

RESEARCH PROJECT SEGMENT

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Investigations
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Study No: G-III Study Title: LAKE AND STREAM
INVESTIGATIONS

Job No: G-III-K Job Title: Population Studies of
Game Fish and Evaluation
of Managed Lakes in the
Salcha District with
Emphasis on Birch and
Harding Lakes

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Period Covered: July 1, 1982 to June 30, 1983

ABSTRACT

This report presents fourth year (1982) findings of a study to evaluate the performance of Swanson strain rainbow trout, Salmo gairdneri Richardson, in Birch Lake. Data are provided on growth, survival, and contribution to the sport harvest both of Swanson strain trout stocked as yearlings and stocked fingerling coho salmon, Oncorhynchus kisutch (Walbaum).

A population estimate in late September showed a survival of 27 percent of the 97,000 Swanson River strain rainbow trout stocked into Birch Lake in early June.

Summer creel census at Birch Lake revealed that fishermen spent an estimated 17,058 man-hours to catch 8,614 rainbow trout and coho salmon. Catch per unit effort during the period ranged from 0.37 to 0.78 fish per hour.

In contrast to the previous 3 summers, Age I rainbow trout stocked in early summer did not contribute to the 1982 summer fishery due to their small size at stocking.

Summer and winter creel census combined indicate that during the 1982 fishing year (November, 1981 through August, 1982) anglers expended a total of 28,999 man-hours to catch 22,933 rainbow trout and coho salmon.

Angler pressure was affected by a breakup approximately 2 weeks later than normal. Water temperature and winter dissolved oxygen data are presented for Birch Lake.

Table 1. Scientific and common names of fish mentioned in this report.

Common Name	Scientific Name and Author	Abbreviation
Burbot	<u>Lota lota</u> (Linnaeus)	BB
Chinook salmon	<u>Oncorhynchus tshawytscha</u> (Walbaum)	KS
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 chub	<u>Couesius plumbeus</u> (Agassiz)	LC
Lake trout	<u>Salvelinus namaycush</u> (Walbaum)	LT
Least cisco	<u>Coregonus sardinella</u> (Valenciennes)	LNS
Longnose sucker	<u>Catostomus catostomus</u> Forster	LNS
Northern pike	<u>Esox lucius</u> Linnaeus	NP
Rainbow trout	<u>Salmo gairdneri</u> Richardson	RT
Slimy sculpin	<u>Cottus cognatus</u> Richardson	SSC

Information is presented on an experimental stocking of sheefish, Stenodus leucichthys (Guldenstadt), into Harding Lake, as well as life history information on other stocked and indigenous species and limnological observations. Further evidence of reproduction among Harding Lake lake trout, Salvelinus namaycush (Walbaum), is presented.

Data are presented on the status of the coho salmon populations in Lost and Little Harding Lakes, and on the rainbow trout in Koole Lake.

A limited monitoring of the Salcha River chinook salmon, Oncorhynchus tshawytscha (Walbaum) sport fishery was undertaken, and results are presented.

KEY WORDS

Lake management, rainbow trout, lake trout, northern pike, coho salmon, burbot, chinook salmon, angler effort, least cisco and Salcha district.

BACKGROUND

Salcha District

The Salcha district is bounded generally by the Salcha River drainage, the Tanana River upriver from its confluence with the Salcha River to the Little Delta River, and the Little Delta River and North Star Borough boundary. It contains two large and three small stocked lakes accessible from the Richardson Highway. These lakes, along with the Salcha River, provide excellent recreational potential for local residents, as well as those from Fairbanks and its environs, Fort Wainwright and Eielson Air Force Base. At least two other small lakes in the district may offer sport fishing opportunity in the future.

Figure 1 delineates the study area. Table 1 lists the common and scientific names and abbreviations of fish mentioned in this report.

Birch Lake

Birch Lake is an 803-surface-acre lake located 56 mi southeast of Fairbanks on the Richardson Highway. The maximum depth of its lightly brown-stained waters is 49 ft.

The U.S. Air Force maintains a recreation camp on Birch Lake. Heavy summer use of this camp contributes significantly to angler pressure. There is a state parking and boat launching area along the eastern shoreline, and a turnoff and parking area where the highway passes the south end of the lake. About half the shoreline of the lake is private land with cabins. The lake has four small inlets and an outlet with a fish and water-level-control structure on it.

Chemical rehabilitation in 1966 removed humpback whitefish, least cisco, burbot, slimy sculpin, and stunted northern pike, and fingerling rainbow trout were stocked. Since that time, a popular summer and winter sport

