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STATE OF ALASKA  
Walter J. Hickel, Governor

ANNUAL REPORT OF PROGRESS, 1967 - 1968

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-9

SPORT FISH INVESTIGATIONS OF ALASKA

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## INTRODUCTION

This report of progress consists of findings and work accomplished under the State of Alaska Federal Aid in Fish Restoration Project F-5-R-9, "Sport Fish Investigations of Alaska."

The project during this reporting period was composed of 21 separate studies. Of these, seven jobs continued the inventorying and cataloging of the numerous waters, providing a comprehensive index of the State's recreational waters. Nine jobs accomplished special studies involving Dolly Varden, grayling, silver salmon, king salmon and sheefish, among others. The remaining five jobs are designed to accomplish creel census, migration, access and silver salmon egg-take studies. The egg-take study, Job 7-F, was inactive because egg-takes were accomplished under other projects.

Special reports on specific phases of the Dolly Varden Life History Study have been published in the Department's Research Report series.

The information gathered from all of these studies provides the background necessary for better management and assists in development of future investigational studies.

The subject matter contained within these reports is often fragmentary in nature. The findings may not be conclusive and the interpretations contained therein are subject to re-evaluation as the work progresses.

## RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.  
Project No.: F-5-R-9 Title: Inventory and Cataloging of the Sport Fish and Sport Fish Waters in the Interior of Alaska.  
Job No.: 15-A

Period Covered: July 1, 1967 to June 30, 1968.

## ABSTRACT

During the reporting period surveys were conducted on 12 lakes on the south slope of the Brooks Range and on 16 lakes and five streams adjacent to the road system in Interior Alaska.

Test netting was conducted on 29 lakes to determine fish population characteristics in conjunction with initial surveys, and for annual assessment of lakes stocked with silver salmon, Oncorhynchus kisutch, and rainbow trout, Salmo gairdneri.

Size and age data of sport fish from various Brooks Range lakes are presented.

Arctic grayling, Thymallus arcticus, were stocked in nine additional waters to further ascertain their winter dissolved oxygen demands and other ecological requirements.

Dissolved oxygen testing was conducted on 37 lakes for current comparative data on managed waters, to determine the potential of newly surveyed waters for fish introduction or other management, and to determine the oxygen requirements of grayling.

An experimental stock of 31,200 lake trout fingerlings, Salvelinus namaycush was made into Harding Lake. Newly rehabilitated Birch and Little Harding Lakes both received recommended fish stocks - 353,000 rainbow trout to Birch Lake and 26,500 silver salmon in Little Harding Lake. Test angling in Little Harding Lake indicated very satisfactory initial growth of the silver salmon.

## RECOMMENDATIONS

It is recommended that:

1. Inventory and Cataloging of Interior Alaskan waters be continued with emphasis on newly accessible waters as present road systems are extended.
2. Initial lake and stream inventory be conducted in the Nome and Teller areas of the Seward Peninsula, the Chandalar Complex of the Brooks Range and the Alaska Highway area from Tok to the Canadian Border.

3. Annual assessment of stocked waters be intensified to provide more detailed information on population trends, interspecies relationships, and success of present stocking policies.
4. An extensive limnological survey of Harding Lake be conducted with special emphasis given to determining reproductive success of lake trout and growth and survival of stocked lake trout.
5. A pre-rehabilitation study of Lost Lake be initiated and a new outlet control structure be designed by the Department's Engineering Section.
6. Suitable sites for grayling and lake trout egg takes be located in areas free of intensive angler use.
7. Lake mapping and pre-rehabilitation studies be initiated on Quartz, Medicine, and Deadman Lakes.

#### OBJECTIVES

- (1) To assess the environmental characteristics and fish species composition of the waters of the job area and, where practicable, obtain estimates of existing or potential angler use and sport fish harvest.
- (2) To investigate remote area waters; determine fish species composition, quality of angling, accessibility and value in distributing angler effort over a wider area, to offer desired protection of individual fish stocks.
- (3) To evaluate present stocking policies and programs, and assess fish survival, growth, and interspecies relationships.
- (4) To evaluate application of fishery restoration measures and availability of sport fish egg sources.
- (5) To evaluate the success of adult, fry, and fingerling lake trout transplants in establishing a fishery for this species in Harding Lake.
- (6) To determine the suitability of lakes of various water quality and ecological characteristics for introduction of Arctic grayling and to expand the number of waters in which this species may provide a sport fishery.
- (7) To assist as required in the investigations of public access status to the area's fishing waters.
- (8) To evaluate multiple water use development projects (public and private) and their effects on the area's streams and lakes, for the proper protection of the sport fish resources.

#### TECHNIQUES USED

Graduated mesh 125' monofilament gill nets with five mesh sizes ranging from 1/2 to 2 1/2 inches square measure were used to sample fish populations of stocked lakes and waters with undetermined fish populations. Test angling was also conducted on several waters. Species composition, abundance, growth rates and general condition of fish were evaluated. Aging of fish was

accomplished using the "cold" method of impressing scales on cellulose acetate. A Bausch and Lomb microprojector was used to read the scale impressions.

Winter dissolved oxygen levels of lakes were determined by the drop titration method utilizing a Hach Model OX-2-P dissolved oxygen test kit.

Lakes and streams were physically surveyed and surface areas, depths, temperatures and pertinent biological information were recorded.

Information relating to land uses, access to waters, and future needs was forwarded to Department Access Biologists and assistance was given to the access staff in performing their investigations.

