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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

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RESEARCH PROJECT SEGMENT

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ABSTRACT

Fifteen 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.

Estimates of survival to Age I of Swanson rainbow trout in three lakes ranged from 44 to 69%, the highest ever recorded for rainbow trout in the Delta area stocked lakes. Growth and condition are also discussed.

A population of Arctic grayling, Thymallus arcticus (Pallas) was established and natural reproduction documented in a 10 acre lake located in the Alaska Range.

Estimates of angler use and sport harvest were made on Quartz Lake from May 28 through September 6, 1983. The pressure estimate for the period was 7,571 man days. Total estimated harvest for the period was 8,307 coho salmon and 62 rainbow trout.

Catch rates, size and age of fish harvested are given for both summer and winter censuses.

Harvest and use data for Fielding, George and Volkmar Lakes are also discussed.

Sampling of the northern pike, Esox lucius Linnaeus population in George Lake and Volkmar Lake utilized several gear types with variable results.

Fyke nets were ineffective for capturing adult pike even during early spring spawning activity in Volkmar Lake, but caught several juvenile pike during July sampling. Sizes of fish captured are presented.

During a three day float of the Delta River below Tangle Lakes, a total of 153 grayling was caught ranging from 115 to 414 mm and having a mean length of 295 mm. This compares closely with samples from prior years. Age classes II-IX were represented, with Age VI grayling comprising 24% of the sample.

Potential detrimental impact of the fishery and aquatic habitat in the Delta Clearwater River resulting from land clearing and agricultural activities has become a major concern in recent years. The first observable impact occurred in May, 1982, when stained water from cleared lands reached the Delta Clearwater River. Remedial action and monitoring efforts being conducted in cooperation with other agencies are discussed.

The status of access concerns on Jan Lake and George Lake are addressed.

KEY WORDS

Interior Alaska, Tanana River drainage, stocked fish evaluation, survival estimates, rainbow trout, coho salmon, northern pike, angler use and harvest, lake surveys, agricultural impacts and access.

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 confluence 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 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.

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.

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

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

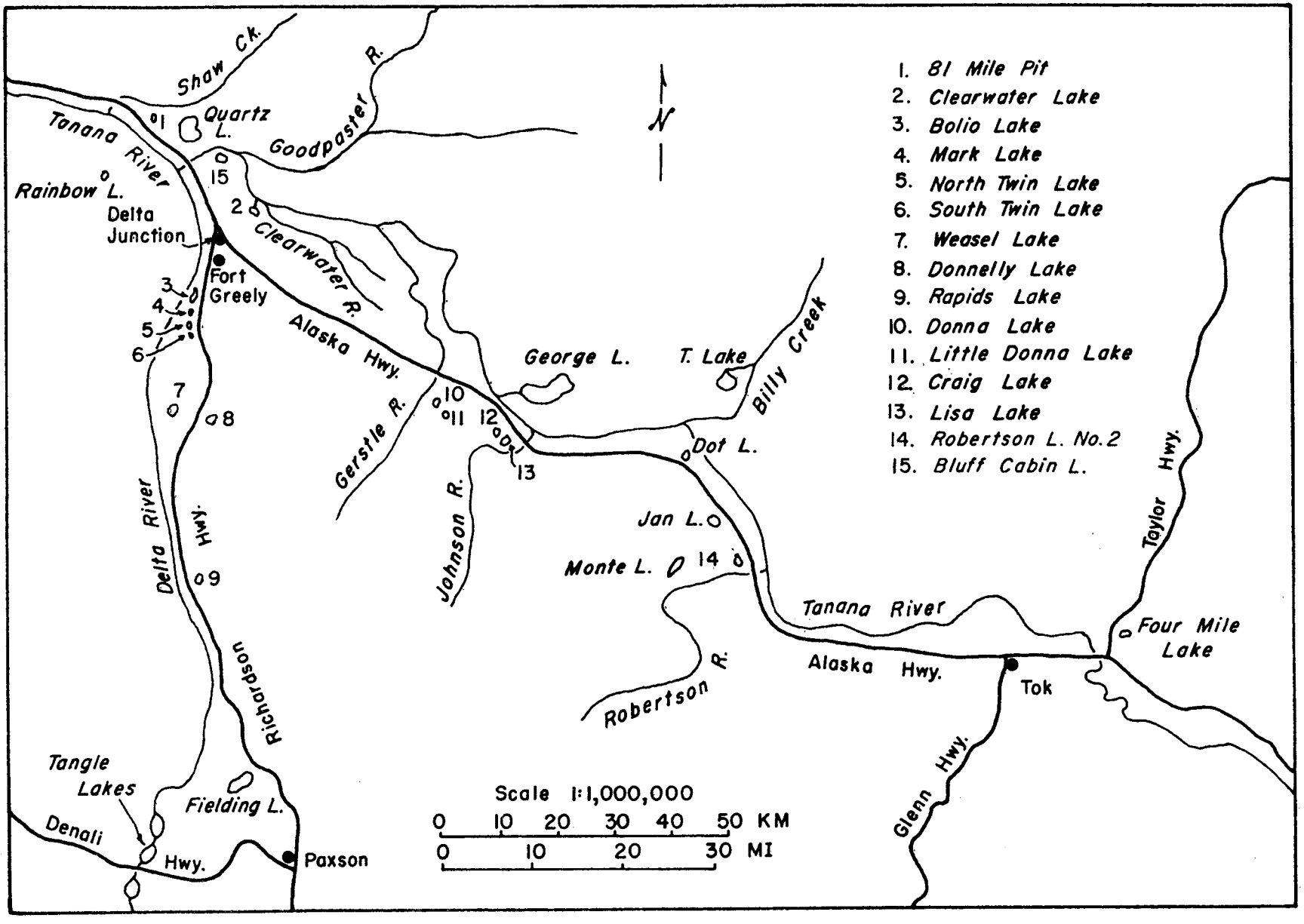

Figure 1. Location of waters in the Delta district.

