Location	No. of Fish	Species*	Length Range (mm)	Mean Length (mm)	Frequency**	% Comp.
Arizona	T8N R7W Sec. 11	16	GR	230-242	236	0.80	100
Blueberry	T9S R3W Sec. 2	19	RT	110-339	169	1.26	100
Crater	T4N R6W Sec. 29	14	RT	96-165	122	0.70	100
Kenny	T1S R3E Sec. 31	---					
Monsoon	T12N R7W Sec. 17	8	LT	200-622		0.19	44.4
		6	WF	228-422		0.14	33.3
		3	GR	180-270		0.07	16.7
		1	BB	303		0.02	5.6
Moose	T8W R5W Sec. 14	20	GR	168-364	242	0.45	13.6
		123	LNS	222-318		2.80	83.7
		4	BB	151-491		0.09	2.7
Pippin	T2S R1E Sec. 11	---					
Worthington	T9S R3W Sec. 1	5	RT	132-358	285	0.29	100
Thompson	T8S R3W Sec. 26	60	RT	122-479	181	3.75	100
Tebay	Lat 61°12',	35	RT	133-371	239	0.89	53.8
	Long. 144°15'	30	DV	120-264	183	0.76	46.2
Tolsona	T4N R5W Sec. 24	52	LNS	125-450		1.36	52.0
		40	GR	122-370	247	1.05	40.0
		8	BB	----		0.21	8.0

*GR - Grayling; BB - Burbot; LNS - Longnose sucker; DV - Dolly Varden; WF - Whitefish; LT - Lake trout; RT - Rainbow trout.

**Frequency is the number of fish per net hour.

Iron Mountain and Wolf lakes are located across the Copper River in the Cheshnina and Kotsina rivers drainage. Fish were not found in either lake. Wolf Lake has a maximum depth of 17 feet; Iron Mountain is 65 feet deep. A "cat" trail from Strelna passes within one mile of Iron Mountain Lake. Both lakes are of sufficient size for float plane access.

Lost Lake is situated 1 1/2 miles north of Chitina on a "cat" trail. The lake is two acres in size and 45 feet deep. A dense population of suckers and whitefish is present. The net frequency of suckers is 7.56 fish per net hour. Should access to this lake be improved, it will be rehabilitated.

Little Billy and Van lakes are located off the McCarthy-Chitina Road. Little Billy Lake presently does not support a fish population.

Van Lake has a surface area of 500 acres and a maximum depth of 72 feet. Test nets produced four Dolly Varden ranging from 436 - 492 mm in fork length. Other fish known to inhabit the lake are sculpins, Cottus sp. This lake is a short walk from the road. As access across the Copper River is completed, the lake will be stocked with salmonids.

Hungry Hollow Lake is located four miles due south of Mile 11 on the Denali Highway. This 90-acre lake has a maximum depth of 72 feet and is within the Middle Fork drainage of the Gulkana River. Fish present include whitefish, lake trout, and grayling. Presently, the lake can be reached only by aircraft and tracked vehicle.

Mile 123 R. Lake is a shallow lake, 13 feet deep, and is presently devoid of all fish. Winter dissolved oxygen tests will be conducted to determine if an experimental plant of grayling is feasible.

Edgerton and Mile 22 lakes, located along the Edgerton Highway and on the Tok Highway, respectively, were test netted. No fish were caught, and these lakes are considered too shallow to sustain a fish population.

Plumb Bob, Soup, and Mud lakes are shallow lakes located along the Glenn Highway. No fish were taken from these lakes and they are considered too shallow to sustain a fish population.

A resume of survey data obtained from the new lake surveys conducted in 1969 are presented in Table 2.

Creel Census - Valdez Bay

The censused catch rate of sport-caught silver salmon, Oncorhynchus kisutch, from Valdez Bay was 0.4 fish per hour in 1966 and 1.1 per hour in 1967.

Table 3 does not show an increase in anglers from 1968 to 1969; however, in 1968, 22% of the creel checks were from the military recreation camp. In 1969, this camp failed to submit a single creel census check, which could indicate a general increase in anglers utilizing the area if this information were available.