## FINDINGS

### Fish Stocking Evaluations

Results of annual test netting of waters stocked with rainbow trout or silver salmon are included in Table 1.

In the majority of these waters growth of both species has remained satisfactory. However, it now appears that in many of these lakes combined populations of rainbow trout and silver salmon are not compatible. Rainbow trout fingerlings often fail to show any appreciable survival when stocked in lakes having populations of silver salmon. More intensive efforts to assess growth, survival and interspecies relationships of stocked salmon and trout appear necessary and will be initiated in 1968.

Open water investigations of this project were terminated by the August 14, 1967 flood in the Fairbanks area, and Harding and Birch Lakes were not test netted. However, in 1967 both of these lakes received recommended stocks of fish - 31,200 lake trout fingerlings in Harding Lake and 353,000 rainbow trout fingerlings in Birch Lake. Test netting will be conducted in 1968 to evaluate survival and growth of these fish.

In August, 1967, vandals removed the screens from the fish barrier on the outlet of Birch Lake. As the water in the outlet stream was very high, undesirable fish may have gained entry to this newly rehabilitated lake before the screens could be replaced. Test netting will be conducted in 1968 to determine the extent, if any, of reinfestation.

Little Harding Lake, rehabilitated in 1966, was stocked with 26,500 silver salmon fingerlings in July of 1967. No test netting has yet been conducted on this lake, but 33 silver salmon were captured by angling in late March, 1968 and showed excellent initial growth, with fork lengths ranging from 127 to 159 mm and a mean length of 140 mm.

North and South Twin Lakes on Fort Greely were experimentally stocked with rainbow trout in 1966 as a result of favorable oxygen determinations. Test netting in 1967 revealed a much larger sucker, Catostomus catostomus, population in these lakes than the original surveys indicated. The rainbow trout captured showed good growth, but it is recommended that no further rainbow trout be stocked in these waters and they be chemically rehabilitated when the necessary arrangements can be made with Fort Greely.

TABLE 1 - Test Netting 1967, Interior Alaska.

<u>Name</u>	<u>Date</u>	<u>Number</u>	<u>Species</u>	<u>Length Range mm</u>	<u>Mean Length</u>	<u>Freq.**</u>	<u>Percent Comp.</u>
Baker Lake	7-8-67	None					
Donna Lake*	6-27-67	22	Rb	265 - 420	318	0.55	100.00
Four Mile Lake	7-20-67	None					
Little Donna Lake*	6-27-67	28	Rb	337 - 444	390	1.64	100.00
Lisa Lake*	6-21-67	9	Rb	229 - 368	305	0.30	29.03
		22	SS	178 - 234	199	0.73	70.97
Jan Lake*	6-28-67	10	Rb	224 - 336	271	0.42	41.60
		14	SS	174 - 205	190	0.58	58.40
Bolio Lake*	7-13-67	28	SS	105 - 292	178	0.76	100.00
Craig Lake*	6-29-67	10	Rb	143 - 341	256	0.14	15.87
		53	SS	168 - 211	185	0.77	84.13
No. Twin Lake	7-24-67	4	Rb	211 - 240	220	0.09	7.30
		51	Su	177 - 307		1.10	92.70
So. Twin Lake	7-26-67	11	Rb	166 - 248	209	0.25	9.48
		105	Su			2.38	90.52
Mark Lake*	7-12-67	5	Rb	230 - 320	266	0.17	55.55
		4	SS	165 - 195	177	0.13	44.45
81 Mile Pit*	7-12-67	4	Rb	184 - 207	196	0.21	100.00
Rapids Lake*	6-13-67	6	Rb	98 - 175	154	0.35	100.00
Brown (Kuck) Lake	7-5-67	16	NP	267 - 511	354	1.00	100.00

TABLE 1 - Continued - Test Netting 1967, Interior Alaska.

<u>Name</u>	<u>Date</u>	<u>Number</u>	<u>Species</u>	<u>Length Range mm</u>	<u>Mean Length</u>	<u>Freq.**</u>	<u>Percent Comp.</u>
Mallard Lake	7-7-67	5	NP	358 - 523	439	0.18	100.00
Island Lake	7-18-67	6	NP	235 - 745	447	0.15	100.00
Deadman Lake	7-18-67	19	NP	233 - 405	308	1.36	100.00
Manley Slough	7-11-67	5	NP	513 - 559	530	0.12	27.78
		4	Sf	674 - 838	727	0.10	22.22
		9	Ci.	140 - 348	218	0.22	50.00
Chandalar Lake	7-19-67	3	LT	442 - 590	502	0.13	21.42
		5	Ci.	154 - 187	172	0.21	35.72
		5	HWf	155 - 470	284	0.21	35.72
		1	NP	776	776	0.04	7.14
Walker Lake	7-30-67	15	LT	165 - 838	523	0.36	35.72
		2	Gr	117 - 356	236	0.05	4.76
		2	AC	559 - 622	591	0.05	4.76
		23	RWf	140 - 394	328	0.54	54.76
Minakokosa Lake	7-31-67	3	LT	508 - 660	588	0.07	37.50
		5	RWf	305 - 432	376	0.12	62.50
Wild Lake	8-2-67	4	LT	419 - 686	519	0.16	36.36
		2	NP	572 - 615	594	0.08	18.18
		1	Ci.	234	234	0.04	9.09
		4	RWf	259 - 394	316	0.16	36.36
Kollioksak Lake	7-29-67	3	Ci.	262 - 375	327	0.12	33.33
		6	NP	398 - 720	514	0.25	66.66
Iniakuk Lake	7-29-67	1	LT	575	575	0.02	7.69
		4	NP	521 - 765	604	0.08	30.77

TABLE 1 - Continued - Test Netting 1967, Interior Alaska.

