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Bill Sheffield, Governor

Annual Performance Report for

EVALUATION OF INTERIOR ALASKA WATERS AND
SPORT FISH WITH EMPHASIS
ON MANAGED WATERS--DELTA DISTRICT

by

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RESEARCH PROJECT SEGMENT

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Study No.: G-III Study Title: Lake and Stream Investigations

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ABSTRACT

Thirteen lakes stocked with rainbow trout, Salmo gairdneri Richardson, and coho salmon, Oncorhynchus kisutch (Walbaum), were sampled with gill nets, and data on survival and growth relative to stocking rates, size at stocking and strains are presented.

Age II Talarik rainbow trout had mean lengths ranging from 354 to 421 millimeters and averaged 399 millimeters. Age III Talarik trout in two lakes had mean lengths of 501 millimeters and 572 millimeters and individual fish weighed up to 3.1 kilograms (6.8 pounds).

Age II Swanson rainbow trout in Quartz Lake ranged from 342 to 380 millimeters in length with a mean of 358 millimeters, while Age III Swanson trout ranged from 432 to 498 millimeters with a mean of 450 millimeters.

Eighty-seven percent of the net catch in Quartz Lake was comprised of Age I coho salmon ranging from 193 to 280 millimeters and having a mean length of 221 millimeters. Frequency of the catch was 1.53 fish/net hour. A comparison of capture rates, growth and stocking data for Age I coho salmon stocked in Quartz Lake from 1977 to 1981 is presented.

* "This research report has been numbered in a manner consistent with past projects which were partially funded with Federal dollars. Though no Federal dollars were available this year, the consistent project numbering will enable future researchers to locate this data."

Two study sections in the lower Goodpaster River were sampled by electro-fishing from June 29 to July 2, to determine population levels of Arctic grayling, Thymallus arcticus (Pallas). Age, length and species composition data were also collected. The Petersen population estimate of 176 grayling per kilometer (281 grayling per mile) was the lowest recorded in 8 years of sampling. Age Class IV grayling were predominant, comprising 44 percent of the sample. Capture rate and relative abundance of all species captured in the Goodpaster River are presented.

Estimates of angler use and sport harvest were made on Quartz Lake from May 16 through September 6, 1982. Total estimated harvest for the period was 16,421 coho salmon and 1,911 rainbow trout. The pressure estimate for the period was 29,857 angler hours. Catch rates, size and age of fish harvested are given for both summer and winter censuses.

A creel census was conducted at Fielding Lake from July 4 to September 5, 1982. Catch rates, age-length composition and other data for Arctic grayling, burbot, Lota lota (Linnaeus) and lake trout, Salvelinus namaycush (Walbaum), are presented.

Harvest and use data for the George Lake northern pike (Esox lucius Linnaeus), fishery are discussed.

A survey on Fielding Lake including limnological investigations and fish sampling, was conducted from early July to October 8, 1982. Size and age composition data for burbot, lake trout and Arctic grayling are presented.

Gill net sampling results for Monte Lake are presented.

KEY WORDS

Fish stocking, population estimates, age, growth, sport harvest, creel census, lake survey, rainbow trout, coho salmon, grayling, lake trout, burbot and interior Alaska.

BACKGROUND

The recreational fisheries locations in the upper Tanana River drainage generally fall into three categories: streams, lakes with indigenous fish species and stocked lakes. Table 1 lists common and scientific names of all fish species mentioned in this report.

The principal fish species of recreational importance in area streams are Arctic grayling and round whitefish. Burbot are widely distributed in the larger glacial rivers and near the confluences of many tributary streams. Lakes at lower elevations (generally below 2,200 ft) that connect to a river system usually contain populations of northern pike, burbot, least cisco, and humpback whitefish. Lakes at higher elevations support populations of lake trout, grayling, round whitefish and burbot.

Landlocked lakes are typically barren. Since statehood most lakes near the highway system have been surveyed and several that were found to contain

Table 1. List of common names, scientific names and abbreviations.

Common Name	Scientific Name & Author	Abbreviation
Arctic grayling	<u>Thymallus arcticus</u> (Pallas)	GR
Arctic lamprey	<u>Lampetra japonica</u> (Martens)	AL
Burbot	<u>Lota lota</u> (Linnaeus)	BB
Coho salmon	<u>Oncorhynchus kisutch</u> (Walbaum)	SS
Humpback whitefish	<u>Coregonus pidschian</u> (Gmelin)	HWF
Inconnu (Sheefish)	<u>Stenodus leucichthys</u> (Guldenstadt)	SF
Lake trout	<u>Salvelinus namaycush</u> (Walbaum)	LT
Least cisco	<u>Coregonus sardinella</u> Valenciennes	LCI
Longnose sucker	<u>Catostomus catostomus</u> (Forster)	LNS
Northern pike	<u>Esox lucius</u> Linnaeus	NP
Rainbow trout	<u>Salmo gairdneri</u> Richardson	RT
Round whitefish	<u>Prosopium cylindraceum</u> (Pallas)	RWF
Slimy sculpin	<u>Cottus cognatus</u> Richardson	SSC

undesirable fish populations have been chemically rehabilitated. Many capable of supporting fish have been stocked with rainbow trout or coho salmon. A few have been stocked with Arctic grayling. Various stocking rates, sizes, strains and timing have been tested to determine those which provide optimum survival and growth of stocked fish. Table 2 gives the morphoedaphic index for selected interior Alaska stocked lakes.

Research and management of selected waters are directed toward monitoring fish population levels and angler utilization. The locations of waters within the study area are shown in Figure 1.

RECOMMENDATIONS

Research

1. Continue fall gill net sampling of stocked lakes as a means to assess survival and growth of stocked fish.
2. Estimate survival of Age I Swanson rainbow trout in North Twin Lake and Ft. Greely #2 Lake.
3. Continue life history investigations of burbot, lake trout and grayling in Fielding Lake.
4. Sample northern pike in Volkmar Lake to assess size and age composition.

Management

1. Continue monitoring angler harvest on Quartz, George, Volkmar and Fielding Lakes.
2. Document current use levels on Denali Highway Lakes (Glacier, Landmark Gap and Tangles).
3. Investigate the feasibility of utilizing aeration devices to prevent winter kill in three managed Ft. Greely Lakes (Big, Bolio and South Twin).

OBJECTIVES

1. To evaluate stocking policies for rainbow trout and coho salmon and formulate stocking recommendations for optimum survival and growth.
2. To monitor existing fish stocks in the Goodpaster River to determine changes in population structure.
3. To obtain estimates of existing or potential angler use and sport fish harvest on Quartz Lake, George Lake and Fielding Lake.

Table 2. Morphoedaphic Index * values for stocked Interior Alaska Lakes, 1978.