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 Little Donna, Mark and North Twin Lakes.

3. Continue life history investigations of burbot, lake trout and grayling in Fielding Lake.

4. Intensify northern pike sampling efforts on Volkmar and George Lakes to more accurately assess size and age composition and population trends.

Management

1. Continue monitoring angler harvest on Quartz, George, Volkmar and Fielding Lakes.

2. Document current use levels and harvest composition on Denali Highway Lakes (Glacier, Landmark Gap and Tangles).

3. Investigate the feasibility of utilizing aeration devices to prevent winterkill in three managed Ft. Greely Lakes (Big, Bolio and South Twin).

4. Continue to survey new lakes in the area, particularly between Tok and the Canadian border to determine present sport fishing opportunities of indigenous fish species or stocking potential.

5. Cooperate with U.S. Fish and Wildlife Service and other appropriate agencies in improving and marking access trails to selected waters that currently offer sport fishing opportunities in the Tok area.

OBJECTIVES

1. To evaluate stocking policies for rainbow trout and coho salmon in 16 lakes in the Delta-Tok District and formulate stocking recommendations for optimum survival and growth. Emphasis will be placed on assessing growth and survival of Swanson strain rainbow trout stocked in 1982 in eight lakes (Quartz, South Twin, North Twin, Mark, Four Mile, Ft. Greely #2, Hidden and Monte Lakes) from May 15 to September 30. Comparison will be made of growth and survival relative to stocking rates, size of fish stocked and strains. Population estimates will be made of Age I Swanson rainbow trout in Mark Lake, North Twin Lake and Ft. Greely #2 Lake.

2. To obtain estimates of existing or potential angler use and sport fish harvest on Quartz, George, Volkmar and Fielding Lakes by angler interviews and catch sampling for the summer season from breakup to September 5 and for the winter season from November through April.

3. To assess existing natural fish stocks in several high-use fisheries (Fielding Lake, George Lake, Volkmar Lake and the Delta River) both summer and winter (except Delta River) to determine changes in population structure (size and age composition) to provide a data base for comparison with past and future data, and to make regulatory decisions that will assure continued quality fisheries and prevent possible overexploitation.

4. To monitor the effects of development programs (particularly large-scale agricultural activity near the headwaters of the Delta Clearwater River) on fisheries habitat from April through September and obtain water quality samples for comparison with baseline sampling conducted in 1977 and 1978. Also collect water samples from the Richardson Clearwater River to provide baseline data prior to proposed agricultural land disposals.

5. Assist as required on a continual basis in the investigation of public access status on George, Healy, Jan, Mansfield and Tetlin Lakes and other waters affected by the Alaska Native Claims Settlement Act and work with appropriate State and Federal agencies in obtaining easements or access agreements.

TECHNIQUES USED

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.

New Hampshire and South Dakota style fyke nets were used in capture and recapture efforts for population estimates in stocked lakes. 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 captured in these nets were marked by fin removal (usually adipose) and released in deep water. Initial capture efforts usually utilized two to four fyke nets per lake fished for two to three overnight periods. Recapture efforts were made 10 days after marking and release, with nets fished one or two overnight periods.

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

Fork lengths of fish were measured to the nearest millimeter. Weights were measured to the nearest 0.1 g on a triple beam balance or to the

nearest 0.01 pound on a Chatillon platform balance. Larger fish were weighed on a Chatillon IN-6 or IN-25 spring scale. Condition factors were determined by the formula $K=W \div L^3 \times 10^5$, where K = condition factor, W = weight in g and L = length in millimeters. Fish were tagged with Floy FD-68 anchor tags.

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 seconds and read along their dorsal radius on a 3M 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 wet 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.

FINDINGS

Fish Stocking Evaluation

Fish population sampling was conducted for survival and growth evaluation of rainbow trout and coho salmon from August 18 to September 15 on 14 lakes. Lakes were sampled with one or two gill nets, with the exception of Quartz Lake which was fished with three gill nets. Nets were fished for 15.5 to 26.8 hours. One additional lake, Monte, was netted with two gill nets fished for 22.5 hours under ice on November 16.

Netting results, population characteristics and stocking histories are summarized in Table 2. Seven lakes, Four Mile, Hidden, Mark, Monte, North Twin, Quartz and Weasel, had catch frequencies (fish per net hour) for Age I Swanson rainbow trout of 0.29, 5.33, 0.87, 0.44, 0.75, 0.72 and 3.50 respectively. Hidden Lake, with the highest catch frequency of 5.33, was stocked at the lowest density of 133 fish/acre. It was also a new lake, stocked for the first time in 1982.