Table 3 shows a rise in the catch per hour of sport-caught silver salmon during the 1969 season.

The decrease in number of hours per angler was due to the strong wind conditions that prevailed during most of the creel census period. Anglers were reluctant to venture into Valdez Bay in small boats.

Dissolved Oxygen Determinations - 1969

During the spring of 1969, dissolved oxygen determinations were made in 26 lakes (Table 4).

TABLE 2 Test-Net Summaries, New Lakes, Glennallen Area, 1969.

Name	Location	No. of Fish	Species*	Length Range (mm)	Mean Length (mm)	Frequency**	% Comp.
Art	T4N R6W Sec. 4, 5	125	GR			6.30	54.1
		64	WF			3.00	27.7
		42	LNS			2.00	18.2
Little Billy	T5S R8E Sec. 2	---					
Fox	T9N R2E Sec. 20	281	WF	191-392		6.19	71.2
		25	GR	146-349		0.54	6.3
		87	LNS	121-451		1.89	22.0
		2	BB	482-587		0.04	0.5
Iron Mountain	Lat 61°35' Long 144°05'	---					
Kay	T4N R6W Sec. 22	143	GR	190-322	253	5.95	100
Van	T4S R7E Sec. 21	4	DV	436-492	464	0.20	100
Edgerton	T3S R5E Sec. 9	---					
Wolf	T2S R5E Sec. 1	---					
Lost	T4S R5E Sec. 12	2	LNS	160-200		7.56	1.0
		189	WF	146-264		0.88	99.0
Hungry Hollow		53	WF	300-435		1.10	73.6
		10	GR	202-328		0.20	13.9
		9	LT	330-580		0.19	12.5
Lindy	T4N R7W Sec. 25	30	LNS	212-425		1.50	100

TABLE 2 (Cont) Test-Net Summaries, New Lakes, Glennallen Area, 1969.

Name	Location	No. of Fish	Species*	Length Range (mm)	Mean Length (mm)	Frequency**	% Comp.
Mile 128 Rich. Hwy.	T6N R1W Sec. 14	---					
Plumb Bob	T4N R5W Sec. 27	---					
Mud	T4N R4W Sec. 15	---					
Soup	T4N R4W Sec. 27	---					
Mile 22 Tok Road	T8N R3E Sec. 15	---					

*GR - Grayling; BB - Burbot; LNS - Longnose sucker; DV - Dolly Varden; WF - Whitefish; LT - Lake trout; RT - Rainbow trout.

**Frequency is the number of fish per net hour.

TABLE 3 Creel Census, Valdez Bay, 1968-69.

Year	Total Anglers	Hours/ Angler	Silver Salmon/ Hour	All Salmon/ Hour*
1968	552	4.6	0.14	0.45
1969	524	1.4	0.33	0.90

*All species including pink, O. gorbuscha; chum, O. keta; and silver, O. nerka, salmon.

Kenny Lake: The low spring dissolved oxygen concentration was 1.0 ppm. Winter dissolved oxygen has varied from 3.5 - 0.75 ppm in the years since 1965. A plant of grayling fry made in 1968 did not survive the first winter due, presumably, to insufficient oxygen.

These grayling are the progeny of Tolsona Lake stocks. Critical winter oxygen levels in Tolsona Lake have been recorded as low as 1.0 ppm.

Pippin Lake: The spring dissolved oxygen concentrations have never been higher than the 1.6 ppm recorded in 1965. Three experimental grayling plantings made since 1966 have demonstrated survival during the first winter. An apparent total winter kill did occur during the second winter.

Conversely, Scoter Lake which had a dissolved oxygen concentration of 1.0 ppm in 1967 and no discernable oxygen in 1969 supports a good population of grayling.

Mae West Lake: This lake, with a maximum depth of nine feet, had a dissolved oxygen concentration of only 1.0 ppm in the spring of 1969. No evidence of winter kill was found, and grayling fishing was excellent that year.