Lake	Morphoedaphic Index
Quartz	34.9
Rapids	27.6
Bluff Cabin	12.5
Bolio	11.5
South Twin	8.5
Mark	6.0
North Twin	5.7
Lisa	4.7
Robertson #2	4.5
Jan	4.3
Rainbow	4.1
Donna	3.8
Four Mile	3.6
Little Donna	2.8
Ft. Greely #2	2.2
Craig	1.5
Donnelly	1.4

* Morphoedaphic Index (MEI) = Conductance divided by mean depth.

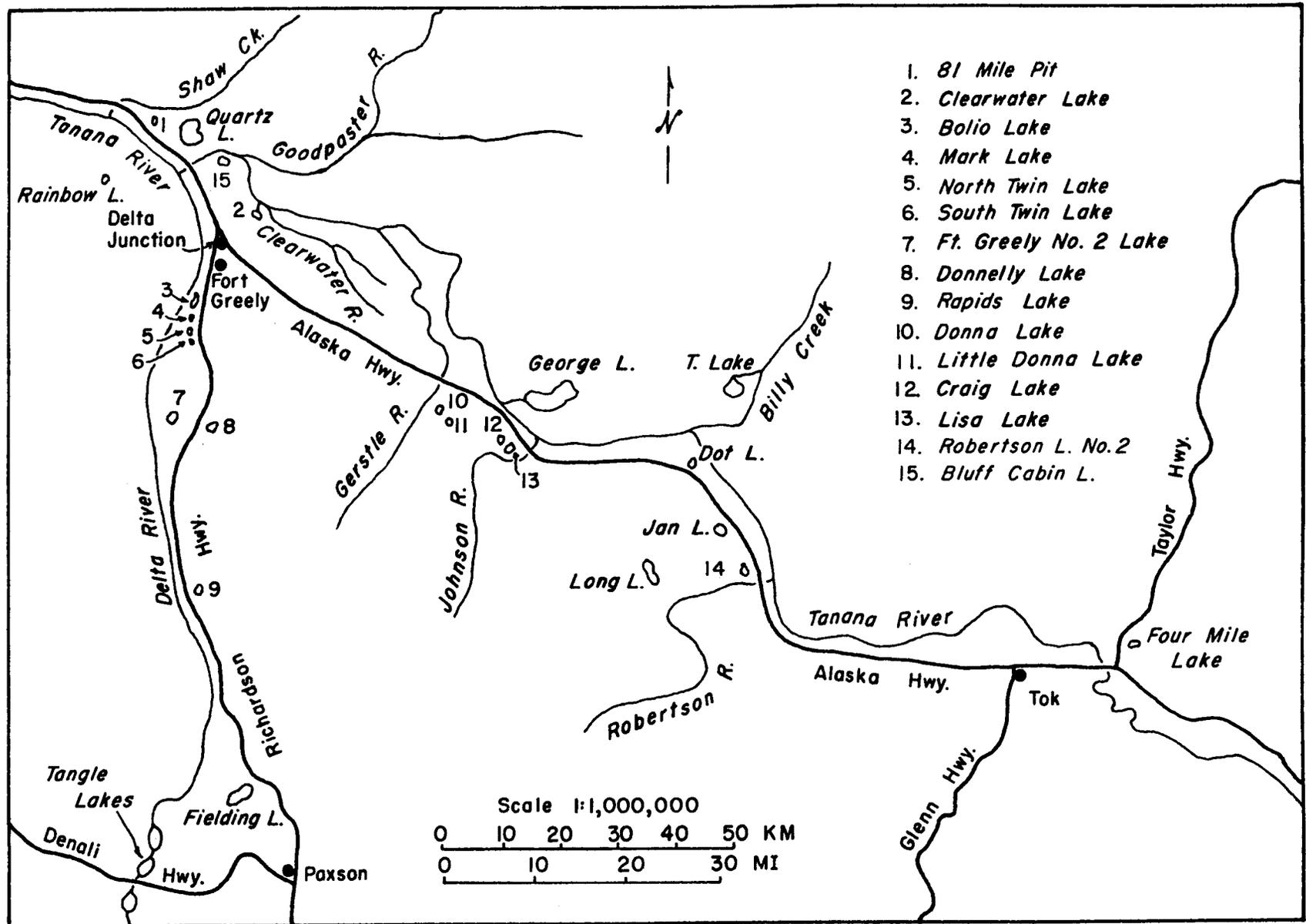


Figure 1. Location of waters in the Delta District.

4. To assist as required in the investigation of public access status to the area's recreational fishery waters.

TECHNIQUES

Fall sampling of fish populations in stocked lakes utilized graduated mesh monofilament gill nets, 125 ft x 6 ft sinking nets with five mesh sizes ranging from 1/2 in to 2 1/2 in bar measure.

A boat-mounted electrofishing unit described by Van Hulle (1968) was used to capture fish for population studies in the Goodpaster River.

Population estimates were determined by Bailey's modification of the Petersen estimate described by Ricker (1975).

New Hampshire and South Dakota style fyke nets were used to sample fish in Fielding Lake. The nets measured 15 to 18 ft in length by 2 to 4 ft in diameter with 3/8-in-sq knotless nylon webbing and 4-ft-deep center leads from 25 to 50 ft in length.

Fish were measured to fork length in millimeters. Chatillon IN-6 or IN-25 spring scales were used to determine weights.

Grayling scales used for age determination were cleaned, mounted on gummed cards, then impressed on 20 mil acetate using a Carver press at 20,000 psi heated to 200°F for 30 sec and read along their dorsal radius on a 3 M Consultant 114 Microfiche reader. Rainbow trout and coho salmon scales were cleaned, mounted between glass slides and read using a Bausch and Lomb micro-projector. Burbot and lake trout were aged using otoliths wetted in glycerine and alcohol and viewed with a binocular microscope.

Water samples were collected using a Kemmerer water sampler, and chemical analysis was done with a Hach model AL-36-B kit.

The morphoedaphic index (MEI), used as a comparative measure of potential productivity for stocked lakes, is conductance divided by mean depth. Conductivity was measured with a Hach model 2510 conductivity meter. Lake depths were determined with a Lowrance echo sounder.

FINDINGS

Fish Stocking Evaluations

Fish population sampling was conducted from August 24 to September 8 on 13 lakes stocked with rainbow trout and coho salmon for growth and survival evaluation of stocked fish. Most lakes were sampled with two gill nets fished for 21 to 26 hours, however, two nets were fished for 14.3 hours in Four Mile Lake. Only one gill net was fished in Robertson #2 Lake and three nets were fished in Quartz Lake.

Netting results, population characteristics and stocking histories are summarized in Table 3.

Table 3. Population characteristics of stocked lakes determined by graduated mesh gill nets, Interior Alaska, 1982.