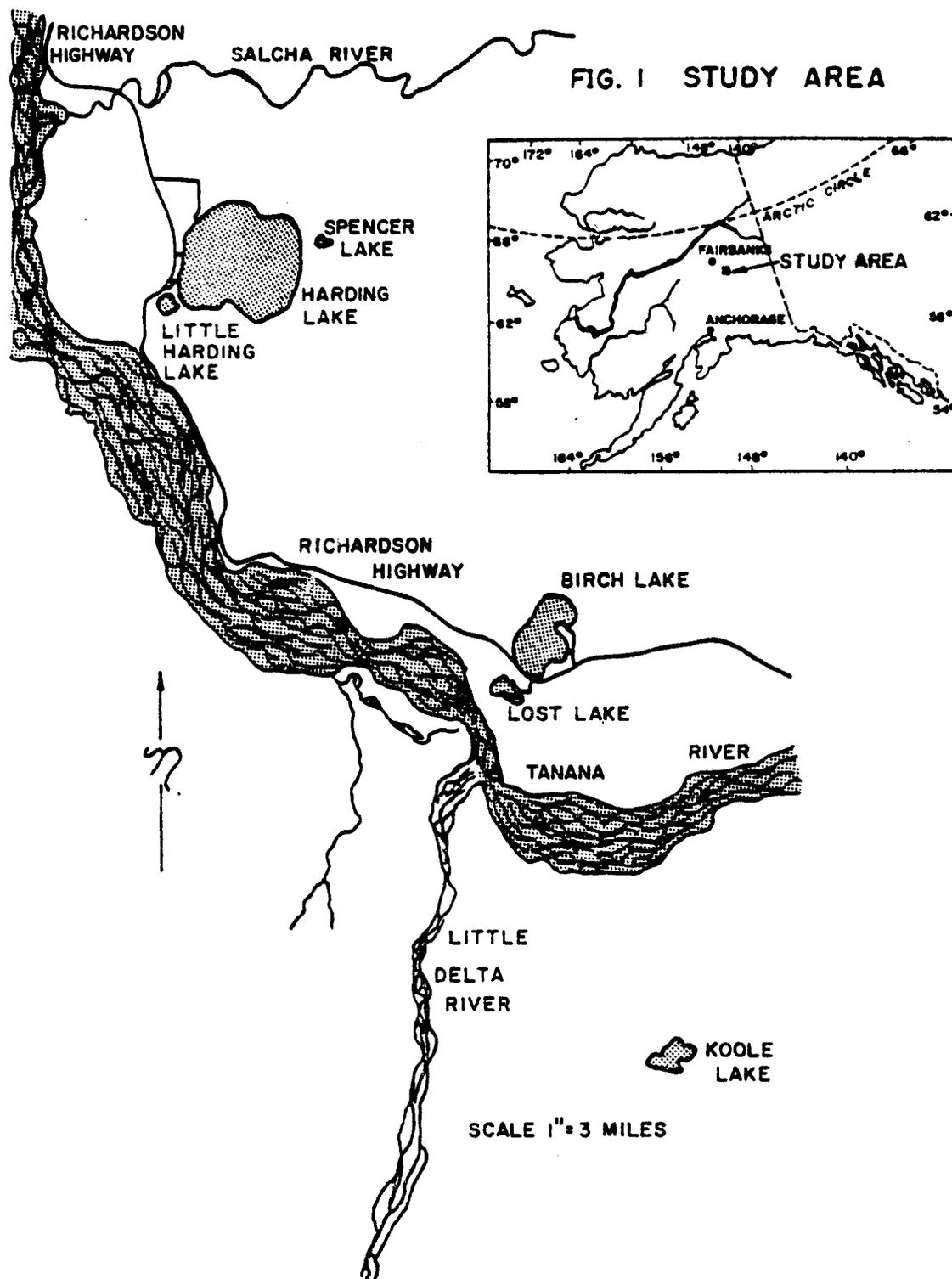


Figure 1. Delineation of study area.

fishery has been maintained by stockings of rainbow trout and coho salmon fingerlings and sub-catchable rainbow trout.

Lake chubs and slimy sculpins have appeared in the lake, probably due to vandalization of the outlet structure in 1967. The chubs have attained such a high population level that they compete with stocked game fish for both space and food.

An evaluation of the Birch Lake rainbow trout fishery and a comparison of the stocking suitability of the Ennis-Alaska strain and the Swanson River strain rainbow trout was launched in the spring of 1979. Summer creel census indicated that the May 1979 stocking of 101,314 Age I sub-catchable Ennis-Alaska strain rainbows contributed increasingly to the creel as the summer progressed, and that 1,420 had been caught and kept by early September. Throughout the summer, fishermen spent 16,324 man-hours angling to catch 4,473 rainbows of all age classes. Fishing success increased greatly after freeze-up. A fall population estimate showed a survival to October of 20.8% of the rainbows stocked in the spring. A "popeye" disease, apparently related to warm water bacteria, appeared in the Ennis-Alaska strain fish during the summer of 1979.

In 1980 and 1981, 55,074 and 50,000 Age I Swanson strain sub-catchables were stocked into the lake. In addition, 59,000 and 30,000 coho fingerlings were stocked in 1980 and 1981, respectively.

Fall population estimates in 1980 and 1981 showed survivals of 53.8% and 45.1%, respectively, for the Age I rainbows. The sub-catchable Swanson rainbows contributed more to the creel in their first summer in 1981 than in 1980 (4,811 vs. 1,697), probably because the 1981 Age I fish were slightly larger and there were few large, old rainbows available to anglers.

A die off noted at breakup 1981 destroyed most of the Ennis-Alaska strain and older rainbows in the lake. It appeared to be caused by a combination of opportunistic bacteria and cestode infestation. Few Swanson strain rainbows appeared to have been killed. No obvious disease problems were noted in the Swanson rainbows in Birch Lake in 1981.

In the final analysis of the 1979 stocking of Ennis-Alaska yearlings, an estimated 16,917 of the 21,073 trout that survived to the fall of 1979 were taken by anglers before most of the remainder disappeared from the lake in early 1981.

Creel census figures for the fishing year of 1981 (November 1980 through August 1981) indicated that anglers spent 29,933 man-hours to catch 23,827 cohos and rainbows (0.80 fish per hour) compared to the fishing year 1980, when anglers spent 34,921 man hours to catch 17,960 rainbow trout (0.51 fish per hour).

Harding Lake

Harding Lake is located 45 mi southeast of Fairbanks along the Richardson Highway. The transparent green, 2,470-acre lake has a maximum depth of 144 ft. There are two inlets but no visible outlet. Climatological trends and drainage changes have reduced the level of the lake about 3 ft since the mid-1960's, drying up large areas used by pike for spawning and summer habitat at the north end of the lake.

The indigenous fish in the lake include northern pike, burbot, least cisco and slimy sculpin. Lake trout were introduced into the lake in 1939, 1963 and 1965 as adults and in 1967 as fingerlings. Coho salmon fingerlings and smolts were stocked intermittently from 1968 until 1981.

While stocked coho salmon and lake trout attained a large size in Harding Lake, survival of cohos was low and no evidence of lake trout reproduction had been seen prior to 1981. However, in 1981, an Age VII lake trout was netted which had been spawned in the lake. This was the first evidence of lake trout reproduction in Harding Lake. The contribution of stocking to a sport fishery has so far been negligible (Hallberg, 1979). Pike and burbot remain the basis of a light intensity sport fishery in the lake.