Several lakes along the McCarthy-Chitina Road were checked for dissolved oxygen concentrations. Ruth and Arizona lakes had only 1.0 ppm, Mill Pond Lake had 0.0 ppm, and Moose Lake had 0.5 ppm. All were experimentally stocked with grayling fry to determine if fisheries could be established at these winter dissolved oxygen levels.

Grayling have overwintered in waters in the Fairbanks area when the recorded dissolved oxygen concentrations were 0.0 ppm (Roguski, 1969) indicating that they are anaerobic, but that survival is accomplished at nearly unmeasurable oxygen levels.

Burbot

In 1968, age IV burbot from Tolsona Lake averaged 57 mm longer than age IV fish from Moose Lake. In 1969 this same difference was apparent (Table 5). This difference in growth rate persists through age VI fish. No age VII or older fish were taken from Moose Lake during either year. The reason for these differences is not known.

Relative fish numbers vary. Moose Lake has had a slightly higher density of suckers during the past five years. With only 1,500 feet of stream between the two lakes, interchange of fish is possible. Only small (age III or less) burbot have been observed in Bessie Creek.

TABLE 4 Winter Dissolved Oxygen Determinations, Glennallen Area, 1969.

Date	Lake	Snow (Inches)	Ice (Inches)	Depth of Sample (ft)	PPM Oxygen	Max. Depth (ft)	Fish Present*
3/24	Louise (McCarthy)	13	26	6	10.0	35	Unknown
3/24	Moose (McCarthy)	3	37	6	0.5	15	Stocked '69
3/24	Billy	8	37	6	8.0	---	GR
3/24	Strelna	9	26	6	12.0	60	Stocked '69
3/24	Ruth	9	30	6	1.0	22	Stocked '69
3/24	Sculpin	8	33	6	6.0	40	RT
3/25	Lou's	9	26	6	5.0	17	SS, GR
3/25	Baultoff	13	26	6	3.0	---	Unknown
3/25	Mystery	8	30	6	8.0	34	S
3/25	Mill Pond	9	25	6	0.0	10	---
3/25	Dadina	8	29	6	7.0	15	Stocked '69
4/8	Crater (Lake Louise)	8	22	5	8.0	17	RT
4/8	Caribou (Lake Louise)	12	24	5	8.0	25	SS, GR, RT
4/8	Elbow	12	20	5	8.0	17	GR, SS
4/8	Junction	10	25	5	5.5	19	GR
4/9	Kenny	4	31	5	1.0	13	Stocked '69
4/9	Pippin	6	24	5	1.3	14	Stocked '69

TABLE 4 (Cont) Winter Dissolved Oxygen Determinations, Glennallen Area, 1969.

Date	Lake	Snow (Inches)	Ice (Inches)	Depth of Sample (ft)	PPM Oxygen	Max. Depth (ft)	Fish Present*
4/13	Mae West	4	31	5	1.0	9	GR
4/14	Tolsona	6	33	5	1.0	13	GR, BB
4/14	Moose	6	34	5	1.5	30	GR, BB
4/14	Scoter	6	23	5	0.0	18	GR
4/14	Arizona	6	30	5	1.0	19	Stocked '68
4/14	Mirror	6	24	5	5.5	12	GR, BB
4/16	June	12	28	5	8.5	20	GR, BB, WF
4/16	Dick	12	29	5	8.0	32	GR, BB
4/16	Nita	12	28	5	7.0	45	GR, BB, WF

*GR - Grayling; WF - Whitefish; BB - Burbot; SS - Silver salmon; RT - Rainbow trout; S - Sucker.

TABLE 5 Age and Length of Sport-Caught Burbot from Moose, Tolsona, and Ewan Lakes, 1969.