Lake	Date Sampled	Species	No. Captured	Age Class	Length Range	(mm) Mean	Freq. *	Date Stocked	Total Number	No. /lb	No. /acre	Source
Bluff Cabin	8/31	RT	20	II	385-480	421	0.43	7/23/80	5,000	414	100	Talarik
Donna	9/08	RT	12	II	361-449	407	0.28	7/23/80	5,000	414	86	Talarik
Little Donna	9/08	RT	7	III	476-552	501	0.17	9/18/79	3,550	203	76	Talarik
Donnelly	8/26	SS	38	II	181-247	220	0.72	5/27/80	10,000	216	154	Ship Creek
Lisa	9/03	SS	11	IV	253-335	293	0.21	8/15/78	10,000	145	154	Seward Lagoon
		RT	1	II	412		0.02	7/23/80	4,500	414	90	Talarik
		SS	53	0	100-118	110	1.19	6/17/82	8,500	224	170	Seward
Mark	8/24	SS	1	IV	439		0.02	8/15/78	15,000	145	300	Seward Lagoon
		RT	4	II	325-392	354	0.09	7/23/80	2,000	414	100	Talarik
		SSC	3	...	57-66							
North Twin	8/24	RT	1	VII	428		0.02	7/24/75	15,000	171	652	Ennis
South Twin	8/24	SS	25	II	191-230	216	0.52	5/27/80	5,000	216	238	Ship Creek
Quartz	8/26	RT	4	II	342-380	358	0.06	8/28/80	87,600	372	58	Swanson River
		RT	8	III	432-498	450	0.11	9/13/79	33,000	283	22	Swanson River
		SS	110	I	193-280	221	1.53	5/14&19/81	149,500	303-374	100	Bear Creek
		SS	4	III	385-430	406	0.05	9/21/79	150,000	57	100	Seward
Rainbow	9/24	RT	15	III	505-600	572	0.31	9/18/79	10,000	203	100	Talarik
Rapids	8/26	RT	3	II	200-237	221	0.07	7/23/80	500	413	100	Talarik
		RT	1	III	313		0.02	Natural Reproduction				
Robertson #2	9/03	RT	8	III	271-300	279	0.37	9/18/79	2,450	203	306	Talarik
Four Mile	9/02	RT	7	V	391-452	424	0.25	6/13/77	24,800	95	248	Ennis
		SF	2	IV				Natural Reproduction				
		SF	1	V				Natural Reproduction				
		SF	1	unknown	605		0.04	Probably Original 1969 Plant				

* Fish per net hour - 125 ft graduated mesh gill net.

Rainbow Trout:

No rainbow were available for stocking in the study lakes in 1981, consequently no Age I trout were available for sampling.

Age II Talarik rainbow trout were sampled in four lakes, Bluff Cabin, Donna, Lisa and Mark. Catch frequencies (fish per net hour) were 0.43, 0.28, 0.02 and 0.09, respectively. This compares with catch frequencies of 0.76, 0.54, 0.36 and 0.55 for the same lakes in 1981 when the fish were Age I. The lower catch rates for Age II Talarik rainbow trout in Lisa and Mark lakes is probably a result of their great accessibility and higher sport harvest.

Growth to Age II of the Talarik strain rainbow trout in the four lakes sampled in 1982 compared favorably with Age II fish of other strains samples from 1976 to 1979. Age II Talarik fish had mean lengths ranging from 354 to 421 mm and averaged 399 mm, while Age II rainbow trout sampled in 9 lakes from 1976 to 1979 had mean lengths ranging from 310 to 442 mm and averaged 383 mm.

The Age II Talarik rainbow trout in Bluff Cabin and Donna Lakes in the fall, 1982 had mean weights of 0.83 kg (1.83 lbs) and 0.84 kg (1.84), respectively.

Age III Talarik rainbow trout were sampled in Little Donna, Rainbow and Robertson #2 lakes at catch frequencies of 0.17, 0.31 and 0.37, respectively. This compares with catch frequencies of 0.01-0.30 for Age III rainbow of other strains in 12 lakes sampled from 1976 to 1980. In 9 of those 12 lakes the catch frequency ranged from 0.01 to 0.08.

Growth to Age III of the Talarik trout in Little Donna and Rainbow Lakes surpassed the growth of other strains in 12 lakes sampled from 1976 to 1980. Age III Talarik trout in Little Donna and Rainbow Lakes had mean lengths of 501 mm and 572 mm, respectively. Two females sampled in Rainbow Lake in fall, 1982 were 600 mm (23.6 in) in length and 3.1 kg (6.8 lbs) in weight. The mean weight of nine rainbow trout sampled was 2.4 kg (5.3 lbs). Age III trout of other strains in 12 lakes sampled from 1976 to 1980 ranged from 287 to 499 mm and averaged 429 mm. This includes five samples from Quartz Lake, (the most productive of the stocked lakes with an MEI value of 34.9) where Age III rainbows sampled from 1976 to 1980 had mean lengths of 450 mm, 424 mm, 478 mm, 462 mm and 499 mm. In comparison, Age IV Winthrop rainbow trout netted in Rainbow Lake in 1978 had a length range of 363 to 462 mm and a mean of 425 mm.

The smaller mean length of 279 mm for Age III Talarik rainbow trout in Robertson #2 Lake as compared to Little Donna and Rainbow Lakes can be attributed to several factors including a higher population density due to a higher initial stocking rate (306/acre), higher survival (Peckham, 1981) and lower sport fish harvest. The lake is also only 8 acres in size.

Seven Age V Ennis rainbow trout were caught in Four Mile Lake at a frequency of 0.25 fish/net hr. The fish had a length range of 391-452 mm

and a mean of 424 mm. The catch rate is considered high for stocked trout of this age, especially since the lake has received relatively heavy fishing pressure from Tok area anglers.

Sheefish are also present in the lake from a 1969 plant and subsequent natural reproduction in 1975, 1976 and 1977 (Alt, 1981). Four sheefish ranging from 417 to 605 mm were gill netted on September 2, 1982. Two sheefish, 417 mm and 451 mm in length, had 34 and 12 rainbow trout fingerling, respectively, in their stomachs. The trout were part of a plant of 25,700 Swanson fingerling at 315/lb stocked the previous day. The two sheefish with trout in their stomachs were caught in a net nearest the stocking site. Of the two sheefish caught in the second gill net, the largest had an empty stomach and the other had been feeding on cladocerans.

Age II and Age III Swanson rainbow trout were netted in Quartz Lake at rates of 0.06 and 0.11 fish/hr, respectively. The Age II fish, ranging from 342 to 380 mm with a mean of 358 mm, were from a 1980 plant of 87,600 (58/acre) at a size of 372/lb. The catch rate is considerably lower than the 0.38 fish/hr for Age II Swanson trout stocked in 1979 at a lower rate of 22 fish/acre and a larger size of 283/lb. The Age II Swanson trout from the 1979 plant had a mean length of 377 mm in 1981 compared to 358 mm for Age II Swanson trout of the 1980 plant.