Hallberg described a decline in the relative abundance of least cisco from numbers caught during test netting in the early 1970's. In 1980 and 1981, a resurgence was noted in the least cisco population, with large numbers of young, spawning fish being netted in the fall.

Little Harding Lake

Little Harding Lake is a 54-surface-acre lake located adjacent to Harding Lake, 45 mi down the Richardson Highway from Fairbanks. The maximum depth is 28 ft. The water is brown-stained and the shoreline is swampy. The outlet empties into Harding Lake. There are control structures at both ends of the outlet to prevent fish movement.

Little Harding Lake was rehabilitated in 1966 to remove stunted northern pike and subsequently stocked with coho salmon. Re-infestation by pike necessitated rehabilitation again in 1976, followed by the stocking of 48,400 coho fingerlings that same year. Kramer (1978) and Hallberg (1979) found very high survival of these fish, and consequently growth was slow.

In 1981, three age classes of cohos were present in the lake, and were providing a popular winter fishery.

Lost Lake

Lost Lake is a 102-acre-lake located 56 mi southeast of Fairbanks on the Richardson Highway, and 1/2 mi southwest of Birch Lake. The brown-stained waters have a maximum depth of 39 ft. A fish control structure blocks the outlet.

Lost Lake has been rehabilitated three times (last in 1970). Stockings of coho salmon and rainbow trout have produced an intermittently successful sport fishery. Efforts to maintain the sport fishery have been somewhat

thwarted by vandalism of the weir on the outlet stream, which allowed the stocked fish to escape and permitted entry of undesirable species. In the spring of 1979, the lake was inhabited by coho salmon, lake chubs, and longnose suckers.

Since 1979 the lake has been stocked with between 10,000 and 30,000 coho salmon per year. Sport fishing effort is light.

Koole Lake

Koole Lake is a 320 surface acre lake lying in the Tanana flats 8 mi southeast across the Tanana River from Birch Lake. It has a large shoal area and a maximum depth of 22 feet. The water is transparent brown and much of the shoal area supports lily pads and emergent aquatic vegetation.

Access to the lake is by snowmobile or light aircraft. An intermittent outlet is blocked by an old beaver dam. The land surrounding the lake is primarily military reservation and there are no roads or cabins in the area.

Koole Lake contained no native fish species. It was stocked with rainbow trout in 1974 and has provided a popular fly-in fishery.

A brief trip to Koole Lake in June, 1979 indicated that the lake had good sport fishing potential for 16 in, 1 1/2 pound rainbows (Doxey, 1980).

By August 1980, the average length of those fish had increased to 17 in and the average weight was 3 lbs. In July of 1980 Koole Lake was stocked with 42,927 Talarik strain rainbow trout at 413 per pound.

Bad flying weather and time constraints precluded any surveys of Koole Lake in 1981.

Spencer Lake

Spencer Lake is a brown-stained 11-acre-lake lying 3/8 mi east of Harding Lake. The lake has no apparent inlet. A small, swampy outlet drains toward Harding Lake. A brief survey in August 1979 revealed a population of small northern pike and encouraged the staff to continue evaluating the lake for possible rehabilitation and stocking (Doxey, 1980).

Bathymetric and dissolved oxygen analyses were conducted in the spring 1980 and 1981, and further information was collected on the northern pike population of the lake. In late 1981, the chemical restoration plan for Spencer Lake was filed and application was made for a permit to treat the lake with rotenone.

RECOMMENDATIONS

Management

1. Birch Lake should be managed for a rainbow trout sport fishery.

2. The rainbow trout stocking program at Koole Lake should be continued on a yearly basis.
3. Little Harding and Lost Lakes should be managed for coho salmon fisheries. They should be stocked with cohos in the summer of 1983.
4. Spencer Lake should be stocked with rainbow trout or another appropriate species.

Research

1. The evaluation of the survival and catchability of Swanson River strain rainbow trout in Birch Lake should continue, emphasizing comparisons between trout stocked as fingerlings and sub-catchables.
2. The evaluation of coho salmon growth, survival, catchability, and stocking practices in Lost and Little Harding Lakes should continue.
3. Methods of improving sport fishing in Harding Lake should be investigated, and studies of indigenous fish should be continued. Investigation of the 1982 sheefish planting should continue, and more sheefish should be stocked as they become available.
4. Evaluation of the potential of Spencer Lake to produce a sport fishery should begin with the stocking of that lake.

OBJECTIVES

1. To evaluate survival, growth, and contribution to the creel of Swanson River rainbow trout in Birch Lake to determine optimum stocking parameters.
2. To begin a sheefish stocking program in Harding Lake, to study the interactions of indigenous fish with those sheefish, and to evaluate the success of the program.
3. To determine limnological conditions that affect survival and growth of stocked game fish in lakes of the district, with emphasis on Birch and Harding Lakes.
4. To evaluate stocks of coho salmon in Birch, Little Harding and Lost Lakes to determine their population status, growth and catchability.
5. To monitor other sport fisheries in the district as they develop.
6. To provide recommendations for management of stocked lakes in the Interior.

TECHNIQUES

An electrofishing unit based on the boat-mounted unit described by Van Hulle (1968) and Roguski and Winslow (1969) was used for obtaining part of the rainbow trout population estimate in Birch Lake.

Multifilament and monofilament sinking or floating gill nets measuring 125 x 6 ft and consisting of five 25-ft panels of 1/2-2 1/2 in bar mesh were used to monitor fish populations in Lost, Harding, Little Harding, and Koole Lakes. Gill nets were set at varying depths and habitats on both the bottom and surface. Fish were occasionally collected by angling.

Fyke nets measuring 20 ft in length by 4 ft diameter with 3/8 in knotless nylon webbing and 100 ft x 4 ft center leads were set along the shoreline of Birch Lake to capture fish for population estimates and growth studies.

For the Birch Lake rainbow trout population estimate, captured fish were marked by fin clips and released. Different fin clips were used in different areas of the lake to determine the degree of mixing. Numbers of marked and unmarked fish were tabulated upon recapture, and population estimates and confidence limits were determined using Schnabel multiple mark and recapture estimates. Survival to fall estimates of Age I trout planted in May are adjusted for summer angler take.