	Tolsona Lake	Moose Lake	Ewan Lake
No. Age IV	1	3	1
Avg. Length*	510	415	500
Length Range	510	392-440	500
No. Age V	12	12	2
Avg. Length	580	502	534
Length Range	532-630	440-573	460-568
No. Age VI	2	5	1
Avg. Length	546	512	555
Length Range	530-562	468-536	555
No. Age VII	2		2
Avg. Length	741		576
Length Range	738-745		546-605
No. Age VIII	1		2
Avg. Length	815		611
Length Range	815		570-651
No. Age IX			1
Avg. Length			525
Length Range			525

*Length in millimeters.

Stomach samples were examined, and the results were similar to 1968. Most of the stomachs were empty and the remainder contained mollusks and fish remains. Whitefish and burbot have been identified from burbot stomachs.

During the winters of 1968-69 and 1969-70, a volunteer creel census was conducted at Tolsona Lake. In 1968-69, 489 burbot were recorded; in 1969-70, 590 burbot were listed. Fishing success remained the same with an average catch of eight fish per angler. The increase in fishing pressure is due primarily to the increased recreational use of the snow machine.

Habitat Protection

New highway construction near Chitina was monitored throughout the summer of 1969. Weight of rip-rap rock placed along the shoreline of Three Mile Lake caused an "eruption" of a portion of the lake bottom, resulting in the formation of a mud island which reduced the size of the lake by approximately one-half acre. Several sounding surveys revealed no change in the maximum depth of the lake. Outlet improvement work will be accomplished in 1970. This will prevent erosion and increase the depth of the lake by one foot.

Preliminary alignment surveys by the Trans-Alaska Pipeline System were monitored during 1969-70. In

the Copper River basin, stream-crossing permits (written and verbal) were requested by TAPS field personnel prior to actual equipment crossings. Areas of concern were checked before and after crossings were made. Because of the normal frozen condition of the Copper River basin during the winter months, there was little damage to the aquatic habitat. In the Valdez area, the pipeline routes and tank farm area were inspected with Commercial Fisheries Division biologists. Recommendations were made which would provide maximum protection to the environment and wildlife.

In cooperation with other biologists, a report was prepared which outlined the present fisheries resources located along the pipeline route and some of the problems which may be encountered (Table 6).

The primary concern regarding the pipeline construction and fisheries resources is stream crossing. Efforts are underway to schedule crossings at a time when fish numbers are minimal.

Within the Copper River and Valdez Bay drainages, the pipeline may cross 15 streams utilized by salmon and 59 streams inhabited by other species such as Dolly Varden, rainbow trout, and grayling.

It is impossible to predict what environmental damages might occur until the exact route is located and the method of pipe laying is known. Vehicle pull-outs were constructed adjacent to the foot trails leading to Mae West and Lost Cabin lakes as a result of cooperation between the Alaska Department of Highways and the Department of Fish and Game. These pull-outs will accommodate several vehicles.

During the winter of 1969-70 a test oil well was drilled in the Mendeltna Creek area. The operation was closely monitored as the drill site was less than 100 yards from Mendeltna Creek. One small oil spill was observed, but was quickly contained to avoid contamination of the stream.

Deterioration of Aquatic Habitat

The total precipitation for the Copper River basin (as measured at the Gulkana airport) during 1969 was 3.4 inches. The ten-year average for this area is 13.7 inches. This drought condition has had a definite influence on fish habitat and fish behavior.

Many of the small tributaries normally utilized by grayling for spawning and summer habitat either become dry or were too low for upstream migration. Streams in this category included Moose, Dry, Bear, Poplar, Bessie, Grove, Our, Sinona, and Porcupine creeks.

Grayling normally utilizing these streams were forced to remain in the larger rivers. Spawning success was lower in the larger stream than it would have been in the small tributaries. Many of the female grayling caught in the Gulkana River in September contained loose eggs, indicating incomplete spawning.

Most lakes in the area showed the effects of low precipitation. Crosswind Lake dropped to a low level in September and no water was flowing out of the outlet. There was a stream overwinter loss of fish trapped in small water pockets.