The catch rate of Age I trout of the 1980 plant was 0.31 fish/hr as compared to 0.09 fish/hr for Age I trout from the 1979 plant.

The catch rate in Quartz Lake for Age III Swanson rainbow trout of 0.11 fish/hr was surpassed only once by Age III rainbows from other strains in sampling from 1977-1980. In 1978 Age III rainbow trout of the Ennis strain were netted at a rate of 0.14 fish/hr. The stocking rate was also the highest for that year class (140/acre), over six times greater than the 22/acre stocked in 1979. The other catch frequencies for Age III rainbow trout sampled from 1976 to 1980 ranged from 0.01 to 0.06 and stocking rates ranged from 65 to 123 fish/acre. Age III Swanson rainbow trout in Quartz Lake ranged from 432 to 498 mm with a mean of 450 mm.

Coho Salmon:

Quartz was the only lake sampled in 1982 with Age I coho salmon. Eighty-seven percent of the catch was comprised of coho salmon of the Bear Creek strain. They ranged from 193 to 280 mm, had a mean length of 221 mm and were netted at a rate of 1.53 fish/net hr. In comparison, Age I coho salmon from the Seward source were captured in 1980 at a rate of 1.85 fish/hr and ranged from 185 to 235 mm with a mean length of 211 mm. These fish of the 1980 year class, although slightly smaller when sampled, were stocked at a larger size of 57/lb on September 21, compared to the 1981 class which was stocked on May 14, and 19, at a size of 303-374/lb. Stocking rates were the same at 100/acre.

A comparison of capture rates, growth and stocking data for Age I coho salmon stocked in Quartz Lake from 1977 to 1981 is shown in Table 4. Growth to Age I is similar in each of the four years, although size of fish stocked ranged from 57 to 394 fish/lb and stocking dates ranged from May 14 to September 21.

Table 4. Comparison of capture rates, growth and stocking data for Age I coho salmon in Quartz Lake.

Date Sampled	No. Captured	Range	Mean	Freq.*	Date Stocked	Total No.	No. /lb.	No. /acre	Source
9/26/78	74	212-243	223	1.03	6/28- 8/15/77	197,000	170- 394	130	Seward Lagoon
9/13/79	5	208-232	221	0.08	8/17/78	55,549	129	37	Seward Lagoon
8/27/80	162	185-235	211	1.85	9/21/79	150,095	57	100	Seward
8/26/82	110	193-280	221	1.53	5/14 & 19 1981	149,500	303- 374	100	Bear Creek

* Fish per net hour - 125 ft graduated mesh gill net.

The reason for the low catch rate of 0.08 fish/net hr in 1979 is unknown, although the stocking rate for that year class (1978) was only 37 fish/acre. Five other lakes stocked with Seward Lagoon coho salmon in 1978 had catch rates for Age I fish in 1979 of 0.02, 0.38, 0.30, 0.80 and 0.22 fish/net hr with stocking rates ranging from 186 to 300 fish/acre (Peckham, 1980). Condition of the fish at time of stocking in each of the lakes was reported as good.

Goodpaster River Studies

Population Estimates:

Population levels of Arctic grayling were determined for two study sections in the lower Goodpaster River from June 29 to July 2, 1982. During previous sampling (Tack, 1974 and 1975), grayling population estimates were made for each of three areas in the entire 185 km (115 mi) of the Goodpaster River. Population estimates from 1975 through 1980 (Peckham, 1976, 1977, 1978, 1981) and again in this study are limited to two study sections, 4.8 km (3 mi) each in length, located in the lower 53 km (33 mi). The fish were captured using electrofishing gear, as in previous work. Two passes were made through each section to capture fish for marking. Grayling greater than 150 mm were given a upper caudal fin clip. One day was allowed for random mixing of marked fish prior to a final run to examine for recaptures.

The Petersen estimates for grayling in Section 2 (4.8-9.6 km, 3-6 mi) and Section 6 (24-28.8 km, 15-18 mi) are 178 grayling per km and 174 grayling per km, respectively (Table 5). The estimate for the two study sections combined was 176 grayling per km (281 grayling per mi). In contrast to the 1980 estimate, which was the highest recorded in 7 years of study (Peckham, 1981), the 1982 estimate was the lowest ever recorded, being 57% below the previous 7-year mean. Record high grayling numbers in the Goodpaster River in 1980 corresponded to record numbers found in the Delta Clearwater and Richardson Clearwater Rivers using similar sampling methods (Ridder, 1981). As with the Goodpaster River, record low numbers were found in the Delta Clearwater in 1982. However, the Richardson Clearwater River grayling population did not follow a similar pattern, but instead experienced a new record high, more than doubling the previous high taken in index sampling in 1980 (Ridder, in press). A comparison of population estimates for the lower Goodpaster River from 1973 to 1982 is presented in Table 6.

Age And Length Frequency Data:

Age determinations by scale analysis were made from a random subsample of an equal number of grayling from each index section of the Goodpaster River. Age Class IV was the predominant age group, comprising 44% of the total subsample (Table 7). Age Class I, which comprised 5 percent of the 1980 sample, was absent in 1982. However, as noted in past years, the number of grayling captured in Age Classes I and II may not accurately depict their true abundance. Fish in the smaller size groups were commonly observed but are less effectively stunned by the boat shocker, and therefore are more difficult to net.

Table 5. Population estimates for Arctic grayling (greater than 150 mm)
in two sections of the Goodpaster River, June 29-July 2, 1982.

Section	Marked Fish in Population (m)	Fish Examined (c)	Recaps (r)	Petersen Estimate (N)*	GR/km	GR/mi
2 (km 4.8-9.6)	79	107	9	853	178	284
6 (km 24-28.8)	214	155	39	835	174	278
2 and 6 combined	293	260	48	1,688	176	281

$$* N = \frac{(m)(c + 1)}{r + 1}$$

Table 6. A comparison of population estimates for Arctic grayling (greater than 150 mm) in the lower Goodpaster River for 1973-1982.

Year	Method of Estimate	Length of Area		Population Estimate	
		km	mi	GR/km	GR/mi
1973	Schnabel	53.0	33	480	770
1974	Petersen	53.0	33	201	323
1975	Petersen	9.6	6*	475	760
1976	Petersen	9.6	6	351	563
1977	Petersen	9.6	6	377	604
1978	Petersen	9.6	6	468	749
1980	Petersen	9.6	6	512	819
1982	Petersen	9.6	6	176	281

* The 6 miles for which the estimates were made in 1975 through 1982 include two index areas of 3 miles each (miles 3-6 and miles 15-18). No estimate was made in 1979 or 1981.

Table 7. Age frequency and length of Arctic grayling captured in two sections (Section 2 and 6) of the Goodpaster River, June, 1982.