<u>Name</u>	<u>Date</u>	<u>Number</u>	<u>Species</u>	<u>Length Range mm</u>	<u>Mean Length</u>	<u>Freq.**</u>	<u>Percent Comp.</u>
Iniakuk Lake							
Continued	7-29-67	4	RWf	234 - 330	270	0.08	30.77
		4	HWf	452 - 588	490	0.08	30.77
Helpmejack Lake	7-28-67	2	LT	610 - 648	629	0.08	14.29
		1	Gr	140	140	0.04	7.14
		10	NP	356 - 699	517	0.42	71.43
		1	RWf	284	284	0.04	7.14
Nutuvukti Lake	7-31-67	3	NP	597 - 787	673	0.07	33.33
		6	HWf	470 - 546	503	0.14	66.66
Takahula Lake	7-29-67	1	Gr	280	280	0.04	33.33
		2	NP	715 - 787	751	0.08	66.66
Tobuk Lake	7-31-67	14	NP	495 - 800	621	0.33	100.00
Selby-Narvak Lake	7-29-67	3	LT	530 - 686	585	0.13	10.34
		19	Gr	148 - 415	342	0.79	65.52
		7	NP	399 - 978	725	0.29	24.14

\*Lake stocked with trout or silver salmon under present management program.

\*\*Number of fish per hour in 125' variable mesh gill net.

LT	-	Lake Trout	NP	-	Northern Pike	Rb	-	Rainbow Trout
Gr	-	Grayling	Ci	-	Least Cisco	SS	-	Silver Salmon
RWf	-	Round Whitefish	HWf	-	Humpback Whitefish	Sf	-	Sheefish
AC	-	Arctic Char	Su	-	Northern Sucker			

## Lake and Stream Surveys:

The 28 lakes and 5 streams surveyed in 1967-68 and their locations are listed in Table 2.

### Brooks Range

In late July and early August, 1967, a brief cooperative survey of 10 lakes on the south slope of the Brooks Range was undertaken with the Bureau of Land Management. Initial plans included use of a BLM Grumman Goose aircraft; however, forest fire obligations for this aircraft necessitated the use of a Cessna 180 float plane rather than postpone the survey for another year. Because of the limited carrying capacity of the Cessna 180, several flights were required to shuttle men and equipment to the study areas.

Nets were set in several lakes in succession, recovered the following day and reset in other lakes. Unfortunately, this left little time for testing the quality of angling and for taking depth soundings and other measurements. Only one gill net was set in each lake. Thus, the fish captured may not represent the total fish species in a lake or perhaps may not give a representative sample of fish size and availability.

Attempts were made to obtain a few depth soundings of each lake using a Ross P-100 fathometer. This instrument is graduated only to 100 feet, but will give multiples of this depth if readings are taken frequently enough to follow each 100 foot increment on the dial. It was not always practical to do this using the float plane and on only two lakes, Walker and Wild, was a boat used for depth sounding on limited areas of the lakes. Thus, depths recorded may not be maximum and it is believed that some of the lakes may be several times deeper than the surveys indicate.

Test netting data from the Brooks Range lake surveys are included in Table 1. Age and size data of game fish collected are presented in Table 3. Because of slow growth and the extreme age of many of the fish, aging by scale reading was accomplished with some difficulty, especially with northern pike, Esox lucius. Therefore, ages listed in Table 3 should be considered as approximate. Other data for the individual lakes are included in the following.

#### Walker Lake:

Surface area 9,500 acres. This lake is one of the most accessible good lake trout and Arctic char, Salvelinus alpinus, lakes in the Brooks Range. It is located approximately 45 minutes by float plane west of Bettles. Walker Lake is the largest lake in the area and is also probably the finest, not only from a fishery viewpoint but also aesthetically. Its natural beauty is marred only by the presence of several buildings on Swan Island and one on the northwest shore of the lake.

Walker Lake was netted for 42 hours. The largest lake trout, 8.8 kg, and the only Arctic char taken in this survey were captured off Swan Island. The lake had previously been recorded as containing northern pike but none were taken on this survey. Angling from the shore of Swan Island produced only a few Arctic char and lake trout in several hours of fishing.

TABLE 2 - Lakes and Streams Surveyed in Interior Alaska, 1967.