For growth studies, Birch Lake rainbow trout and coho salmon samples were collected monthly, and coho salmon were collected in Lost and Little Harding Lakes twice during the open water season. Koole Lake rainbows were collected during March and in June. The fish were measured to the nearest millimeter of fork length and weighed to the nearest gram on a triple beam balance or Chatillon IN-2 spring scale. Larger fish were weighed on a Chatillon IN-25 spring scale. Scales used for age determination were individually cleaned and mounted between glass slides or were impressed on 20 mil acetate using a Carver press at 20,000 psi, heated to 200°F for 30 seconds. The scales were read on a Bruning 200 microfiche reader.

Birch Lake nearshore water temperatures were recorded continuously through most of the summer by a Ryan thermograph. Thermograph temperatures were calibrated and verified through spot checks with conventional thermometers.

A summer creel census program was set up at Birch Lake. Weeks were stratified according to predicted intensive use periods on Saturdays, Sundays, and holidays, and predicted light-use periods on weekdays. Two random fisherman counts were taken during weekend intensive use periods and a minimum of one weekly count was made at random on weekdays. Two or three counts were made during holiday-intensive use periods. Immediately after one of the weekend fisherman counts, most or all of the fishermen were interviewed. Notes were made on the number and size composition of the rainbow trout in the catch, and on the time spent angling.

A limited winter creel census was also conducted at Birch Lake. Similar information was gathered. For the purposes of organizing the creel census data, a "fishing year" is defined as the period from freeze-up (November)

of one year through the end of August of the the next. Angler effort is very low from early September to freeze-up, and no creel census is undertaken.

The instantaneous angler counts were expanded to yield an estimate of angler hours during the periods. These estimates were then adjusted for known weather and darkness conditions to obtain the final estimate. Catch per unit effort (CPUE) data, expressed as fish per angler hour, were obtained from the interviews. Previous years' creel census data are included in the tables in this report (Doxey, 1980; 1981; and 1982).

The Salcha River chinook salmon sport fishery was monitored as time allowed by traveling by boat to the area where fishermen concentrated, making a count, and interviewing all of the anglers as to catch, angler hours, and previous catch.

Notes were taken on catch whenever anglers were encountered on waterbodies which were not subject to an organized creel census.

Spencer Lake was chemically rehabilitated by dispensing rotenone into the water from 30 gallon drums placed in a boat.

FINDINGS

Birch Lake

Fish Stocking:

Due to a late breakup stocking could not begin until June in 1982, in contrast to previous years when sub-catchable trout were stocked in mid to late May. On June 9, a total of 97,278 Swanson strain rainbow trout was stocked into Birch Lake. The trout were yearling sub-catchables at 59/lb. They were in excellent condition, with only a few mortalities from injuries incurred during handling. On August 23, a total of 298,500 Swanson rainbow fingerlings at 349/lb was stocked. An estimated 700-1,000 of the fingerlings were dead.

Creel Census--Fishing Year 1982:

A limited winter creel census was conducted and data were expanded to cover the period from November 21, 1981 to April 25, 1982, after which most ice fishing activity ended due to weakening ice. During the winter of 1981-82, the Fairbanks Alaska Department of Fish and Game office registered 47 fishing shanties for use on Birch Lake.

The greatest number of anglers seen on the lake was 66 on February 6, and weekend counts averaged 34 anglers. Weekday counts ranged from 0 to 7 fishermen.

Overall CPUE was 1.21 fish per hour, and ranged from 0.41 to 3.40 fish per hour. Catches were best in early and mid-winter and declined toward spring.

Anglers spent an estimated 11,941 man-hours to catch 14,379 rainbow trout and coho salmon during the winter. As in the previous 2 winters, yearling rainbows stocked as sub-catchables in 1981 comprised the majority (64%) of the catch (9,194 at 0.77 fish per hour). A total of 3,941 (0.33 fish/hr) cohos was caught, and the catch was rounded out by 1,194 (0.10 fish/hr) Age II trout stocked as yearlings in 1980 and 50 larger, older trout from previous plantings.

Breakup was late in 1982, and the last of the ice was disappearing on May 28, the beginning of the Memorial Day weekend. The late breakup cut approximately 2 weeks from the normal summer fishing season.

The 1982 summer creel census covered the period from May 28 to August 29. A total of 227 anglers was interviewed. The number of anglers seen during weekend counts ranged from 6 to 94. Anglers spent an estimated 17,058 man-hours to catch a projected total of 8,614 rainbow trout and coho salmon, for an overall CPUE of 0.50 fish/hr. Effort was about the same as the previous summer (Table 2) and probably would have surpassed the 1981 effort if breakup had come earlier. The catch was down from the 1981 total, primarily because the yearling rainbows arrived from the hatchery at 59/lb, less than half the size they had been in previous years (average size 19/lb in 1979, 1980, and 1981). The 1982 yearlings did not contribute measurably to the summer fishery, in contrast to the summers of 1979-1981, when the yearling catch increased throughout the season and ranged from 1,420 to 4,811 in the 3 years. Table 3 compares rainbow trout fisheries for the summers 1979-1982. The increasing catch of Age III and older trout reflects the continuing catchability and survival to the creel of Swanson strain yearlings stocked in 1980.

Table 4 gives details of the 1982 summer creel census. The summer contribution of coho salmon to the creel declined in 1982 (717 compared to 2,712 in 1981), but their contribution to the catch during the entire 1982 fishing year was considerable (45%).

The combined winter and summer totals for the fishing year 1982 are compared with past years in Table 5. Despite the decline of coho catches in the summer of 1982, their contribution to the winter fishery compensated for the lack of 1982 sub-catchable rainbows entering the yearly totals, and held up the CPUE.