Age Class	Number	Percent	Length (mm)	
			Range	Mean
I	0	-	-	-
II	8	8	108-176	133
III	21	22	173-216	191
IV	43	44	188-267	218
V	21	22	229-290	249
VI	<u>4</u>	4	<u>250-293</u>	<u>270</u>
	97		108-293	225

The length frequency of 374 grayling captured in the two study sections is shown in Table 8. The most abundant size group was grayling having a length range of 190-209 mm, which accounted for 28.3% of the total sample. Only 11 grayling or 3.0% of the total exceeded 270 mm in length. The mean length of the entire sample was 206 mm. The lower 53 km (33 mi) of the Goodpaster River is characteristicly a rearing area for small grayling, with the upper reaches of the river being inhabited by larger grayling (Tack, 1974).

Capture Rate:

The capture rate of fish species collected during electrofishing was recorded to provide an index of their relative abundance. The index may be biased because grayling were the target species and more effort was directed toward their capture; however, the data are intended to reveal trends in population abundance when compared to data from prior years.

The relative abundance of grayling, round whitefish and longnose suckers, as revealed by fish captured per hour, was 83, 25 and 20, respectively. Both grayling and round whitefish were captured at a rate 47% lower than the previous 6-year means from 1973 to 1980, while suckers were captured at a higher rate (Table 9).

Other species of fish captured at a rate less than one fish per hour included Arctic lamprey, burbot, coho salmon, humpback whitefish, northern pike and slimy sculpin.

Angler Pressure And Sport Fish Harvest Estimates

Quartz Lake:

Quartz Lake is a 1,500 acre lake located near the Richardson Highway, approximately 16 miles north of Delta Junction. The lake was rehabilitated in 1970 with powdered rotenone to eliminate stunted northern pike and least cisco. Rainbow trout have been stocked annually since rehabilitation except in 1978 and 1981, when none were available. Coho salmon have been stocked each year since 1977 except 1980 and 1982.

A stratified random sampling schedule was used to determine angling pressure from May 16 to September 6, 1982. The schedule involved four hourly counts on 1 weekday and 1 weekend day per week and all holidays. The hours covered prior to July 31 were 6 a.m. to 12 midnight. Because of fewer hours of daylight after July 31 the hours covered were 6 a.m. to 7 p.m..

The pressure estimate for the 1982 summer season was 29,857 angler hours or 10,663 man-days (Table 10). Man-days were calculated by dividing total angler hour estimates by the mean number of hours per trip (2.8) for 1977-1980. The angler hour estimate for 1982 was 10% less than the 1981 estimate of 33,106 angler hours (Peckham, 1982), but was 16% higher than the mean for the four previous years (1978-1981). The pressure decline for 1982 was at least partly a result of reduced coho salmon availability, which reached peak levels in 1981.

Table 8. Length frequency of Arctic grayling captured in two sections of the Goodpaster River, June, 1982.

Length (mm)	Section 2 (Miles 3-6)		Section 6 (Miles 15-18)		Section 2 and 6 Combined	
	Number	Percent	Number	Percent	Number	Percent
70-89	3	2.6	0	0	3	.8
90-109	1	.9	1	.4	2	.5
110-129	5	4.3	17	6.6	22	5.9
130-149	12	10.3	10	3.9	22	5.9
150-169	2	1.7	3	1.2	5	1.3
170-189	12	10.3	39	15.2	51	13.6
190-209	28	23.9	78	30.4	106	28.3
210-229	18	15.4	34	13.2	52	13.9
230-249	20	17.1	41	16.0	61	16.3
250-269	13	11.1	26	10.1	39	10.4
270-289	1	.9	6	2.3	7	1.9
290-309	1	.9	2	.8	3	.8
310-329	<u>1</u>	.9	<u>0</u>	0	<u>1</u>	.3
	117		257		374	

Section	Mean Length (mm)
2	202
6	208
combined	206

Table 9. A comparison of fish capture rates using a boat mounted shocker, Goodpaster River, 1973-1982.

Species	1973, 1975, 1976, 1977, 1978, 1980				1982	
	Fish/hr		Percent		Fish/hr	Percent
	Range	Mean	Range	Mean		
Grayling	78-223	157	61-81	72	83	65
Round Whitefish	31-89	47	16-26	22	25	19
Suckers	2-28	14	1-15	7	20	16

Table 10. Quartz Lake angler pressure estimates, May 16-September 6, 1982.

Month	Weekdays		Weekends and Holidays		Total
	Estimated Angler Hours	Percent of Total	Estimated Angler Hours	Percent of Total	
May 16-July 31 (6 a.m. to midnight)	11,278	47	12,677	53	23,955
August 1-Sept. 6 (6 a.m. to 7 p.m.)	<u>3,500</u>	<u>59</u>	<u>2,402</u>	<u>41</u>	<u>5,902</u>
Total	14,778	49	15,079	51	29,857

Anglers returning to the boat launch ramp during the sampling period were interviewed to determine catch success for completed trips. During the season a total of 200 anglers contacted had fished 530 hours and kept 292 coho salmon and 34 rainbow trout. The catch rate for fish kept was 0.55 coho salmon per hour and 0.064 rainbow trout per hour (Table 11).

The catch rate for coho salmon was considerably lower than the 1981 record high level of 1.59 coho salmon per hour, when a strong Age II year class prevailed. This year class, as Age III in 1982 ranged from 282 to 430 mm, and was predominant in the reported catch until July when Age I coho salmon began entering the creel in greater abundance. The August and September harvest was almost exclusively Age I coho salmon having a mean length of approximately 230 mm.

The rainbow trout catch rate of 0.064, although low, continues to show improvement from the previous 3 years which ranged from 0.003 to 0.025. Of the 34 rainbow trout examined in the sport harvest, 87% were Age III from the 1979 stocking of 33,000 (22 fish/acre) Swanson rainbow trout, while only 13% were from the 1980 stocking of 87,600 (58 fish/acre) Swanson rainbow trout. The mean length of the Age II rainbow trout ranged from 310 to 314 mm, while the Age III fish ranged from 394-460 mm. The mean length of all rainbow trout observed in the creel was 415 mm.

The expanded total harvest based on catch rate estimates was 16,421 coho salmon and 1,911 rainbow trout. This compares to 1981 harvest estimates of 52,639 coho salmon and 827 rainbow trout. The 1982 estimates reflect the stocking of Swanson rainbow trout in 1979 and 1980 and the fact that coho salmon were not stocked in 1980.

Winter fishing success on Quartz Lake was monitored from November 7, 1981 to April 14, 1982. During the period 109 anglers contacted had fished 317 hours and harvested 173 coho salmon and 45 rainbow trout for catch rates of 0.55 and 0.14 fish/hr respectively, (Table 12).

A sample of 70 coho salmon had a length range of 200-398 mm, a mean of 299 mm and were predominantly Age III (1979 plant). The 45 rainbow trout sampled had a length range of 252-458 mm with a mean of 393 mm. The age composition was 91% Age III (1979 plant) and 9% Age II (1980 plant).