Predation from sheefish may have been a factor in the lowest catch of 0.29 fish/hr in Four Mile Lake.

The lake was test-netted immediately after rainbow trout were stocked on September 1, 1982. Two sheefish sampled near the stocking site each had trout in their stomachs; one had 34 and the other had 12.

Older age classes of fish were also present in Mark, Monte, Quartz and Weasel Lakes. A light population of Age III rainbow trout was present in Mark Lake. Monte Lake has an indigenous population of lake trout (332-450 mm). Quartz Lake had two older age classes of rainbow trout and Age II coho salmon. One Age IX rainbow trout was netted in Weasel Lake.

Table 2. Population characteristics of stocked lakes determined by graduated mesh gill nets, Interior Alaska, 1983.

Lake	Date Sampled	Species	No. Captured	Age Class	Length (mm) Range	Length (mm) Mean	Freq.*	Date Stocked	Total Number	No./ lb.	No./ acre	Source
Bluff Cabin	9/15	RT	17	III	400-532	493	0.35	7/23/80	5,000	414	100	Talarik
Coal Mine #5	8/18	SS	17	II	169-278	205	0.76	5/14/81	3,000	374	300	Seward
Donna	9/08	RT	9	III	515-610	549	0.19	7/23/80	5,000	414	86	Talarik
Donnelly	8/18	SS	7	I	215-236	226	0.18	6/17/82	5,600	224	86	Seward
		SS	3	III	272-302	282	0.08	5/27/80	10,000	216	154	Ship Creek
Four Mile	8/30	RT	15	I	209-247	227	0.29	9/01/82	25,700	315	257	Swanson
		RT	8	VI	395-463	439	0.16	6/13/77	24,800	95	248	Ennis
		SF	4	V	476-505	490	0.08					
Hidden	8/30	RT	83	I	193-259	220	5.33	9/01/82	4,000	315	133	Swanson
Lisa	9/08	SS	41	I	180-215	197	0.85	6/17/82	8,500	224	170	Seward
Little Donna	9/08	RT	4	IV	529-570	555	0.08	9/18/79	3,550	203	76	Talarik
Mark	8/22	RT	23	I	119-237	181	0.87	9/16/82	8,000	140	400	Swanson
		RT	3	III	496-532	515	0.11	7/23/80	2,000	414	100	Talarik
Monte	11/16	RT	20	I	200-247	223	0.44	9/01/82	30,000	315	168	Swanson
		LT	15	...	332-450	392	0.33					
North Twin	8/22	RT	19	I	120-270	172	0.75	9/16/82	6,000	140	261	Swanson
Quartz	9/07	RT	46	I	197-260	224	0.72	9/15/82	226,600	360	151	Swanson
		RT	4	III	458-487	478	0.06	8/28/80	87,600	372	58	Swanson
		RT	3	IV	450-515	488	0.05	9/13/79	33,000	283	22	Swanson
		SS	54	0	111-225	197	0.85	5/23/83	46,550	170	31	Clear Creek
		SS	8	II	334-415	368	0.13	5/14&19/81	149,500	303-374	100	Bear Creek
Rapids	8/24	RT	2	II	275-300	288	0.04	Natural Reproduction				
		RT	5	III	285-332	308	0.10	7/23/80	500	413	100	Talarik
Robertson #2	9/08	RT	7	IV	347-388	368	0.30	9/18/79	2,450	203	306	Talarik
Weasel	8/22	RT	84	I	115-237	192	3.50	9/16/82	2,000	140	250	Swanson
(Ft. Greely #2**)		RT	1	IX	510		0.04	7/10/74	10,000	588	1,250	Winthrop

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

** Ft. Greely #2 was renamed by military personnel.

The catch frequencies of Age I Swanson trout suggest overall good survival from stocked fish and compare favorably with catch frequencies for Age I Talarik rainbow trout of 0.36-1.22 with a mean frequency of 0.68 for seven lakes sampled in 1980 and 1981 (Peckham, 1981 and 1982).

The catch rate of 0.72 for Age I Swanson trout in Quartz Lake is the highest since the first sampling of Age I Ennis trout in 1973, following rehabilitation in 1970. A comparison of capture rates, growth and stocking data for Age I rainbow trout in Quartz Lake from 1973 to 1983 is shown in Table 3. Rainbow trout were unavailable for stocking in 1978 and 1981.

Length to Age I for the Swanson rainbow trout is less than other strains previously stocked, however size of Swanson fish stocked has been smaller and the planting dates have been later.

Mean lengths for Age I Swanson trout in the seven lakes sampled in 1983 ranged from 172 to 227 mm with an overall mean of 206 mm.

Age I coho salmon sampled in Donnelly and Lisa Lakes had mean lengths of 226 mm and 197 mm and were captured at rates of 0.18 and 0.85 fish/hr, respectively. Donnelly Lake was stocked at a rate of 86 fish/acre, while Lisa Lake received 170 fish/acre.