<u>Name</u>	<u>Location</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Quadrangle</u>
Lakes:				
Baker	Elliott Highway	65°01'N	150°25'W	Tanana A-1
Brown	Elliott Highway	65°25'N	148°45'W	Livengood B-4
Mallard	Elliott Highway	46°24'N	148°45'W	Livengood B-4
Island	Alaska Highway Near Border	62°42'N	141°07'W	Nabesna C-1
Four Mile	Taylor Highway	63°20'N	142°32'W	Tanacross B-4
Unnamed Lakes 1-11	Ft. Greely Reservation	63°50'N	149°50'W	Mt. Hayes D-4
Walker	Brooks Range	67°10'N	154°25'W	Survey Pass
Selby-Narvak	Brooks Range	66°55'N	155°04'W	Hughes
Wild	Brooks Range	67°30'N	151°32'W	Wiseman
Iniakuk	Brooks Range	67°08'N	153°12'W	Survey Pass
Kollioksuk	Brooks Range	66°58'N	156°28'W	Shungnak
Helpmejack	Brooks Range	66°56'N	153°34'W	Hughes
Takahula	Brooks Range	67°21'N	153°40'W	Survey Pass
Tobuk	Brooks Range	67°18'N	153°28'W	Survey Pass
Minakokosa	Brooks Range	66°50'N	155°00'W	Hughes
Nutuvukti	Brooks Range	67°00'N	154°45'W	Survey Pass
Chandalar	Brooks Range	67°30'N	148°30'W	Chandalar
Squaw	Brooks Range	67°35'N	148°15'W	Chandalar
Streams:				
Upper Tatalina River	Elliott Highway	65°12'N	150°10'W	Tanana A-1
Hutlinana Creek	Elliott Highway	65°04'N	149°02'W	Livengood A-2
Baker Creek	Elliott Highway	65°05'N	150°14'W	Tanana A-1
Manley Slough	Elliott Highway	65°00'N	150°32'W	Kantishna D-2

TABLE 3 - Size and Age of Game Fish from Various Brooks Range Lakes, 1967.

<u>Lake</u>	<u>Species</u>	<u>Length mm</u>	<u>Weight Grams</u>	<u>Age Group</u>
<u>Walker</u>	LT	838	8,850	XIII
	LT	762	6,360	XI
	LT	660	3,090	XI
	LT	640	3,230	X
	LT	533	1,475	IX
	LT	526	1,675	VIII
	LT	526	1,730	VIII
	LT	513	1,390	VIII
	LT	495	1,390	VIII
	LT	495	1,080	VII
	LT	483	960	VIII
	LT	394	570	V
	LT	358	400	V
	AC	622	2,720	IX
	AC	559	1,670	VIII
<u>Minakakosa</u>	Gr	356	--	V
	Gr	117	--	I
<u>Wild</u>	LT	660	2,890	X
	LT	597	1,930	VII
<u>Wild</u>	LT	686	3,630	X
	LT	523	1,700	IX
	LT	437	790	VI
	LT	419	680	VI
	NP	615	1,420	XV
	NP	572	1,020	XIII
	<u>Kolliaksak</u>	NP	720	2,810
NP		614	1,645	XII
NP		426	450	IX
NP		410	450	VIII
NP		398	450	VII
<u>Iniakuk</u>	LT	575	1,990	VII
	NP	765	--	XIX
	NP	610	1,530	XII
	NP	521	990	VIII
<u>Helpmejack</u>	LT	648	2,780	IX
	LT	610	2,160	IX
	NP	699	2,890	XV
	NP	624	2,840	XIV
	NP	546	1,360	X
	NP	521	--	X
	NP	500	800	VIII
	NP	495	1,080	VII
	NP	495	1,020	VII

TABLE 3 - Continued - Size and Age of Game Fish from Various Brooks Range Lakes, 1967.

<u>Lake</u>	<u>Species</u>	<u>Length mm</u>	<u>Weight Grams</u>	<u>Age Group</u>
<u>Helpmejack</u> (Continued)	NP	475	--	VII
	NP	406	450	VI
	NP	356	340	VI
	Gr	140	--	I
<u>Nutuvukti</u>	NP	787	3,860	XIX
	NP	635	--	XVI
	NP	597	1,250	VIII
<u>Takahula</u>	NP	787	3,235	XVII
	NP	715	2,720	XVI
	Gr	280	--	IV
<u>Tobuk</u>	NP	800	4,140	XVIII
	NP	724	1,200	XVI
	NP	711	1,990	XVI
	NP	711	1,870	XIV
	NP	686	2,160	XIII
	NP	622	1,760	XII
	NP	610	1,590	XII
	NP	584	1,080	IX
	NP	572	1,190	XI
	NP	551	960	X
	NP	546	910	X
	NP	546	1,080	X
	NP	533	860	X
	NP	495	810	X
<u>Selby - Narvak</u>	LT	686	2,950	IX
	LT	540	1,620	VII
	LT	530	1,360	VII
	NP	978	7,600	XXIII
	NP	775	3,040	XVI
	NP	760	3,460	XVI
	NP	686	2,500	XII
	NP	508	1,130	X
	NP	399	480	VI
	Gr	415	740	VIII
	Gr	405	680	VIII
	Gr	400	--	VII
	Gr	380	--	VI
	Gr	148	--	I
	<u>Chandalar</u>	Gr	419	--
Gr		305	--	VI

TABLE 3 - Continued - Size and Age of Game Fish from Various Brooks Range Lakes, 1967.

<u>Lake</u>	<u>Species</u>	<u>Length</u> <u>mm</u>	<u>Weight</u> <u>Grams</u>	<u>Age</u> <u>Group</u>
<u>Chandalar</u> (Continued)	LT	617	--	IX
	LT	590	2,160	IX
	LT	533	--	VIII
	LT	475	1,050	VII
	LT	442	910	VII
	NP	776	3,860	XV
	<u>Squaw</u>	LT	597	1,900
LT		546	1,475	VIII
LT		457	765	VII
NP		914	4,880	XX
NP		826	3,970	XVI
NP		787	3,405	XIII
NP		660	2,495	XII
NP		610	1,420	XII
<u>Shainin</u>	LT	800	6,010	XIII
	LT	762	4,540	XI
	LT	698	3,970	XI
	LT	686	3,520	XI
	LT	658	2,890	X
	LT	572	1,590	IX
	LT	533	1,560	IX
	LT	520	1,190	VIII
	LT	505	1,390	VII
	LT	457	1,020	VII
	LT	457	820	VI

LT - Lake Trout  
AC - Arctic Char  
Gr - Grayling  
NP - Northern Pike

The lake trout stomachs contained a variety of items ranging from snails and insects to slimy sculpin, Cottus cognatus, and other fish, including a 450 mm lake trout in the stomach of the largest lake trout. Light to moderate infestations of tapeworms and tapeworm cysts were found in the viscera of the lake trout and char.