Rainbow Trout Population Estimate:

In late September and early October a combination of electrofishing and fyke netting was used to capture fish for a population estimate of the Age I Swanson strain rainbows stocked into Birch Lake in June 1982. Three days of fyke netting and night electrofishing yielded 4,129 marked yearlings. In contrast to previous years when night electrofishing produced about 100 yearlings per hour, night shocking in 1982 yielded only about 30 per hour. Fyke netting made up the difference, however, with catches of yearlings per net night in each of three fyke nets ranging from 558 to 1,242 and averaging 815 trout during the 3 days when fish were marked. After 3 days of marking and releasing fish, the fyke nets were operated for an additional 2 days. A subsample of 600 fish per day from each net was used to monitor

Table 2. Total effort and CPUE* comparisons of 1979 through 1982 summer fisheries for Birch Lake rainbow trout.

Dates	Angler-Hours	CPUE	Total Catch
May 27 - Sept. 3, 1979	16,324	0.28 fish/hr	4,473
May 19 - Sept. 1, 1980	22,290	0.34 fish/hr	7,602
May 11 - August 30, 1981	17,974	0.55 fish/hr	9,932
May 28 - Aug. 29, 1982	17,058	0.46 fish/hr	7,897

* CPUE = catch per unit effort

Table 3. Comparison of catch by age class of rainbow trout in Birch Lake for the summers of 1979 through 1982.

Dates	Age III & Older		Age II		Age I	
	Number	Percent	Number	Percent	Number	Percent
May 27 - September 3, 1979	Combined w/ Age II		3,053	68.0	1,420	32.0
May 19 - September 1, 1980	890	12.0	5,015	66.0	1,697	22.0
May 11 - August 30, 1981	53	0.5	5,068	51.0	4,811	48.4
May 28 - August 29, 1982	1,446	18.0	6,451	82.0	0	0

Table 4. Birch Lake summer creel census - 1982. Estimated fishing pressure and catch statistics by species and age class.

Period	Man Hours	Fish/ Hour	Age III & Older RT		Age II Rainbow		Age I Rainbow		Coho		Total Rainbow	Total Catch
			%	Number	%	Number	%	Number	%	Number		
May 28 - June 27	8,820	0.45	20	793	78	3,087	0	0	2	88	3,880	3,968
June 28 - July 25	3,891	0.78	13	389	81	2,451	0	0	6	195	2,840	3,035
July 26 - August 29	<u>4,347</u>	<u>0.37</u>	<u>16</u>	<u>264</u>	<u>57</u>	<u>913</u>	<u>0</u>	<u>0</u>	<u>27</u>	<u>434</u>	<u>1,177</u>	<u>1,611</u>
Totals	17,058		17	1,446	75	6,451	0	0	8	717	7,897	8,614
Mean fish/hour by Age Class and by species.			0.08		0.38		0		0.05		0.46	0.51

Note: Age III Rainbows were Swanson strain fish stocked in 1980.
 Age II Rainbows were Swanson strain fish stocked in 1981.
 Age I Rainbows were Swanson strain fish stocked in 1982.
 Cohos were Age I and II fish stocked in 1980 and 1981.

Table 5. Fishing year totals from combined winter-summer Birch Lake creel census. Contributions of year classes.

Fishing Year	Man Hours	CPUE Fish/hr	Older RT	1979 RT	1980 RT	1981 RT	1982 RT	Coho	Total
Dec. 1, 1979- Sept. 1, 1980	34,921	0.52	2,027	14,236	1,697	N/A	N/A	N/A	17,960
Nov. 23, 1980- Aug. 30, 1981	29,933	0.79	241	2,682	13,081	4,811	N/A	2,832	23,647
Nov. 21, 1981- Aug. 31, 1982	28,999	0.80	0	50	2,640	15,645	0	4,658	22,993

* 1980-1981 coho combined.

recapture ratios. Mixing was excellent, with 22% of the recaptures on the third day being fish that had been marked across the lake.

The data yielded a Schnabel estimate of 28,191 Age I rainbows, with a 95% confidence interval of 26,265 to 30,341 fish. This represents a survival to fall of 27.0% of the 97,278 sub-catchables stocked in June, 1982, compared with adjusted yearling survival estimates of 56.9% and 54.7% in 1980 and 1981 (Doxey, 1982). The reduced survival can probably be attributed to the smaller size of the yearlings at stocking in 1982 compared to 1981. Very few of the 298,500 Swanson fingerlings stocked in August were seen during capture efforts. This is probably a reflection of gear selectivity, since coho fingerlings are similarly difficult to catch in the fall of their first year. In the fall of 1983, population estimates will begin on Age I trout stocked as fingerlings, to establish comparisons between those fish and survival to fall of Age I trout stocked as yearlings since 1979. These estimates, along with creel census information, should establish indices which will facilitate maintenance and enhancement of the sport fishery in Birch Lake.

Rainbow Trout Growth:

Swanson yearlings were sampled four times for length in 1982. Their mean length increased 81% from 85 mm at stocking in June to 154 mm in October. Swanson yearlings stocked at an average length of 127 mm in 1980 and 1981 exhibited an average length increase of 44% over the summer (Table 6).

The average length of Swanson fingerlings increased from 46 mm at stocking on August 23 to 64 mm on September 30.

Ice fishermen's catches were sampled in January 1983, to obtain lengths for trout stocked as sub-catchables in 1980 and 1981. Length range for 1980 rainbows (n=3) was 330-356 mm, and mean length was 343 mm. Rainbows stocked in 1981 (n=18) had a length range of 241 to 305 mm with a mean length of 267 mm.

Rainbow Trout Diseases:

There were no obvious disease problems in the Birch Lake rainbow trout population in 1982. The "popeye" disease which afflicted the Ennis-Alaska rainbows in 1979 and 1980 did not appear in the Swanson trout. No die off of large trout was observed in the spring of 1982, as happened in the spring of 1981 (Doxey, 1982).

Coho Salmon Growth:

Birch Lake cohos were sampled for length in early 1983. Fish from the 1980 plant had a mean fork length of 256 mm, with a length range of 229 to 292 mm. Cohos stocked in 1981 ranged from 203 to 216 mm, with a mean length of 206 mm.