A comparison of on-site pressure and harvest estimates with postal survey results by Mills (1979, 1980, 1981a, 1981b, 1982) is shown in Table 13. The postal survey covers the period from January 1 to September 30, while the on-site estimates generally cover the period from mid May through Labor Day weekend. The table illustrates the steady decline in rainbow trout harvest from 1977 to 1980, as well as the reversal of the trend in 1981 and 1982, when rainbow trout harvest dramatically increased as a result of the 1979 and 1980 plants of Swanson rainbow trout.

The contribution of Swanson rainbows is brought into better perspective when numbers of fish stocked are compared. In the four years prior to the 1977 on-site estimate of 2,488 rainbow trout harvested, a total of 777,400 rainbow trout of the Winthrop, Ennis and Oregon strains were stocked. In comparison, during the four years prior to the 1982 on-site estimate of

Table 11. Quartz Lake creel census summary *, May 16 to September 6, 1982.

Month	Anglers	Total Hrs Fished	Coho Salmon				Rainbow Trout				Fish per Hour**			Hrs. per Trip
			Total Kept	No. Sampled	Length (mm)		Total Kept	No. Sampled	Length (mm)		SS	RI	Total	
					Range	Mean			Range	Mean				
May	55	147	2	1	324		17	17	314-450	418	0.01	0.116	0.13	2.7
June	48	119	41	24	160-430	281	17	17	310-460	411	0.35	0.143	0.49	2.5
July	49	155	91	91	152-428	275	0	0			0.59		0.59	3.2
August	31	70	96	96	178-350	225	0	0			1.37		1.37	2.3
Sept.	<u>17</u>	<u>39</u>	<u>62</u>	<u>62</u>	<u>205-261</u>	<u>234</u>	<u>0</u>	<u>0</u>			<u>1.61</u>		<u>1.61</u>	<u>2.3</u>
Total	200	530	292	274	152-430	249	34	34	310-460	415	0.55	0.064	0.62	2.7

* All data presented are for completed trips.

** Fish per hour is only for fish kept.

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Table 12. Quartz Lake winter creel census summary, November 7, 1981 to April 14, 1982.

Anglers Contacted	Total Hours Fished	Coho Salmon				Rainbow Trout				Fish per Hour		
		Total Kept	No. Sampled	Length (mm)		Total Kept	No. Sampled	Length (mm)		SS	RI	Total
				Range	Mean			Range	Mean			
109	317	173	70	200-398	299	45	45	252-458	393	0.55	0.14	0.69

Table 13. A comparison of on-site pressure and harvest estimates with postal survey* results, Quartz Lake, 1977-1981.

Year	On-Site Estimates			Postal Survey		
	Man- ^{**} Days	RT	SS	Man- Days	RT	SS
1977	8,884	2,488	0	6,317	2,634	0
1978	5,704	639	16,449	6,845	512	14,892
1979	8,580	240	33,393	10,150	273	34,787
1980	9,647	81	25,121	13,994	129	23,316
1981	11,824	827	52,639	19,599	1,869	50,965
1982	10,663	1,911	16,421			

* The postal survey was conducted by Michael J. Mills, Biometrician, Sport Fish Division, Anchorage. The postal survey covers the period from Jan. 1 to Sept. 30, while the on-site estimates generally cover the period from mid May through Labor Day weekend.

** Man-days were calculated by dividing total angler hour estimates by the mean number of hours per trip (2.8) for 1977-1980.

1,911 rainbow trout harvested, a total of only 120,500 Swanson rainbow trout were stocked (no rainbows were stocked in 1978 or 1981).

George Lake:

George Lake, located about 40 miles east of Delta Junction, continues to be the most heavily utilized northern pike fishery in the Delta area. Civilian and military anglers from the Delta and Fairbanks area are the principal users. The Tanana River isolates this 4,500-acre lake from the Alaska Highway, making it accessible only by boat or float plane. Float plane use is presently light. Fishing pressure is heaviest from breakup (usually near the end of May) until mid-July.

With total pressure and harvest estimates available from the Statewide Harvest Study conducted by Mills since 1977, no attempt was made to determine total use or harvest in the field. The 1981 use estimate for George Lake, of 1,351 man days, with an estimated 2,236 northern pike harvested (Mills, 1982), is the highest use and harvest estimate since the harvest study began in 1977 (Table 14).

Thirty anglers contacted during June harvested 40 northern pike ranging from 444 to 715 mm in length with a mean of 553 mm.

Fielding Lake:

Creel census was conducted at Fielding Lake from July 4 to September 5, 1982. Eighteen days censused during the period included 11 weekend days and 7 weekdays. Break up occurred during the week prior to Independence Day weekend.

Grayling, lake trout, burbot and round whitefish were reported in the harvest in 1982. To more accurately record angler effort and success, fish caught were separated into two groups: 1) those caught with hand held rods and 2) those caught with set lines. Results are summarized in Table 15.

Of 128 anglers contacted, 95 had fished with hand held rods and 33 had used set lines. The anglers using hand held rods fished a total of 288 hours and kept 124 grayling, 17 lake trout and one round whitefish. Fish/hr for grayling and lake trout respectively were 0.43 and 0.070.

Fifty-six percent of the grayling harvested were caught from the lake by boat anglers, while 44% were caught in the outlet stream adjacent to the public campground. Fishing success for grayling in the lake was good during July but declined in August and September. Seventy grayling sampled had a length range of 232-410 mm and a mean of 336 mm. Twenty-one grayling sampled in the outlet fishery were slightly smaller, having a mean length of 331 mm.

Grayling sampled in the creel were predominantly Age V and Age VI, comprising 36% and 32% of the total, respectively (Table 16).

Fifteen lake trout sampled had a length range of 310-813 mm and a mean of 478 mm. Age IX fish ranging from 430 to 550 mm comprised 40% of the

Table 14. George Lake effort and northern pike harvest estimates from postal surveys*, 1977-1981.

Year	Man Days Fished	Northern Pike Harvested
1977	854	1,227
1978	1,271	1,392
1979	903	2,018
1980	1,057	1,395
1981	1,351	2,236

* The postal survey was conducted by Michael J. Mills, Biometrician, Sport Fish Division, Anchorage.

Table 15. Fielding Lake creel census summary, July 4 to September 5, 1982.

FISHING METHOD: HAND HELD ROD

Anglers Contacted	95
Total Hours Fished	288

Grayling:

Total kept	124
Number sampled	70
Length range (mm)	232-410
Mean length (mm)	336
Grayling/hr	0.43

Lake Trout:

Total kept	17
Number sampled	15
Length range (mm)	310-813
Mean length (mm)	478
Lake trout/hr	0.070

Round Whitefish:

Total kept	1
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FISHING METHOD: SET LINES

Anglers contacted	33
Number Hooks fished overnight	301

Burbot:

Total caught	52
Total kept	36
Number sampled	19
Length range (mm)	305-1,016
Mean length (mm)	448
Burbot/hook (caught)	0.17
Burbot/hook (kept)	0.12

Lake Trout:

Total caught	2
Total kept	1

Table 16. Age frequency and lengths of sport harvested Arctic grayling from Fielding Lake, July and August, 1982.