Age 0 coho salmon in Quartz Lake demonstrated exceptional growth from date of stocking on May 23, 1983 to September 7, 1983. The fish planted at a size of 170 fish/lb ranged from 111 to 225 mm, with a mean length of 197 mm and mean weight of 0.23 lb or 4.35 fish/lb in the fall sample. A mid-summer sample of 60 coho salmon captured with fyke nets on July 14 provided a mean length 122 mm and mean weight of 0.05 or 20.69 fish/lb. The condition factors for the July and September samples were 1.21 and 1.36, respectively.

Janell, a 10-acre lake located in the Alaska Range at an elevation of 3,950 ft, was experimentally stocked with 440 pond-reared grayling (45 fish/lb) on August 10, 1978. On August 10, 1979 a 12-hour set using a 1/2" x 25' x 6' gill net panel caught four grayling 217-244 mm in length with a mean of 234 mm.

No further sampling was conducted until June 28, 1983, when an experimental gill net was set for 1 hour. Natural reproduction was documented with the capture of two age classes other than the original plant. Of the five grayling captured, 2 were Age II (139 mm and 154 mm), 2 were Age III (229 mm and 237 mm) and 1 was Age V (323 mm). Numerous grayling in the 130-160 mm length range were observed in the shallows.

At least three small inlets have permanent flow throughout the summer. The outlet flows through large boulders into Dry Creek, a tributary of the Tanana River. Steep gradient and falls are a barrier to upstream fish migration from Dry Creek. Maximum depth of the lake is 33 ft.

Table 3. Comparison of capture rates, growth and stocking data for various strains of rainbow trout to Age I in Quartz Lake, 1973-1983.

Date Sampled	No. Captured	Length (mm) Range	Length (mm) Mean	Freq.*	Date Stocked	Total No.	No. /lb.	No. /acre	Source
8/08/73	71	269-391	335	1.97	6/23-7/26/72	306,800	106-163	204	Ennis
11/14/74	22	275-352	323	0.52	8/1-8/15/73	285,100	98-105	190	Winthrop
10/08/75	16	225-310	275	0.33	7/10-8/28/74	184,600	119-588	123	Winthrop
9/08/76	2	274-289	282	0.05	7/24-28/75	210,000	171-186	140	Ennis
9/13/77	2	300-304	302	0.04	8/3-24/76	97,800	100-670	65	Oregon
9/26/78	1	264	...	0.01	7/26-8/11/77	113,800	11-304	76	Ennis-Alaska
8/27/80	8	193-240	219	0.09	9/13/79	32,858	283	22	Swanson
9/03/81	18	200-315	226	0.31	8/28/80	87,600	372	58	Swanson
9/07/83	46	197-260	224	0.72	9/15/82	226,600	360	151	Swanson

* Fish per net hour, 125' graduated mesh gill net.

Survival Estimates:

Estimates of survival to Age I of Swanson rainbow trout made in Mark, North Twin and Weasel Lakes were 44%, 48% and 69%, respectively (Table 4). These are the highest survival estimates ever recorded for rainbow trout in the Delta area.

In comparison, survival to Age I for Talarik rainbow trout sampled in three lakes in 1980 and four lakes in 1981 ranged from 7-23% and 5-8%, respectively (Peckham, 1981, 1983). The lower survival experienced in 1981 was for fish stocked at a size of 414/lb, while the generally higher surviving Talarik rainbow in 1980 were 203/lb when stocked. The Swanson rainbow trout were stocked at a size of 140/lb and at densities ranging from 250 to 400 fish/acre.

Growth and Condition:

Growth and condition comparisons for Age I Swanson rainbow trout sampled in 1983 are presented in Table 5. Four of the lakes sampled in early and late summer demonstrated an increase in the condition factor in late summer, as one would expect.

The mean condition factor of 1.38 for Swanson trout in the seven lakes sampled in fall, 1983 was greater than the mean condition factor of 1.27 for fall sampled Talarik rainbow trout in four lakes during 1981 (Peckham, 1982). The mean lengths of fall sampled Swanson trout however, were considerably less than that of fall sampled Talarik trout (206 mm as compared to 259 mm).

Angler Pressure and Sport Fish Harvest Estimates

Fielding Lake:

Creel census has been conducted on Fielding Lake during the past two seasons to determine pressure and composition of the angler harvest, with particular interest in the sport harvest of burbot and lake trout. A more extensive creel census effort made in 1982 is reported by Peckham, 1983.

The high number of set lines for burbot and the small size of burbot caught continues to be the primary concern for this fishery. On July 2, 1983, there were 51 jug lines with 101 hooks set on Fielding Lake. Most of these sets were fished for 3 nights during the holiday weekend. Fifteen anglers contacted on July 2 and 3 that reported fishing for burbot caught 25, releasing five because of their small size and keeping 20. Seven burbot sampled ranged from 378 to 740 mm in length with a mean of 465 mm. Others kept, but not seen, were reported to range from 300 to 435 mm.

Moderate pressure also occurs in late winter. On March 20 and April 3, 1983, 10 anglers contacted had fished 120 hooks overnight, catching 40 burbot. Only two of the total exceeded 500 mm in length, one being 508 mm and the other 750 mm. Eighteen burbot sampled ranged from 305 to 750 mm in length, with a mean of 411 mm.

Table 4. Survival estimates for Age I Swanson rainbow trout in three interior Alaska lakes, 1983.