Limnological Information:

The open water season on Birch Lake was about a month shorter in 1982 than in the previous 3 years, due to both a late breakup (May 30) and an early

Table 6. Length data for Age I rainbow trout planted in Birch Lake since 1979.

Date Stocked	Broodstock	Mean Length		
		At Stocking	Fall of First Year	Fall of Second Year
5/21/79	Ennis-Alaska	127 mm	225 mm	232 mm
5/23/80	Swanson River	130 mm	179 mm	259 mm
5/20/81	Swanson River	125 mm	188 mm	267 mm*
6/08/82	Swanson River	85 mm	154 mm	...

* Based on January, 1983 data.

FIGURE 2

AVERAGE WEEKLY SURFACE WATER TEMPERATURES BIRCH LAKE 1982 NEARSHORE AREA

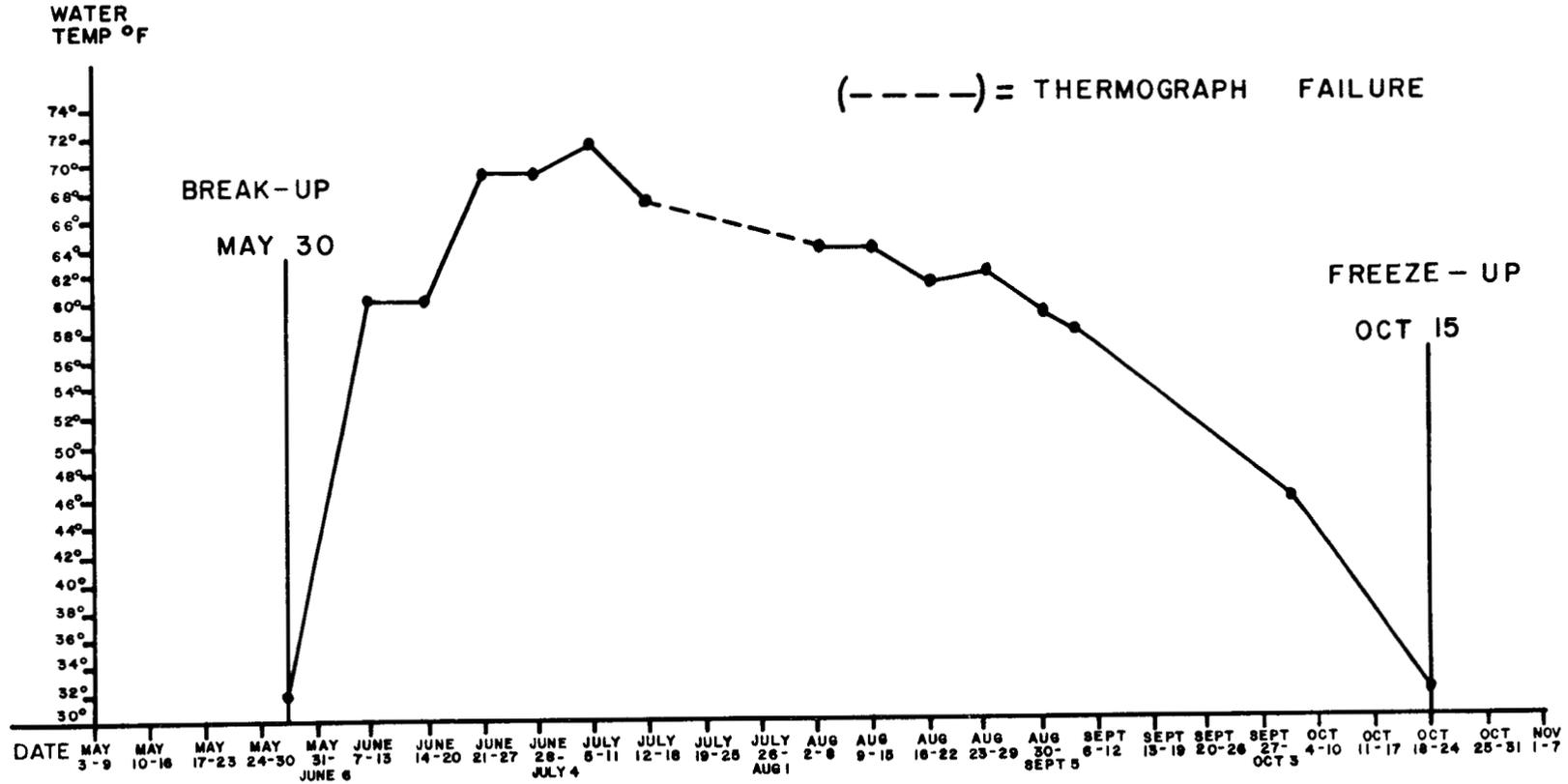


Table 7. Winter dissolved oxygen sampling, Birch Lake, 3/17/82.

Station Number	Water Depth (in.)	Snow Depth (in.)	Ice Thickness (in.)	Sample Depth (in.)	Water Temp (°F)	D.O. ppm
1	60	13	30	38	33.8	10.0
2	60	11	34	54	32.9	7.0
3	63	11	34	60	33.8	7.8
4	72	11	34	62	33.8	7.6

Note: Station number 1 was off the Recreation Camp Point. Stations 2-4 were off the Military Recreation Camp.

freeze-up (October 15). The late breakup shortened the sport fishery, since fishermen begin the summer fishery as soon as there is enough open water to angle or operate a boat. The early freeze-up had little effect on the summer sport fishery, since angler effort drops rapidly after early September.

Daily water temperatures recorded in a nearshore area were averaged by week and are presented in Figure 2. Water temperatures were at their highest in late June and early July. Weekly averages in excess of any recorded in 1980 and 1981 were recorded during this period, ranging from 68°F to 71°F. After this hot spell, periods of rainfall and cooler weather depressed the water temperatures and they followed the same gradual cooling pattern through late summer and fall that they had during previous years. Water temperature and CPUE data from the years 1979-1982 were examined for correlations, and none could be found.

Winter dissolved oxygen sampling was conducted at Birch Lake on March 17, 1982 in two different areas of the lake. Dissolved oxygen levels ranged from 7.6 to 10 ppm. Table 7 gives data collected during the sampling period.