Age Class	Number	Percent	Length (mm)	
			Range	Mean
III	5	7	232-262	247
IV	8	11	270-310	293
V	25	36	290-361	328
VI	22	32	328-410	358
VII	8	11	355-410	383
VIII	<u>2</u>	3	<u>395-405</u>	<u>400</u>
Total	70		232-410	336

sample. Five other age groups were represented. The largest lake trout was 813 mm and was Age XVI (Table 17).

Thirty-three anglers contacted had used set lines for burbot, fishing a total of 301 hooks in overnight sets. Once set, the lines were usually fished continuously for the duration of the trip, and were checked and baited daily. Anglers reported catching 52 burbot, keeping 36 and releasing 16. Fish per unit of effort reported as burbot/hook was 0.17 for burbot caught and 0.12 for burbot kept (Table 15).

Nineteen burbot sampled had a length range of 305-1,016 mm and a mean of 448 mm. Six age classes were represented in the sample. Ages VI, VII, VIII and IX comprised 32%, 26%, 21% and 11% of the sample, respectively. The largest individual observed was 1,016 mm (40 inches) in length and 7.5 kg (16.5 pounds) in weight and was Age XV (Table 18).

Two lake trout were reported caught on lines set for burbot. One 635 mm in length was kept and another 595 mm in length was released. Pressure on Fielding Lake was heaviest on Independence Day weekend when every available parking spot in the campground and adjoining private property was occupied. Thirty-two boat anglers and five shore anglers were counted at 10 p.m. on July 3. Also on July 3, a total of 50 jug sets were counted, with a total of approximately 125 hooks.

There are 14 private cabins located on the north and north-east shore.

The Statewide Harvest Study (Mills, 1982) reported 1,369 man-days of effort and a total harvest of 1,913 grayling, 295 lake trout, 249 burbot and 11 round whitefish for the 1981 season.

Lake Surveys

Fielding Lake:

Fielding is a 1,660-acre lake located at an elevation of 2,973 feet in the Alaska Range about 65 miles south of Delta Junction near Mile 200.5 Richardson Highway. Maximum depth located during bottom contour mapping in 1982 was 74 feet (Figure 2). The lake has four inlets with estimated flows ranging from 2 to 10 cfs, plus three inlets that flow seasonally. The outlet flows from the north end of the lake about 2 miles before entering Phelan Creek a tributary of the Delta River. Aquatic vegetation is plentiful in depths less than 15 feet, particularly in the south end of the lake. The lake is usually ice free from late June until mid October.

Water chemistry recorded on August 6, 1982 was as follows: pH = 8.7, total alkalinity = 86 ppm, total hardness = 68 ppm and conductivity = 90 μ mhos. Dissolved oxygen levels recorded on July 9 were 9 ppm at the surface, 10 ppm at 20 ft and 7 ppm at 45 ft. On August 6 dissolved oxygen at the surface and at 45 ft was 9 ppm. Temperature profiles taken during the season are shown in Table 19.

Surface water temperatures warmed relatively quickly after breakup to 12°C on July 7, reaching a maximum of 14°C on August 6 and cooling to 6.8°C on October 1, at which time the lake was nearly homeothermous. Temperature at

Table 17. Age frequency and lengths of sport harvested lake trout from Fielding Lake, July and August, 1982.

Age Class	Number	Percent	Length (mm)	
			Range	Mean
VI	3	20	310-352	333
VII	1	7	423	...
VIII	3	20	451-494	472
IX	6	40	430-550	502
XII	1	7	641	...
XVI	<u>1</u>	7	<u>813</u>	<u>...</u>
Total	15		310-813	478

Table 18. Age frequency and lengths of sport harvested burbot from Fielding Lake, July and August, 1982.

Age Class	Number	Percent	Length (mm)	
			Range	Mean
VI	6	32	356-419	389
VII	5	26	305-457	366
VIII	4	21	445-559	478
IX	2	11	460-508	484
X	1	5	457	...
XV	<u>1</u>	5	<u>1,016</u>	<u>---</u>
Total	19		305-1,016	448

FIELDING LAKE

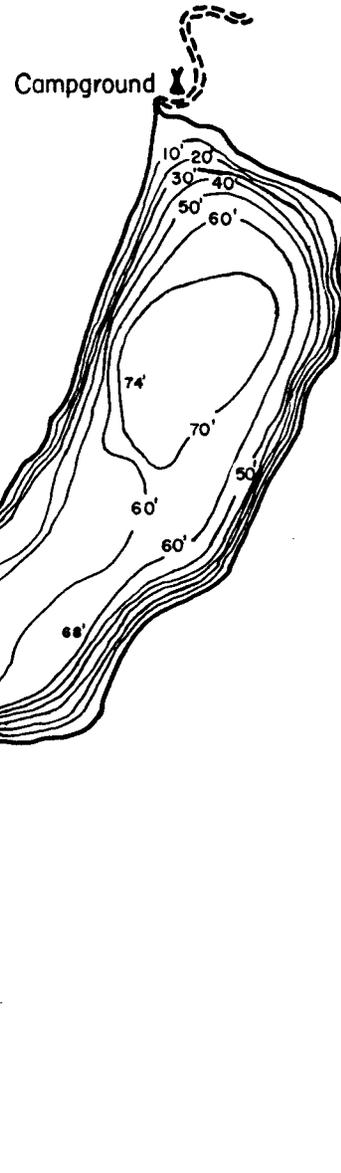
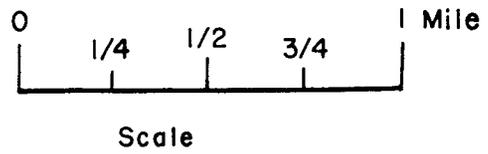


Figure 2. Bathymetric map of Fielding Lake.

Table 19. Temperature profiles, Fielding Lake, July 7 to October 1, 1982.

Date	<u>7/7/82</u>	<u>7/9/82</u>	<u>8/6/82</u>	<u>8/21/82</u>	<u>10/1/82</u>
Depth (ft)	Temp. (C ^o)				
Surface	12.0	12.1	14.0	12.8	6.8
5	10.0	11.0	11.0	12.0	6.8
10	8.0	11.0	11.0	11.5	6.8
15	7.6	10.5	11.0	11.3	6.9
20	7.5	8.0	11.0	11.0	6.9
25	7.0	6.8	10.5	11.0	6.9
30	6.5	6.0	10.2	10.5	6.9
35	6.0	5.1	10.0	10.3	6.9
40	5.9 (bottom)	5.0	9.9	10.0	6.5
45		4.8	9.9	10.0	6.5
50		4.2	9.5	9.5	6.5

50 ft depth (the limit of the recording cord) was 4.2°C on July 9, 9.5°C on August 6, 9.5°C on August 21 and 6.5°C on October 1. On October 8, ice 1½ in thick was present in the protected bays and surface temperature in the main body of the lake was 5°C.