Lake	Surface Acres	Date of Estimate	Petersen Estimate	% Survival	95 % Confidence Level		No. Stocked	No./ lb.	No./ Acre
					Estimate	% Survival			
Mark	20	7/1/83	3,533	44	2,737-4,627	34-58	8,000	140	400
North Twin	23	7/1/83	2,897	48	2,468-3,419	41-57	6,000	140	261
Weasel	8	7/6/83	1,380	69	1,164-1,634	58-82	2,000	140	250

Table 5. Growth and condition comparisons for Age I Swanson rainbow trout in seven interior Alaska Lakes, 1983.

Lake	Date Sampled	Sample Size	Length (mm) Range	Length (mm) Mean	Weight (g) Range	Weight (g) Mean	K
Four Mile	8/30	15	209-247	227	113-213	163	1.39
Hidden	8/30	49	193-259	220	95-290	159	1.49
Mark	6/23	128	82-149	109	7-35	15	1.16
	8/22	23	119-237	181	23-181	82	1.38
Monte	11/16	12	200-247	223	91-181	132	1.19
North Twin	6/23	94	55-170	121	2-54	21	1.19
	8/22	19	120-270	172	23-277	79	1.55
Quartz	7/14	4	110-131	119	15-27	19	1.13
	9/06	45	197-260	224	100-331	159	1.41
Weasel	6/28	27	79-165	118	5-54	19	1.16
	7/06	23	94-158	124	10-44	23	1.21
	8/22	84	115-237	192	14-154	86	1.22

Two additional anglers contacted on April 24, 1983 had caught three burbot in overnight sets. All were about 300 mm in length and were released. The release of small burbot caught on set lines is another concern. Since most hooked burbot have swallowed the bait, mortality rate for fish released is probably high.

Thirty-seven anglers contacted during July reported catching 10 lake trout. Most of those were reported caught during a weekend trip and were not seen. Lengths obtained on three lake trout were 300 mm, 380 mm and 455 mm, with a mean of 378 mm.

Of 13 lake trout tagged from July 7 to October 1, 1982 three (23%) were reported caught in Fielding Lake from June 19 to July 7, 1983.

Grayling comprised the bulk of the harvest and were caught at a rate of 0.55 fish/hr. Twenty-six grayling sampled ranged from 248 to 405 mm, with a mean length of 325 mm.

The Statewide Harvest Survey by Mills (1982 and 1983) shows total effort on Fielding Lake more than doubled from 1,369 man days in 1981 to 2,764 man-days in 1982.

Reported harvest of all species increased and grayling harvest was 1.6 times greater than in 1981.

George Lake:

A description of George Lake and data pertaining to past use and northern pike harvest are presented by Peckham (1982 and 1983). 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.

Creel census was conducted on 4 week-end days and 2 week-days from May 30 to August 16, 1983. A total of 46 anglers contacted kept 101 northern pike with a length range of 390-953 mm and mean of 546 mm. Catch per hour for fish kept was 0.38 and for fish caught was 0.68. Winter fishing pressure is presently very light.

Volkmar Lake:

Volkmar is a 675-surface-acre lake located about 17 miles northeast of Delta Junction. During the summer access is limited to float planes with the exception of one private air strip located 3/4 mi north of the lake that was constructed in early 1983 and is used by a local transporter. Winter access is by ski-equipped planes or snow-machines. Prior to 1983 snow-machine access was via Quartz Lake and the Goodpaster River, a distance of about 28 miles. Development of additional agricultural lands east of Delta has resulted in improved access roads into the farm project area, hence improved winter access to Volkmar Lake via these roads to near the south bank of the Tanana River. Winter trails from that point shorten the distance to Volkmar Lake by at least 20 mi.

An additional event that has resulted in increased winter usage is the disposal of approximately 1,900 acres of state land near Volkmar Lake for staking under the remote parcel program, beginning in late winter 1982-1983. There are currently about 12 existing cabins used primarily in the summer by owners of float planes.

Visits to Volkmar Lake on 11 occasions from March 9 to July 30, 1983 for creel census and other fisheries survey activities resulted in very few anglers being contacted. Because of the small amount of catch data obtained it is included with other fish sampling data later in this report.

Volkmar Lake was included in the Statewide Harvest Survey for the first time in 1982 (Mills, 1983). The 546 estimated man-days of use is over half the estimated use on George Lake in 1982. The reported harvest was 777 northern pike and 21 humpback whitefish. Winter use accounts for a significantly higher percentage of the total on Volkman Lake.

Quartz Lake:

A statistically based schedule for sampling effort and harvest on Quartz Lake in conjunction with an economic survey was conducted by personnel from the Biometrics Section of the Sport Fish division, Anchorage. The census covered the hours from 6 a.m. to 11 p.m. from May 28 to September 6, 1983. A summary of the results is shown in Table 6.

The estimate of 7,571 man-days of effort with 8,307 coho salmon and 62 rainbow trout harvested is the lowest on-site estimate in the past 5 years. The decline was largely due to reduced availability of coho salmon. None were stocked in 1982. In addition, rainbow trout stocked in 1980 and 1982 have not entered the fishery in the quantity expected.