Harding Lake

Fish Stocking:

On June 4 and 7, 1982, 141,735 sheefish fingerlings at 430/lb (\bar{x} FL 53 mm) were stocked into Harding Lake. They were transferred from the hatchery truck to a boat and moved to the southeastern quadrant of the lake, where they were stocked along a 1/2 mile line over 8 to 12 feet of water. This procedure was intended to minimize potential predation by not creating large concentrations of fish. The area was selected for its low summer predator density, good cover (weed beds) and food availability.

The technique probably worked, as an overnight net set on the stocking line took only two pike. Both had small numbers of sheefish in their stomachs. This was expected, since a small percentage (less than 10%) of the sheefish had developed a swim bladder problem which made them unable to expel the gas. This caused equilibrium and submerging problems, and ultimately resulted in the sheefish swimming upside down at the surface, where they were picked up immediately by gulls. Such fish would be easy prey for northern pike. Upon stocking, the healthy fish sounded and dispersed rapidly. Neither the F.R.E.D. Division hatchery staff or their pathologists were able to determine the cause or effect a cure for the problem. A gill net set overnight on the stocking line on June 29 caught nothing.

On July 9, a total of 370 yearling sheefish was stocked into nearshore waters in Harding Lake. These fish had been held over for feeding experiments at the Clear Hatchery, and had a mean fork length of 280 mm. After circling for awhile they dispersed along the shoreline. Only one mortality was observed.

Test netting, life history and species distribution information:

Test netting efforts in 1982 were conducted with three general goals:

- a) Determining the degree of predation on stocked sheefish,
- b) Establishing seasonal index areas to determine the population status of certain species,
- c) Filling data gaps that exist in the seasonal fish distribution information for some habitats, with emphasis on the profundal zone.

A total of 29 net-nights was expended, primarily in early August and mid-October. Nets were set in depths ranging from 10 inches to 144 feet, the deepest part of the lake. The following information was derived from observation, test netting results, and analysis of previous netting information.

Least Cisco:

Large schools of least ciscos were observed near the surface of the lake throughout the summer. In June they were utilizing all of the surface waters of the lake from shallow, sparsely vegetated areas out to the middle. Later in the summer they moved out of the extreme shallows and were seen only in water with a depth greater than about 3 feet. Schools of fingerlings (approximately 30 mm) were seen over deep water on sunny, calm days in mid and late summer. These were probably young-of-the-year least ciscos, but conclusive identification was impossible because the fish sounded at the approach of the boat. High speed trawling for them with an invertebrate sampler produced nothing, even though several schools of fingerlings were seen during the runs. None were found as stomach contents of the predatory species in the lake.

Adult or subadult least cisco were shown to occupy all depths from the surface to 144 feet. During the summer most appeared to be near the surface. Two 125 ft floating experimental gill nets with the small mesh ends tied together were set out in the lake over 22 ft of water, and 184 ciscos were taken in 1 night. A 125 ft an experimental sinking gill net set on the bottom at the same location caught 20 ciscos overnight. Nets set on the bottom at 70 and 110 ft took small numbers of ciscos and a net set at 144 feet took one.

The age-length composition of the net catches was about the same as in 1981. The majority of the catch were Age I and II sexually mature fish, with lengths ranging from 108 to 163 mm. Very poor growth and survival is indicated for Harding Lake least ciscos beyond Age III. Of 567 ciscos taken during 1982 only seven (age range III-VI) were over 171 mm and the largest was 270 mm. Overall catch was 19.6 least ciscos per net night. Three index areas were established for fall cisco sampling. An early freeze-up prevented adequate sampling of these areas in October 1982. Test netting results for least ciscos in Harding Lake have always been affected to an unknown degree by burbot, which adroitly take ciscos out of the net while not often getting caught themselves. Many of the fish remaining in a

net that has been worked over by burbot are mauled and scaleless, and there is some question as to the validity of the netting results when such evidence is present.

Lake Trout:

During the course of the season, nine lake trout were netted. Six larger specimens (approx. 7,000 to 12,000 g) were released and one large male (7,350 g) was dead in the net.

The other two trout were kept because they provided further evidence (as first reported in Doxey, 1982) of continuing natural reproduction in the lake. One was a 596 mm, 3,400 g female, Age VII. She was in prespawning condition, which indicates that second generation spawning may be occurring. The other was a 262 mm, 183 g developing male, Age III.

The larger lake trout taken in August were found on the bottom in 60-70 feet of water in the southeastern quadrant of the lake. The 262 mm trout was taken in 22 ft of water off the northwestern shoreline. The large trout caught in October were taken in shoal areas (approximately 6 ft deep) in the northwestern area of the lake.

Sheefish:

No further information was gathered on sheefish after June 1982. Most of the fingerling sheefish were too small at stocking to be taken in gill nets. None were seen and no dead ones were found. Examination of the stomachs of predators (pike, burbot, lake trout) revealed primarily ciscos and no sheefish. This, coupled with the presence of high numbers of ciscos in the lake, indicates that the sheefish were probably not targeted to a great degree by predators in summer 1982. The ciscos should provide a good source of food for the sheefish, which were becoming extremely cannibalistic in the hatchery.

Northern Pike:

Prime northern pike habitat was avoided during summer test netting, but 21 were taken for stomach contents examination. Six had empty stomachs and, with the exception of the two taken on the sheefish stocking line immediately after the sheefish were stocked, all had at least ciscos in their guts. Length range of the pike examined was 113 mm to 775 mm.

Test netting results from 1982 and previous years indicate that pike do not occupy depths greater than 45 ft in Harding Lake. Pike distributions appear to change seasonally, but inadequate information exists to say anything definitive on the subject.

Burbot:

Eleven burbot were netted during 1982. No set-line effort was undertaken.

In August, burbot were taken at depths ranging from 60 to 110 ft. Slimy sculpins were the primary food item found in their stomachs, along with caddis fly nymphs, least ciscos and miscellaneous unidentifiable fish

remains. In contrast, burbot taken in the northwest shoals in October (6 ft deep) were eating nothing but ciscos, many of which they were getting from the nets. No sheefish were found in burbot stomachs.