Depth readings were taken only between Swan Island and the west shore, and the 105-foot depth recorded is probably only a fraction of the maximum depth of this lake.

Minakokosa Lake:

Surface area 600 acres. This comparatively small but highly scenic lake was netted for 43 hours with a catch of only three lake trout and five hump-back whitefish, Coregonus lavaretus. All of the fish captured had tapeworm cysts on their stomachs. The whitefish had been eating snails and clams and only one lake trout stomach contained unidentified fish remains.

Limited depth sounding revealed a depth of 135 feet.

Wild Lake:

Surface area 2,000 acres. Wild Lake is a 45-minute float plane flight north of Bettles and, like Walker and Selby-Narvak Lakes, is elongated on a generally north - south axis. The lake is very scenic but also is more developed with homesites and cabins than any other lake of the survey. Gill netting produced northern pike, lake trout, round whitefish, Coregonus cylindraceum, and cisco, Coregonus sardinella. Additional northern pike and lake trout were taken by angling, both from shore and by trolling. The angling for pike and lake trout can be considered very good and residents of the lake report grayling fishing to be excellent at the inlet and outlet, although this was not tried.

Extensive depth soundings in the northern one-third of the lake showed depths to 237 feet and it is likely that greater depths can be found in the southern or middle portions of the lake, judging by the surrounding topography. Fish parasites included tapeworm cysts on the viscera of lake trout and round whitefish, tapeworms and roundworms in the northern pike, and copepods on the gills of whitefish.

The presence of burbot, Lota lota, was disclosed in the stomach contents of one of the pike, and one lake trout stomach contained many small fish, probably young cisco.

Kollioksak Lake:

Surface area 500 acres. This is the most westward lake surveyed this season, and with a measured depth of 30 feet is one of the shallowest of the lakes studied. Six pike and three cisco were taken in the net which was fished for 24 hours. The lake is possibly too shallow for lake trout. Stomach contents of the pike were unidentified fish remains. No parasites were noted in the pike, but tapeworm cysts were found in one cisco.

The lake is not particularly outstanding from a scenic standpoint but appears to have a fair northern pike population.

Iniakuk Lake:

Surface area 3,200 acres. A single net set in this lake yielded only 3 northern pike and 2 round whitefish in 24 hours. The net was reset in another location and this time captured 1 lake trout, 1 northern pike, 2 round whitefish and 4 humpback whitefish in 24 hours.

Slight infestations of tapeworms were noted in all species but northern pike. Northern pike stomachs contained sculpin and burbot, the lake trout contained sculpin and ninespine stickleback, Pungitius pungitius, and both the round and humpback whitefish had snails in the stomach contents.

A few soundings in the lake revealed a depth of 102 feet but somewhat deeper areas probably exist.

Helpmejack Lake:

Surface 600 acres. This lake is approximately 35 minutes west of Bettles by float plane. One net was set near the inlet in water from 0 to 12 feet and was fished for 20 hours.

Two lake trout were captured and both were quite thin-bodied and heavily parasitized with tapeworms. The ten northern pike captured also had tapeworm infestations, but not to the degree of the lake trout. Stomach contents of the pike included sculpin, amphipods and unidentified fish remains. Both lake trout stomachs were empty.

A series of soundings across the lake revealed a depth of 83 feet. Previous surveys, employing test angling, indicated a very good lake trout population but this could not be borne out by the limited test netting.

Nutuvukti Lake:

Surface area 3,600 acres. This large, shallow lake with a measured depth of 57 feet was fished for 44 hours with one net. Three pike and six humpback whitefish were captured. Lake trout are probably not present in the lake, at least in any numbers, but the lake requires a more detailed study.

Stomach contents of the pike did not disclose additional species in the lake, and the only parasites noted were tapeworm cysts in the whitefish.

Takahula Lake:

Surface area 350 acres. This is one of the smallest lakes surveyed, but is also one of the most scenic. It lies in the Alatna River valley and has sheer cliffs bordering the northwest shore. A single net set on the west side of the lake produced only two northern pike and one grayling in 24 hours, although the lake is reported to contain lake trout. Sounding across the lake showed a depth of 65 feet.

Tobuk Lake:

Surface area 380 acres. This is a rather small lake located south and east of Takahula Lake.

A net set off the northeast point for 42 hours captured 14 northern pike, most of them rather small. Several of the pike were infested with tapeworms, one had a sculpin in the stomach, one contained pike remains, and a third pike contained unidentified fish remains. All remaining pike had empty stomachs.

Depth soundings were not taken because of windy conditions but the net set was very shallow and it is believed the lake is also quite shallow.