The catch rate for coho salmon peaked at 1.18 fish per hour from June 18 to 24, with an overall catch rate of 0.40 fish per hour for the season. Age 0 coho salmon which were stocked on May 23, 1983, were being harvested in small numbers as early as late July. By late August they were predominant in the harvest and averaged 190 mm in length. The mean length of 1,606 coho salmon sampled during the season was 292 mm. Twenty-eight rainbow trout had a mean length of 350 mm.

Winter fishing success was monitored from November 7, 1982 to April 19, 1983. During the period 88 anglers contacted had fished 182 hours and harvested 251 coho salmon and 6 rainbow trout for catch rates of 1.38 and 0.03 fish/hr, respectively (Table 7).

Fish Stock Assessment Studies

George Lake:

Fish population sampling was conducted from August 14 to 16 utilizing fyke nets, trap nets and sport fishing gear.

No fish were captured in two overnight fyke net sets.

Table 6. Quartz Lake Sport Fish Harvest and effort estimates May 28 to September 6, 1983.

	Weekly Period	Angler-hours	Angler-days	Coho Harvest	Rainbow Trout Harvest	Fish per hr. SS	Fish per hr. RT
1	5/28 - 6/3	2,730	1,088	689	28	0.25	0.010
2	6/4 - 6/10	978	319	327	7	0.33	0.007
3	6/11 - 6/17	1,386	531	358	11	0.38	0.007
4	6/18 - 6/24	2,870	876	3,392	5	1.18	0.002
5	6/25 - 7/1	2,202	796	1,353	8	0.61	0.004
6	7/2 - 7/8	2,962	1,010	978	0	0.33	...
7	7/9 - 7/15	1,498	583	262	0	0.17	...
8	7/16 - 7/22	1,272	404	511	0	0.40	...
9	7/23 - 7/29	1,585	535	108	0	0.07	...
10	7/30 - 8/5	807	294	127	0	0.16	...
11	8/6 - 8/12	875	425	11	0	0.01	...
12	8/13 - 8/19	751	341	74	0	0.10	...
13	8/20 - 8/26	459	199	29	3	0.06	0.007
14	8/27 - 9/2	230	72	54	0	0.23	...
15	9/3 - 9/6	234	98	34	0	0.14	...
	Total	20,839	7,571	8,307	62	0.40	0.003

Table 7. Quartz Lake winter creel census summary, November 7, 1982 to April 19, 1983.

Anglers Contacted	Total Hours Fished	Coho Salmon				Rainbow Trout				Fish per Hour		
		Total Kept	No. Sampled	Length (mm) Range	Mean	Total Kept	No. Sampled	Length (mm) Range	Mean	SS	RT	Total
88	182	251	207	218-447	267	6	6	410-520	441	1.38	0.03	1.42

A baited experimental burbot trap fished for two nights captured one burbot 260 mm in length and weighing 0.12 kg. Ten baited hooks were also fished continuously for 36 hours without success.

Sampling northern pike with sport fishing gear was relatively ineffective compared with success experienced during late May and June in prior years. During 2 days (4 man-days) only 12 northern pike ranging from 320 to 756 mm and with a mean length of 615 mm were caught.

During annual spring sampling from 1975 to 1981 length measurements were obtained on the average length of 240 northern pike, usually in a 3-to-5 day period during the last week of May or first week of June (unpublished). Sample size ranged from 111 to 387 northern pike. Mean lengths during the 7 years of sampling ranged from 450 to 516 mm with an average of 482 mm.

A northern pike tagged in George Lake on May 29, 1981 was recaptured on August 15, 1983. When tagged, the pike was 634 mm in length and weighed 1.6 kg. When recaptured 26.5 months later the length was 748 mm and weight was 3.4 kg. This is a gain of 114 mm (4.5 in) and 1.8 kg (4 lbs).

Volkmar Lake:

Sampling of the northern pike population in Volkmar Lake utilized: 1) overnight fyke net sets 2) short period gill net sets ranging from 12 to 70 minutes, and 3 hook and line sampling.

Fyke nets were set in shallows near known spawning areas from May 16 to 19. On May 16 the lake was still about 20% ice-covered and the water temperature at two locations ranged from 4 to 7°C. Although northern pike were observed in shallow vegetated areas along the lake margins, none were captured in three overnight sets. Only three humpback whitefish and several slimy sculpin were captured.

On May 19, three gill net sets ranging from 12 to 16 minutes in 0.5-2.0 mm depth captured a total of seven northern pike and nine humpback whitefish. Five of the northern pike were captured in an area where fish were observed spawning. One additional pike was captured with sport fishing gear. Of the eight pike captured on this date, six were males ranging from 475 to 692 mm, with a mean of 557 mm. Three were ripe and three appeared spent. The two females captured were 520 mm and 1,050 mm in length and 1.1 kg and 7.4 kg (16.25 lbs) in weight, respectively. Both were ripe.

Sampling from July 27 to 29, again utilized fyke nets, gill nets and sport fishing gear. Fyke nets fished for 2 nights caught seven northern pike ranging from 90 to 190 mm.

A gill net set for 70 minutes on July 28, in a depth of 3-6 meters caught seven northern pike ranging from 343 to 580 mm in length and seven humpback whitefish ranging from 290 to 360 mm in length.

Test fishing on July 27 and 28 using sport fishing gear resulted in the capture of 34 northern pike ranging from 280 to 775 mm.