Slana River Whitefish

Special regulations allow for the taking of whitefish from the Slana River by use of spear. Fishing begins in October after the river has become silt free. Large numbers of round whitefish, Prosopium cylindraceum, and lake whitefish are present in the Slana River near the Indian village of Mentasta. After dark is the most productive time to catch whitefish. At this time, fishermen are able to wade the shallow river, using lanterns for illumination. The fish are not exceptionally wary and can be approached to within spear range. It is not uncommon for a good fisherman to take as many as 150 fish in an evening.

TABLE 6 Tabulation of Streams Which may be Affected by the Pipeline - Isabel Pass to Valdez Bay.

Tributary Of	Stream	Species	Numbers*	Time**	Stream Classification***
COPPER RIVER DRAINAGE					
Copper Rv.	Gulkana Rv.	RS	25,000	June	III
		KS	1,000	July-Aug.	
		SH	unknown	Sept.	
		GR	unknown		
		WF	unknown		
		BB	unknown		
		RT	unknown		
Summit Lk.	Unnamed	GR	unknown		II
Summit Lk.	Unnamed	GR	unknown		II
Summit Lk.	Unnamed	GR	unknown		II
Summit Lk.	Gunn	GR	unknown	Ice free	II
		RS	200	July	
Gulkana Rv.	Fish	GR		Ice free	III
		RS	3,500	July	
Gulkana Rv.	One Mile	GR	unknown		II
Gulkana Rv.	Unnamed	--	unknown		I
Gulkana Rv.	Unnamed	--	unknown		I
Paxson Lk.	Unnamed	--	unknown		I
Paxson Lk.	Unnamed	--	unknown		I
Paxson Lk.	Unnamed	--	unknown		I
Gulkana Rv.	Haggard	GR	unknown	Ice free	III
Gulkana Rv.	Sourdough	GR	unknown	Ice free	III
Gakona Rv.	Meier's	GR	unknown	Ice free	II
Gakona Rv.	Gillespie	GR	unknown	Ice free	III
Gulkana Rv.	Dry	GR	unknown	Ice free	III
Copper Rv.	Tazlina	RS	10,000	July-Aug.	III
		KS	1,000	July-Aug.	
		DV	unknown		

TABLE 6 (Cont) Tabulation of Streams Which may be Affected by the Pipeline - Isabel Pass to Valdez Bay.

Tributary Of	Stream	Species	Numbers*	Time**	Stream Classification***
		SH	unknown	Sept.	
		GR	unknown		
		BB	unknown		
		SS	unknown	Sept.	
		LT	unknown		
Tazlina Rv.	Moose	GR	unknown	Ice free	III
Tazlina Rv.	Unnamed	GR	unknown	Ice free	II
Copper Rv.	Yetna	GR	unknown	Ice free	II
Copper Rv.	Klutina	KS	1,200	June, July, Aug.	III
		RS	11,000	June, July, Aug.	
		DV	unknown		
		SS	unknown	Sept.	
		GR	unknown		
		LT	unknown		
		WF	unknown		
		BB	unknown		
Copper Rv.	Tonsina	RS	8,000	June, July Aug.	III
		KS	850	June, July Aug.	
		SS	unknown	Sept.	
		GR	unknown		
		DV	unknown		
		LT	unknown		
Tonsina Rv.	Willow	GR	unknown	Ice free	II
Tonsina Rv.	Rock	GR	unknown	Ice free	I
Tonsina Rv.	Squirrel	GR	unknown	Ice free	II
		KS	unknown	July	
Tonsina Rv.	Unnamed	GR	unknown	Ice free	I
Tonsina Rv.	Unnamed	--	unknown		I
Tonsina Rv.	Unnamed	--	unknown		I
Tonsina Rv.	Little Tonsina	GR	unknown	All year	III
		DV	unknown	All year	

TABLE 6 (Cont) Tabulation of Streams Which may be Affected by the Pipeline - Isabel Pass to Valdez Bay.