#### Selby-Narvak:

Surface area 4,700 acres. This water is actually two lakes joined by a narrow channel. A single net, set overnight in the narrows, produced 7 pike, 3 lake trout and 19 grayling. While we were lifting the net, the aircraft pilot angled for grayling, catching 15 grayling from 10-14 inches in 15 successive casts. All three species of fish captured had either tapeworms or tapeworm cysts in the viscera and one lake trout had copepods on the tongue. Although no round whitefish were captured in the net, their presence in the lake was confirmed in the stomach contents of one of the pike. Other pike stomachs contained grayling and sculpin, while the lake trout contained unidentified fish remains. The stomach contents of the grayling were also beyond recognition.

A depth of 150 feet was recorded in the northern part (Narvak) of the lake but the lake could be much deeper in spots. Of the lakes studied, this lake is second only to Walker Lake in both size and beauty and has perhaps as good a fish population, although, as stated previously, limited sampling of these lakes does not allow conclusive statements to be made about the quality of the fishery.

In mid-July a reconnaissance survey of lakes in the eastern Brooks Range was attempted. Extremely bad flying weather limited the survey to only two lakes, Chandalar and Squaw, and only fragmentary data could be obtained from these waters.

#### Chandalar Lake:

Surface area 5,000 acres. Chandalar Lake is somewhat turbid as a result of inflow of glacial material from the North Fork of the Chandalar River. No depth soundings could be taken because of high winds. Test angling, while attempted at several locations along the east shore, was successful only at the outlet with a catch of two lake trout.

Results of setting a single gill net overnight in this lake are presented in Table 1. Size and age data from Chandalar pike, grayling and lake trout taken both by gill net and angling are listed in Table 3. All cisco, whitefish, lake trout and grayling had tapeworm cysts on the viscera, while the single pike captured had no parasites evident.

An excellent landing strip adjacent to the lake is usable by large planes and scheduled service by commercial airlines provides the lake with the best access of any lake in the Brooks Range.

#### Squaw Lake:

Surface area 900 acres. This lake lies northeast of Chandalar Lake in the same drainage. Only a few hours could be spent test angling at Squaw Lake, and no depth soundings were taken. However, the lake has clear water and extensive areas of shoal water are evident.

Test angling at the outlet and one of the inlets, Squaw Creek, produced 22 grayling, 5 northern pike and 4 lake trout. The size and age of the pike and lake trout are listed in Table 3. The grayling ranged in length from 168 to 360 millimeters with a mean length of 260 millimeters.

The lake trout from Squaw Lake were heavily parasitized with tapeworms and tapeworm cysts in the viscera, and copepods on the gills. In the grayling only visceral tapeworm cysts were noted, and the pike had no parasites evident.

One pike had a sculpin in the stomach; one contained unidentified fish remains. The other pike and all lake trout had empty stomachs.

#### Shainin Lake:

Surface area 1,000 acres. This lake, on the north slope of the Brooks Range, was not included in the year's surveys. However, we were able to examine 11 lake trout caught in approximately 1 1/2 man-hours by anglers from near the outlet of the lake. Size and age of these fish are presented in Table 3 for comparison with other Brooks Range lakes.

Parasites included copepods on the gills or tongue of three fish and tapeworm cysts on the viscera of three fish.

A sculpin was found in the stomach of one lake trout and two others contained unidentified fish remains. All other stomachs were empty. Male lake trout as small as 457 mm were found with mature sex products, while the smallest female, 572 mm did not contain mature eggs.

Studies undertaken in the Brooks Range this past season were quite cursory due both to equipment limitations and to the short period available for the surveys. These waters will continue to become more important to sport fishermen as the population of both resident and tourist fishermen grows; thus they deserve a study in detail as soon as practicable.

It will be noted from Table 3 that the northern pike grow very slowly in Brooks Range lakes. Their linear growth lags behind that of pike in the Minto Flats, near Fairbanks. These pike are also in somewhat poorer condition than Minto pike (Alt, 1967). In general, the lake trout linear growth compares favorably to that of lake trout in Paxson and Summit Lakes in the Alaska Range. However, the condition of the Paxson and Summit Lakes lake trout is considerably better (Van Wyhe, in press). Many of the Brooks Range lake trout tended toward the large head and slim body associated with poor growing conditions. The few grayling taken in this survey slightly surpass the growth rates of grayling from the Chena River, near Fairbanks (Van Hulle, 1967).

Catch per net hour was very low in many of the lakes. This was possibly due in part to a lack of familiarity with the lakes, resulting in failure to locate good net set sites. However, the low catch may also be a reflection of rather sparse fish populations. The large percentage of both pike and lake trout captured with empty stomachs may also indicate shortages of prey species and young game fish.

## Elliott Highway

### Baker Lake:

This 320-acre lake located 2 miles south of the Elliott Highway near Manley Hot Springs was found to be very shallow with a maximum measured depth of 10 feet in early July. No fish were captured in a gill net set overnight, and the lake is reported by area residents to almost dry up some years. Numerous aquatic invertebrates are present in the lake, and a large number of ducks indicates a fall hunting potential. Access on foot is quite difficult as no trail to the lake exists.

### Brown (Kuck) Lake:

Surface area 50 acres. This lake near Livengood is accessible from the Elliott Highway by a road that should be passable even in wet weather. The lake is very shallow with no depths over five feet noted. The lake is in the drainage of the West Fork of the Tolovana River. Much of the shoreline is boggy. The public utilizes this lake frequently, and a large population of northern pike is present. However, pike taken by test netting were small (Table 1).