The fish population was sampled from July 6 to October 8 using fyke nets, hoop nets, minnow traps, jug sets and gill nets. Totals of 13 burbot, 42 grayling, 115 round whitefish and 18 slimy sculpin were captured in 11 fyke net sets. Results are summarized in Table 20. Most of the fish were juveniles less than 200 mm in length. One set on July 7, captured 83 round whitefish, 5 grayling, 3 burbot and 2 slimy sculpin. Another set at the outlet on October 1, captured 23 grayling, 1 round whitefish and 1 slimy sculpin.

Three hoop nets without leads were baited and set in 22-30 ft depth for 13 to 20 hours. No fish were captured.

Minnow traps baited with salmon eggs and canned cat food were fished at 15 locations ranging from depths of 10 to 70 ft during July and August. Sets were fished from 13 to 20 hours. A slimy sculpin caught at a depth of 57 ft was the only fish captured.

Set lines with single hooks, having a 3/4 in gap between point and shank, were fished in depths of 10 to 40 ft from July 6 to October 8. The purposes of the sampling were to determine accurate catch rates and sizes of the catch for burbot, to tag burbot and to determine the rate of incidental take of lake trout. Results are summarized in Table 21.

Twenty-eight burbot ranging from 320 to 756 mm with a mean of 483 mm were caught on 121 hooks fished for a total of 2,562 hook hours. Three lake trout ranging from 418 to 514 mm were also caught. Burbot and lake trout were caught at rates of 0.011 and 0.001 fish/hook hour, respectively. Burbot caught in October were larger, having a mean length of 566 mm, compared to mean lengths of 488 mm in July and 443 mm in September.

Six burbot caught in late September and early October were tagged and released.

Age frequency, lengths and weights of burbot captured with set lines are shown in Table 22. Ages VII, VIII, IX and XII were represented in the sample, with Age IX burbot, having a mean length of 531 mm, comprising 50% of the catch. The largest burbot was 756 mm in length and weighted 2.8 kg (6.2 lbs) and was Age XII.

Gill nets were utilized only from September 28 to October 8 in an effort to locate possible lake trout spawning concentrations for sampling and tagging. A total of 21 sets were made in locations expected to provide suitable lake trout spawning habitat. Sets ranged from depths of 3-50 ft and were checked after periods ranging from 3/4 hour to 2 hours to minimize injury and mortality. Nets were fished from 10 a.m. to 6:30 p.m.. The two small mesh panels on most of the gill nets were bunched and tied to reduce the capture of species other than lake trout.

Table 20. Fish captured with fyke traps in Fielding Lake July 6 to October 1, 1982.

Species	Number	Percent	Length (mm)	
			Range	Mean
BB	13	7	80-330	172
GR	42	22	52-333	144
RWF	115	61	62-325	139
SSC	<u>18</u>	10	49-85	...
	188			

Table 21. Catch rate and length of burbot and lake trout caught on setlines in Fielding Lake, July 6 to October 8, 1982.

Dates	Hooks Fished	Total Hook Hrs.	BB/ Hook Hr.	LT/ Hook Hr.	BB			LT	
					No.	Length (mm) Range	Mean	No.	Length (mm)
7-6 to 7-9	19	395	0.013	0.000	5	412-572	488	0	
8-6 to 8-7	19	160	0.000	0.000	0			0	
9-28 to 9-30	53	1,188	0.013	0.001	16	320-552	443	1	424
10-1 to 10-8	30	819	0.009	0.002	7	384-756	566	2	418 & 514
Total	<u>121</u>	<u>2,562</u>	<u>0.011</u>	<u>0.001</u>	<u>28</u>	<u>320-756</u>	<u>483</u>	<u>3</u>	

Table 22. Age frequency, lengths and weights of burbot captured with set lines in Fielding Lake July 7 to October 8, 1982.

Age Class	Number	Percent	Length (mm)		Weight (kg)	
			Range	Mean	Range	Mean
VII	2	10	388-422	405	0.33-0.44	0.37
VIII	7	35	374-619	490	0.33-1.36	0.67
IX	10	50	438-597	531	0.60-1.45	0.96
XII	$\frac{1}{20}$	5	$\frac{756}{374-756}$	$\frac{515}{515}$	$\frac{2.8}{0.33-2.8}$	$\frac{0.84}{0.84}$

Thirteen lake trout were captured during a total of 27 net hours. Two of the lake trout died as a result of the netting. Thirteen lake trout were tagged and released, including 11 caught by gill nets and two by trolling.

The 13 lake trout captured by gill nets ranged from 410 to 840 mm in length with a mean of 573 mm (22.6 in) and ranged from 0.65 to 9.20 kg in weight with a mean of 3.2 kg (7.04 lbs). The largest lake trout netted was 840 mm (33.1 in) and 9.2 kg (20.25 lbs).

Since otoliths were used for lake trout aging, only the two mortalities from gill netting and three mortalities from jug fishing were aged. Lengths and ages are as follows: 410 mm, Age VI; 414 mm, Age VII; and 418 mm, 424 mm and 514 mm, Age VIII. For additional age and length data refer to the section on angler harvest and pressure.

Seven age groups were represented in a combined sample of 30 grayling captured with fyke nets and gill nets. The age-length data are presented in Table 23. Additional age-length information on grayling from Fielding Lake is presented in the Angler Pressure and Sport Fish Harvest section of this report.

Monte Lake:

Monte is a 179-acre lake located near the Robertson River about 74 miles southeast of Delta Junction. It is at an elevation of 1,750 ft, has a maximum depth of 95 ft and is accessible only by float plane or 10 miles by overland trail from Mile 1,348 on the Alaska Highway. The lake has no outlet.

Two gill nets fished for a total of 46 net hours on August 28, 1982 captured 9 lake trout having a length range of 333-418 mm and a mean length of 393 mm. Weight ranged from 0.45 to 1.05 kg with a mean of 0.82 kg.

Present utilization of the lake is light and success is poor. A total of 30,000 rainbow trout was stocked in the lake on September 1, 1982.

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Table 23. Age and lengths of Arctic grayling captured in Fielding Lake, September 28 - October 7, 1982.

	Age Class						
	0	I	II	III	IV	V	VI
	54	98	172	226	306	333	359
	62	112	174	246	318	334	
	62	115	224	256		340	
	70	120		282		340	
	72	126				343	
		146				347	
		148				352	
						355	
Mean Length (mm)	70	124	190	253	312	343	

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