Tributary Of	Stream	Species	Numbers*	Time**	Stream Classification***
		KS SS	250 450	July Sept.	
Little Tonsina	Unnamed	--	unknown		I
Little Tonsina	Unnamed	--	unknown		I
Copper Rv.	Tiekel	DV	unknown	All year	III
Tiekel Rv.	Mosquito	--	unknown		I
Tiekel Rv.	Fall	--	unknown		I
Tiekel Rv.	Unnamed	--	unknown		I
Tiekel Rv.	Unnamed	--	unknown		I
Tiekel Rv.	Tsaina	DV	unknown		I
Tiekel Rv.	Stuart	--	unknown		I
Tsaina	Unnamed	--	unknown		I
Tsaina	Unnamed	--	unknown		I
Tsaina	Unnamed	--	unknown		I
Tsaina	Unnamed	--	unknown		I
Tsaina	Small	--	unknown		I
Tsaina	Unnamed	--	unknown		I
Tsaina	Unnamed	--	unknown		I
Tsaina	Ptarmigan	RT	unknown	Ice free	II
Ptarmigan	Unnamed	--	unknown		I
Ptarmigan	Unnamed	--	unknown		I
Ptarmigan	Unnamed	--	unknown		I
Ptarmigan	Unnamed	--	unknown		I
Ptarmigan	Unnamed	--	unknown		I

TABLE 6 (Cont) Tabulation of Streams Which may be Affected by the Pipeline - Isabel Pass to Valdez Bay.

Tributary Of	Stream	Species	Numbers*	Time**	Stream Classification***
Ptarmigan	Unnamed	--	unknown		I
Ptarmigan	Unnamed	--	unknown		I
VALDEZ BAY DRAINAGE					
Valdez Bay (inlet)	Lowe Rv.	RS	9,000	June, July	III
		PS	4,000	July, Aug.	
		CS	500	Aug.	
		DV	unknown		
Lowe Rv.	Unnamed	--	unknown		I
Lowe Rv.	Sheep	--	unknown		I
Lowe Rv.	Bear	--	unknown		I
Lowe Rv.	Unnamed	--	unknown		I
Valdez Rv.	Abercrombie	PS	unknown	July, Aug.	I
Valdez Rv.	Solomon	PS	unknown	July, Aug.	I
		CS	unknown	July, Aug.	
Valdez Bay (inlet)	Allison	PS	unknown	July-Aug.	I
Valdez Bay (inlet)	Sawmill	CS	unknown	July-Aug.	I
Valdez Bay (inlet)	Sawmill	PS	4,000	July-Aug.	III
		CS	3,500	July-Aug.	

*Species:
RS - Red salmon
SH - Steelhead trout
WF - Whitefish
RT - Rainbow trout
SS - Silver salmon
PS - Pink salmon
KS - King salmon
GR - Grayling
BB - Burbot
DV - Dolly Varden
LT - Lake trout
CS - Chum salmon

*Based on stream surveys and estimates from field observations.

**Period when fish are present in streams in maximum numbers. Ice free - In many streams grayling are present only during ice-free months.

*** I Low productivity. Few, if any, fish present. Very little potential for fisheries.

II Physical characteristics are such that fish present only in portions (such as near terminus) of stream. Minimum fishable population present. Minimum use as spawning stream and nursery area.

III Good to excellent productivity. Used annually by anadromous species for spawning. Good population of sport fish present. Potential for establishment of sport and/or anadromous species.

In 1969 samples of catches were taken for measurement. There was no significant size difference between the two species and all measurements were combined. Fifty-six whitefish ranged in fork length from 235 - 446 mm and averaged 353 mm.

In 1964 whitefish from the Slana River averaged 344 mm in fork length and ranged from 268 - 344 mm.

Observations made at the Slana River since 1964 indicate no significant change in fishing pressure. Whitefish have been used for dog food in the past, but the advent of the snow machine has reduced the number of dog teams in the area. At the time whitefish are most abundant in the Slana River, climatic conditions restrict this sport to only the hardiest. Temperatures may drop as low as minus 30^{o}F.

Approximately 75% of the fish taken are round whitefish.