### Mallard Lake:

Surface area 55 acres. Located 1/4-mile southwest of Brown Lake, this lake is accessible only on foot or by float plane. The water is clear with a brown stain. Depth soundings throughout the lake revealed a maximum depth of 13 feet. As in Brown Lake a large northern pike population exists, although the size of fish taken by test netting was quite small (Table 1). Large numbers of aquatic invertebrates, especially copepods and amphipods, are present.

### Upper Tatalina River:

This stream crosses the Elliott Highway at Mile 45. Small camping areas are present on both sides of the road. The stream has numerous slow stretches, rather deep holes and some riffle areas. Beaver activity was noted upstream from the highway.

The river has a width of approximately 30 feet and appeared to be abnormally low with a flow of less than 10 cfs in early July. Only small grayling were observed, although the river has a reputation for good grayling fishing earlier in the year.

The water is clear with a brown stain. A temperature of 58° F. was recorded. Mayfly and stonefly larvae and pockets of copepods were observed.

### Washington Creek:

A tributary to the Tatalina River, this stream crosses the Elliott Highway at Mile 19. A small campground is present. The water has a brown stain, was slightly cloudy due to rain and had a temperature of 59° F. in early July. No fish were sighted but fishermen had reported excellent catches of grayling in early spring. The stream averages 20 feet in width with numerous deep pools. Mayfly and chironomid larvae were the principal invertebrates noted.

#### Baker Creek:

This 50-foot-wide clearwater stream crosses the Elliott Highway near Manley Hot Springs. In July the stream averaged 3 feet deep with frequent pools up to 8 feet in depth. The flow was estimated at slightly greater than 100 cubic feet per second. Grayling were the only fish noted. Their length ranged from approximately 100 to 300 millimeters with a dominant size of 100 to 150 millimeters. The stream has a reputation for good grayling fishing. Mayfly larvae were abundant, with stonefly and chironomid larvae and leeches also present.

#### Hutlinana Creek:

This tributary to Baker Creek averages 40 feet in width where it crosses the Elliott Highway, with a depth of 18 inches to 8 feet. The flow was estimated at nearly 100 cubic feet per second in early July. Pools are frequent and deep the water was clear with little staining or cloudiness in spite of prior rainfall. Invertebrates were not abundant, with mayflies dominant. Small Dolly Varden char, Salvelinus malma, and grayling were observed. The stream has a fair fishing reputation for both species.

#### Manley Slough:

This slough of the Tanana River is approximately nine miles long and passes through Manley Hot Springs, where it is a popular pike fishing area as well as a place for launching boats for travel on the Tanana. The slough averages nearly 50 feet in width in its lower reaches, has very little velocity and clear, brown-stained water. Water temperature after several very warm days in July was 65° F. Test netting revealed a good population of Cisco and sheefish, Stenodus leucichthys, in addition to the pike (Table 1).

#### Alaska and Taylor Highways

##### Four Mile Lake:

Located 4 1/2 miles up the Taylor Highway, this approximately 100-acre lake can be reached by a trail which originates at Mile 5 on the highway.

The lake has a clear water with a maximum depth of 15 feet. Amphipods, snails and other invertebrate fauna were abundant, but two gill nets set overnight failed to reveal any fish. Dissolved oxygen tests in late March, 1968 (Table 4), showed an oxygen concentration of 1.0 to 3.5 parts per million, and the lake is under consideration for an experimental introduction of sheefish.

##### Island Lake:

This 250-acre lake is located just north of the Alaska Highway, 6 miles from the Canadian border. The water is clear and a maximum depth of 40 feet was found. The lake has a small inlet and drains into Desper Creek. The only fish present, as revealed by test netting, is northern pike. The pike captured (Table 1) were not overly large, but the lake has a good reputation for pike fishing. Most pike stomachs contained amphipods and snails and these invertebrates are extremely abundant.

## Ft. Greely Area

Eleven small unnamed lakes on Ft. Greely were given preliminary surveys with the cooperation of the Ft. Greely Conservation Office. The lakes are located between Bolio Lake and the Richardson Highway and have good summer accessibility on nearby tank trails. The lakes range in area from 2 to 10 acres and all have depths of 20 to 50 feet. No test netting or dissolved oxygen sampling were conducted on these lakes, but it is probable that most of them are capable of supporting populations of rainbow trout, silver salmon or grayling should an expansion of these fisheries on Ft. Greely be desirable.

## Grayling Introductions

In 1967 grayling fry were introduced on an experimental basis to nine additional waters in an effort to further determine the winter dissolved oxygen needs and other ecological requirements of grayling. These waters and their winter dissolved oxygen levels are included in Table 4.

In 1965 grayling fry had been stocked experimentally in 12 waters and survived in several of these waters despite extremely low oxygen levels (Roguski, 1966).

Efforts to assess second year survival of these fish by test netting were thwarted by the severe August 1967 flood in the Fairbanks area which ruined much of our equipment and inundated several of the grayling stocked waters, permitting the possible entrance of other fish and the egress of the stocked grayling.

Another factor which may affect the survival of stocked grayling fry is the presence of predaceous aquatic insects, which are often abundant in waters without an indigenous fish population. While stocking grayling fry in Miller's Pond in 1967, a large number of water boatmen suddenly appeared and devoured many of the grayling fry. It appeared that few, if any, of the fry could survive in the presence of such a dense population of predaceous insects.

Efforts will be made in 1968 to rear grayling to fingerling size to stock in waters which have previously shown no grayling fry survival and have dense populations of predaceous insects.