The length range of 51 northern pike sampled in Volkmar Lake in 1983, excluding seven less than 200 mm, was 280-1,050 mm, with a mean of 523 mm. The weight range was 0.15-7.4 kg with a mean of 1.3 kg. A total of 38 pike sampled was tagged and released.

Delta River Grayling

The Alaska National Interest Lands Conservation Act of December 2, 1980, established the upper Delta River, Tangle Lakes and Tangle River as a component of the National Wild and Scenic River System, to be administered by the Secretary of the Interior through the Bureau of Land Management. The Tangle Lakes and Tangle River portion of the system (approximately 24 miles) is classified as "scenic," while the 20 mi stretch between the lakes and the Richardson Highway is designated "wild."

The lake and river section from Tangle Lakes at Mile 22 on the Denali Highway to Mile 212 on the Richardson Highway, a distance of approximately 28 mi, is a popular float trip and grayling fishery. Bureau of Land Management personnel estimated that 371 people used the Delta River during 1981 (Ziegler, et. al. 1981). The Statewide Harvest Study (Mills, 1982 and 1983) does not list the Delta River separately, however the estimated grayling harvest for Tangle Lakes in 1981 and 1982 was 6,858 and 9,590, respectively.

The grayling population in the Delta River was sampled by Sport Fish personnel using sport fishing gear (fly-rods) from July 27 to 29, 1983. 153 grayling were caught. During the 3-day float, ranging from 115 to 414 mm with a mean length of 295 mm. Age Classes II-IX were represented in a sample of 112 grayling (Table 8). This sample ranged from 181 to 370 mm and averaged 291 mm. Grayling of Ages IV, V and VI comprised 64% of the sample; Age VI fish were predominant with 24%.

Two waterfalls that are a barrier to upstream fish migration are located 2 miles below the outlet of lower Tangle Lakes. Of 112 grayling sampled, 51 captured above the falls had a mean length of 294 mm, while 61 captured below the falls had a mean length of 288 mm. The same observation of slightly larger grayling above the falls that have access to the lake system was noted in 1973 and 1974. A sample in 1973 of 279 grayling above the falls had a mean length of 304 mm as compared to a mean length of 281 mm for 363 grayling caught in the river section below the falls (Peckham, 1974). In 1974, 333 grayling above the falls had a mean length of 298 mm while 327 sampled below the falls averaged 270 mm (Peckham, 1975). The overall mean length for the 642 grayling sampled in 1973 and the 660 grayling sampled in 1974 was 291 mm and 284 mm respectively. This compares to a mean length of 295 mm for a sample of 116 grayling sampled in 1978 and a mean length of 295 mm for the 153 grayling sampled in 1983.

A comparison of length data for 1973-1983 is shown is Table 9.

The condition factor calculated for 16 grayling Ages IV-VIII sampled in 1983 was 1.03.

The Delta River offers a high quality recreational experience where floating (by canoe, kayak or rafts) in combination with excellent grayling fishing can be enjoyed in an area of high scenic appeal. The average length of trip is about 3 days and fishing is primarily catch and release except for fish eaten on the trip. During the 1983 sampling, 74 grayling were caught at a rate of 15.6 grayling/hr.

The data indicate no significant change in the mean length of grayling in the Delta River during the past 10 years. The current daily bag limit of five grayling for all of the Tanana River drainage affords further protection from increasing use.

Habitat Investigations

The future well-being of the Delta Clearwater River has become a major concern in recent years because of the accelerated rate of agricultural development with the advent of the Delta Agricultural Project in 1978. That phase of development, called Delta I, totals over 60,000 acres, while the second phase, Delta II East, adds an additional 26,000 acres. Most of the land is now cleared and approximately 20% was in production in 1983. The headwaters of the Delta Clearwater River and approximately the upper 10 miles of the river's southern flank is now bordered by large-scale agriculture.

The first observable impact from the Agricultural Project occurred in May 1982. The normally pristine clarity of the river changed to heretofore unseen dark humic stain that obscured the bottoms of pools and numbers of fish. The stain which was visible in the river from May 6 to at least May 17, resulted from the large volume of spring runoff from cleared fields which flowed through the greenbelt strip into the river's north fork. A firebreak trail constructed during a fire in 1979, which originated in the agricultural project during clearing operations, contributed to the problem by channeling the flow to within one-half mile of the headwaters.

Water samples were collected and analyzed in cooperation with the Department of Environmental Conservation (DEC). While 2, 4-D the major herbicide currently used in the agricultural project area was not detected, Pentachlorophenol (PCP), a wood preservative, was found in low concentrations. Tests for ortho-phosphate were inconclusive, being within the range commonly found in natural waters. The presence of PCP, and possibly other compounds not tested for, suggested a need for more comprehensive testing.

An index of relative fish abundance conducted by the Alaska Department of Fish and Game, Sport Fish Division for the previous 7 years showed 1982 grayling levels to be the lowest ever recorded. Sport harvest

Table 8. Age frequency and length of Arctic grayling captured in the Delta River, July, 1983.