Grayling Egg Take

Grayling eggs were taken at Our Creek for experimental hatching, rearing, and introduction into new waters.

A trap has been operated at Our Creek since 1967. Numbers and sizes of fish taken are presented in Table 7. Since 1967, there has been a decrease in the number of fish trapped. There has, however, been an increase in the size of fish.

In 1968, 1,087,000 eggs were taken with an average of 4,056 per female. In 1969 the total number of eggs taken was 1,086,000, averaging 5,246 per female.

The first egg take at Our Creek was made in 1968. The progeny of prior (1967) year's natural spawning will not be sexually mature until 1970. Therefore, it is not reasonable to assume that the egg take has been the primary cause in the reduction of adult fish. In 1968, eggs were artificially spawned from 268 of the 880 females captured. The remainder were released to spawn naturally. This suggests that natural spawning and rearing conditions may not be ideal.

Since 1967, precipitation has been below normal. In 1969, the total precipitation was 3.5 inches compared to a 13.5 inch, ten-year average. Our Creek is a small stream, and by June, is almost dry. Some eggs do not hatch out and many fry are trapped. Adults entering the small beaver dams cannot return to Moose Lake in the fall because of low waters. The shallow ponds will not overwinter fish. The number of adults lost in this manner is not known. In the fall of 1966, one small beaver dam was opened to allow 400 trapped adult grayling to return to Moose Lake.

TABLE 7 Fork Lengths of Grayling Trapped at Our Creek, 1967, 1968, and 1969.

	Females		Males		
Year	Length Range (mm)	Avg. Length (mm)	Length Range (mm)	Avg. Length (mm)	Total No. Trapped
1967	194-335	270	182-365	279	2257
1968	237-335	276	227-351	289	1660
1969	240-380	305	209-377	306	441*

*A minimum of 200 grayling escaped through the trap.

TABLE 8 Recovery of Marked Grayling from Bessie Creek and Our Creek, 1967-1969.

Mark*	No. Marked	Year Marked	Marking Site	No. Recovered and Site		Recovery Year and Total Recovered		
				Bessie Creek	Our Creek	1967	1968	1969**
Adipose	1,154	1966	Bessie	126	46	172(15%)	46(4%)	23(2%)
				14	32			
L. Ventral and tag	178	1967	Bessie	4	16		20(11%)	25(14%)
R. Ventral and tag	551	1967	Bessie	16	33		49(9%)	27(5%)
L. Pectoral	2,172	1967	Our	1	413		414(19%)	122(6%)

*Mark - Either the fin was removed or the fin removed and fish tagged with subcutaneous tag.

**Bessie Creek was not trapped in 1969.

Since 1965, grayling have entered Bessie Creek early in the spring season when water temperatures were from 35 - 41°F. In Our Creek, the water temperature has varied from 34 - 39°F when the first grayling appeared. In 1969 the first grayling entered Our Creek when the temperature was 37°F. In 1964, grayling first appeared in Moose Creek (Glennallen) at a water temperature of 36°F.

Grayling - Tagging Program

In 1966, a marking program was initiated in the Tolsona-Moose Lake complex. Table 8 shows there was a high recovery of finclipped grayling one year after marking; however, recoveries the second year after marking showed similar survival. For some reason, the recovery of grayling tagged with a subcutaneous tag and a left ventral finclip was higher the year after marking than in the first year.

Trapping of grayling in Our Creek (inlet to Moose Lake) and Bessie Creek (connecting stream between Moose and Tolsona lakes) has been carried out since 1965. Fifty to 55% of the fish have normally been females, although in 1969, 65% of the grayling trapped were females.

It has been found that males enter the spawning areas earlier than females. At least 200 grayling escaped through the trap during the initial stages of trapping. It is assumed that these grayling were predominantly males. This would account for the higher ratio of females taken in 1969.

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A FISH SHOCKING UNIT MOUNTED ON THE BOW OF A RIVER BOAT IS USED TO SAMPLE ARCTIC GRAYLING IN THE TANANA RIVER DRAINAGE.