Future activities of this study will be conducted by the Grayling Investigations Project, and findings will be published by that project.

## Dissolved Oxygen Analysis

Table 4 lists results of dissolved oxygen testing on 37 waters in 1967 and 1968. All data is from winter, under ice determinations.

Many of the currently managed lakes in the region were sampled for further information and comparative data. In all of these waters dissolved oxygen levels have remained adequate for salmonids. Bolio Lake on Ft. Greely has, in some past years, experienced partial winter mortalities as a result of oxygen depletion. However, in 1967 and 1968 the winter oxygen levels in this lake were very satisfactory.

A number of waters were also tested for the possibility of fish introduction, rehabilitation, and other management implications.

TABLE 4 - Lakes Tested for Dissolved Oxygen, 1967 - 1968

<u>Name</u>	<u>Date</u>	<u>Sample Depth</u>	<u>Ice Depth</u>	<u>Snow Depth</u>	<u>PPM Oxygen</u>
Bear Lake	4-14-67		30"	10"	
Main Lake			30"	10"	
North End		5'	30"	10"	2.75
		10'	30"	10"	1.25
		15'	30"	10"	Trace
		20'	30"	10"	Trace
Main Lake			30"	10"	
South End		5'	30"	10"	2.0
		10'	30"	10"	0.5
		17'	30"	10"	1.0
Small Lake		18'	30"	10"	4.25
*Big Lake	4-20-67	5'	35"	2"	0.5
	3-6-68	8'	18"	None	4.0
Birch Lake	3-4-68	10'	30"	0-5"	7.5
Bolio Lake	4-6-67	Sur.	30"	0	6.25
		8'			5.25
		10'			3.75
		13'			1.50
	3-6-68	Sur.	23"	None	5.5
		10'			6.0
Chet Lake	4-21-67	7'	40"	3"	7.5
		14'			4.0
Craig Lake	3-7-68	10'	28"	3"	5.5
*Craig No. 1	3-7-68	6'	27"	6"	2.5
*Craig No. 2	3-7-68	10'	28"	2"	0.5
Deadman Lake	4-6-67	Sur.	30"	8"	3.25
		6'			3.00
	3-20-68	Sur.	33"	12"	4.5
		10'			2.5
Dennis Pond	4-14-67	3'	30"	6"	3.0
		6'			0.5
Donna Lake	3-7-68	Sur.	36"	3"	8.0
		10'			8.0
Little Donna	3-7-68	Sur.	36"	12"	7.0
		6'			6.5
*Dot Lake	3-19-68	Sur.	30"	4"	0.0
4 Mile Lake	3-20-68	Sur.			3.5
		8'	22"	16"	1.0
Eielson Pond #2	4-14-67	5'			1.25
		10'	37"	10"	1.75

TABLE 4 Continued - Lakes Tested for Dissolved Oxygen.

<u>Name</u>	<u>Date</u>	<u>Sample Depth</u>	<u>Ice Depth</u>	<u>Snow Depth</u>	<u>PP Oxygen</u>
Eielson Pond #3	4-19-67	10'	34"	13"	9.50
Eielson Pond #1	4-19-67	7'	34"	12"	0.5
Little Harding	3-4-68	6'	26"	7"	3.5
Hartman Lake	3-8-68	3'	26"	2"	0.1
Independent #2	4-20-67	4'	34"	12"	0.0
		8'			0.0
Independent #3	4-20-67	4'	34"	12"	1.5
		8'	34"	12"	0.0
Independent #7	4-20-67	4'	40"	10"	2.5
		7'	40"	10"	2.75
Jan Lake	3-19-68	Sur.	25"	10"	7.0
		10'			6.0
		20'			4.5
"J" Lake	4-20-67	10'			9.0
		19'	48"	3"	7.0
*Left O.P. Lake	4-20-67	4'	36"	2"	1.5
	3-6-68	8'			1.0
	3-6-68	10'	18"	None	1.5
Lisa Lake	3-7-68	8'	28"	12"	7.5
Lost Lake	3-4-68	10'	24"	3"	8.5
Mark Lake	4-5-67	Sur.	38"	None	7.5
		10'			6.0
	3-6-68	12'	21"	None	7.0
*Miller's Pond	3-12-68	5'	26"	15"	0.0
Nickel Lake	4-21-67	10'	40"	3"	8.0
		20'	40"	3"	5.0
		33'	40"	3"	0.0
*Otto's Lake	2-21-68	5'	36"	3"	0.5
Quartz Lake	3-5-68	8'	29"	None	5.0
*Sergeant's Pond	4-12-67	4'	20"	10"	7.5
		6'			5.75
		8'			1.50
	3-12-68	6'	24"	17"	3.0
North Twin	3-8-68	10'	20"	None	8.5
South Twin	3-8-68	10'	20"	None	6.5
*31 Mile Pit	3-12-68	5'	24"	12"	0.5
81 Mile Pit	3-8-68	8'	27"	1"	4.0
*Experimental Grayling Stocking 1967.					

Three of these lakes, Chet, "J", and Nickel, all located on Ft. Greely, have excellent winter dissolved oxygen levels. They presently provide a fair amount of angling for grayling but are infested with suckers. Rehabilitation and restocking with rainbow trout or silver salmon would undoubtedly improve the sport fishery on these lakes considerably and is recommended for future consideration.

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\*31 Mile Pit 3-12-68 5' 24" 12" 0.5

Biologist Checking Adult King Salmon for Condition of Ripeness Prior to Spawning.