Age Class	Number	Percent	Length (mm) Range	Mean
II	5	5	181-205	192
III	14	13	195-261	224
IV	21	19	204-311	272
V	24	21	281-327	303
VI	27	24	282-355	319
VII	14	12	310-345	326
VIII	6	5	309-345	327
IX	1	1	370	370
Totals	112	100	181-370	291

Table 9. Comparison of length data from Delta River Arctic Grayling, 1973-1983.

Year	Number Of Fish	Length (mm) Range	Mean
1973	642	116-400	291
1974	660	160-399	284
1978	116	177-394	295
1983	153	115-414	295

surveys also revealed a decline in catch rates, which had risen from 0.42 fish/angler hour in 1976 to 0.72 in 1981 (with a 5-year average of 0.60). The rate in 1982 fell back to 0.42.

Whether the apparent decline in grayling numbers in 1982 was a result of natural causes or from possible displacement caused by agricultural runoff, which coincided with normal grayling inmigration, is not known. However, the concern is evident for potential long lasting degradation of water quality, aquatic habitat and the fishery, resulting from fertilizers, herbicides and other agricultural chemicals.

Following the runoff problem in May 1982, several inspection trips were made with personnel from Department of Natural Resources (DNR), USDA Forest Service, USDA Soil Conservation Service (SCS), Department of Fish and Game and a private consultant (hired by DNR) to determine remedial action. The general consensus was that basically two factors contributed to the runoff problem. First, clearing land surrounding the headwaters of the river, except for the narrow greenbelt strip, has altered the runoff characteristics and has eliminated thousands of acres of natural vegetative cover that hold water and allowed it to dissipate slowly. Secondly, the construction of the firebreak in 1979 aggravated the problem by channeling runoff water to within one-half mile of the spring source of the river.

In December 1982, rehabilitation of the fireline trail was contracted by DNR. Restoration efforts involved pushing most of the material originally removed, back into the fireline. In addition, approximately 12 small detention dams were constructed across the fireline trail utilizing on-site material. The purpose of the work was to retard the flow and allow runoff water to spread into the undisturbed greenbelt area rather than being channeled.

The runoff problem experienced in 1982 demonstrates a lack of understanding of the effects that land clearing has on hydrologic systems in this area. The width of greenbelts necessary to protect the integrity of nearby streams is also not known, but is obviously greater than originally believed. This is especially disturbing because the Delta Agricultural Project borders the Delta Clearwater River, the largest spring-fed system accessible by road to interior Alaska sportsmen.

Equally disturbing is the fact that the proposed Delta II West Agricultural Project would border the headwaters of the Richardson Clearwater River, the only other large spring-fed system accessible (by riverboat) to interior Alaska anglers. This project, totaling 33,000 acres, was proposed for a March 1982 land sale but was postponed by then Governor Jay Hammond after numerous concerns were expressed at public meeting held by DNR in Delta Junction and Fairbanks in January 1982.

Prior to the 1983 field season DEC set up a schedule for monthly water quality sampling and flow measurements on the Delta Clearwater River starting before spring breakup. Parameters that were the best

indicators of possible impact from the Delta Agricultural Project, as well as being comparable to baseline studies conducted in 1977 and 1978, were chosen for testing.

In addition, fish samples were collected for fish tissue hydrocarbon analysis by DEC. Similar sampling of the water quality flows and fish was conducted on the Richardson Clearwater River to establish baseline information for that system.

Assistance was provided by Alaska Department of Fish and Game and U.S. Fish and Wildlife Service personnel in collecting water samples, making flow measurements and collecting fish samples.

At the time of this report the results of the fish tissue analysis are not available. Results of the water sample analyses are also not complete, but preliminary reports indicate data very comparable to the 1977 and 1978 baseline studies.

Monitoring of the spring runoff was conducted in April and May 1983. Less snowfall during winter 1982-83 and a gradual spring melt, unlike 1982, resulted in much less runoff from agricultural lands. Most runoff reaching the fireline trail was contained in the first two detention dams.

No staining was observed in the Delta Clearwater River in 1983.

Access

Access status remains relatively unchanged to two area waters affected by conveyance of lands to Native Village Corporations through provisions of the Alaska Natives Claims Settlement Act (ANCSA).

Attempts to resolve the access problem to Jan Lake by entering into a written agreement with the Dot Lake Native Corporation have resulted in little progress. Sport Fish Division personnel met in January 1984 with representatives from the offices of the Attorney General, Department of Transportation and Department of Natural Resources.

Legal action is one option being considered, since the State believes we have a legally strong case concerning the public right-of-way trail. The issue of whether there exists legal public access to the water of Jan Lake hinges upon the status of a trail constructed prior to statehood, which connects Jan Lake to the Alaska Highway at Mile 1352.5. The apparent confusion over this route's status stems from the fact that the route was not specifically described as a valid existing right in the ANCSA land conveyance document that conveyed to Dot Lake Native Corporation the bed of Jan Lake (deemed non-navigable by the Bureau of Land Management) and surrounding lands. It is the State's position that the route is a valid existing right (an R.S. 2477 right-of-way).

Beginning in 1982 a permit fee is required to cross any of the Dot Lake Native Corporation lands.

Although Jan Lake has been stocked by the Department of Fish and Game from 1955 to 1979 no further stocking is planned until the access problem is resolved.

Access status on George Lake is relatively unchanged from that reported in 1981 (Peckham, 1982).

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