Harding Lake Limnological Observations:

The most important physical occurrence at Harding Lake in 1982 was a significant reversal of the water level recession that has been taking place since the late 1960's. The lake came up about 1 foot due to heavy rainfall and possible drainage changes. Littoral areas along the northern shoreline of the lake that had been dry for years were retaken by the lake. Offshore, a large shallow lagoon deepened and emergent vegetation reappeared. As a result, pike and ciscos began utilizing the lagoon, which had been devoid of fish since the early 1970's. Juvenile pike also moved into the newly flooded areas, finding shelter among dying willows and grasses. If the trend continues, the north end of the lake will become increasingly important to the fish population, both in terms of habitat and productivity. When the water was high in the early and mid-1960's, the warm swamps at the north end of the lake extended all the way to the tree line, and were heavily utilized by northern pike for spawning and summer habitat. Schools of ciscos fed along the deeper littoral zone on the edge of the emergent vegetation. Other, smaller areas of emergent vegetation around the lake which disappeared when the lake level dropped are beginning to reappear.

In conjunction with the deep water test-netting that was conducted in August, dissolved oxygen and temperature profiles were taken in four areas of the lake, including the deepest part (144 ft). The thermocline began at between 20 and 25 ft (Table 8) and dissolved oxygen levels rose at 30 ft and declined slowly thereafter. The dissolved oxygen readings indicate that oxygen is not a limiting factor in Harding Lake, and that all of the deeper water of the lake is potential fish habitat.

Little Harding Lake

Fish Stocking:

On June 8, 1982, a total of 15,993 coho salmon at 302/lb was stocked into Little Harding Lake. Stocking mortality was minimal.

General Information:

In 1982, Little Harding Lake contained two age classes of coho salmon in addition to the fish that were stocked that summer. The lake was sampled by gill net on June 8, and by angling in October and November to assess population status and sport fishery potential.

No fish from the 1979 stocking were taken, although some cohos were seen near the outlet structure in late June that appeared by their size to be 1979 fish. These were terminal year fish. Cohos from the 1981 plant grew from a mean length of 130 mm in June to 172 mm in late October. They comprised the majority of fish available to anglers.

Table 8. Summer dissolved oxygen and temperature data. Harding Lake, 8/19/82.

Location	Depth (ft)	Temperature °F	D.O. ppm
60' water in N.E. corner of lake.	Surface	59.9	10.0
	5	59.7	9.7
	10	59.5	9.4
	15	59.5	9.6
	20	59.2	9.6
	25	54.5	10.8
	30	47.3	12.0
	35	44.6	12.0
	40	42.8	11.9
	45	41.9	11.8
	50	41.0	11.7
	(Just off bottom)	60	40.8

Houseboat Bay	surface	59.7	10.5
	3	59.4	10.4
	(Just off bottom)	6	59.4

105' water near center of Lake	surface	59.9	10.0
	10	59.9	9.9
	20	59.7	9.7
	30	48.2	11.8
	35	44.6	12.0
	40	42.9	11.8
	50	41.0	12.2
	60	40.8	11.4
	70	40.3	10.7
	80	40.1	10.3
	90	39.7	9.8
	95	39.7	9.5
100	39.7	8.8	

144' Hole	100	40.5	10.1
	105	40.1	9.6
	110	39.7	9.0
	115	39.4	8.6
	120	39.2	8.3
	125	39.4	8.0
	130	39.4	7.8
	135	39.4	7.2
	140	39.4	5.0

During early summer high runoff in the lake's outlet stimulated strong outmigration efforts by Age I fish. While the screens on the outlet structure were able to prevent most of the cohos from leaving the lake, some had to be rescued from downstream and returned to the lake and many backed down against the screen until they became exhausted by the current and died. While the number thus killed is probably insignificant, they created a problem when they plugged the screens and caused water to flow around the outlet structure during periods of heavy runoff. Frequent maintenance was required to keep the situation under control.

Cohos from the 1982 stocking grew from a mean length of 50 mm in June to 116 mm in October. Angler effort at Little Harding continues at a steady, low level during the summer and varies from low to moderate during winters depending on fish size and availability and the angler's perception of "how fishing is."

Lost Lake

Fish Stocking:

On June 8, 1982, a total of 23,784 coho fingerlings at 302/lb was stocked into Lost Lake. They were in good condition, and mortality was minimal.

General Information:

During test netting of Lost Lake on June 8, suckers and chubs were captured, but no coho salmon. In January 1983, 2.5 hours of angling resulted in a catch of 14 cohos, for a CPUE of 5.6 fish per hour. Three age classes were represented in the catch, from plantings in 1980, 1981 and 1982. The lengths of the two 1982 fish were 140 and 165 mm, and probably represent the top of the size range for that year class. The survivors of the 1981 stocking (n=5) had fork lengths ranging from 190 to 226 mm and a mean length of 214 mm. Cohos stocked in 1980 ranged in length from 238 to 254 mm, with a mean length of 244 mm (n=7).

Angling pressure on Lost Lake continues to be light, but public interest in the fishery is increasing. Angling potential is good.

Koole Lake

Fish Stocking:

On August 23, 1982, a total of 38,610 Swanson strain rainbow trout at 349/lb was stocked into Koole Lake. They were transferred from the hatchery truck to a float plane at Birch Lake for the 10 minute flight to Koole Lake. Condition of the fish was fair and immediate mortality was estimated at 210.

General Information:

After an aerial reconnaissance, a crew of Sport Fish biologists broke trail into Koole Lake with snowmobiles on March 4, 1982. With this, public access by snowmobile became firmly established. The airplane had been the primary method of traveling into the lake in winter as well as summer.

During this and a subsequent trip on March 18, trout were collected by angling for growth and population status information and winter dissolved oxygen levels were assessed (Table 9). The highs of 9 and 11 ppm are excellent winter dissolved oxygen readings. Trout were also collected by angling and gill net during a fly-in trip in June.

Two age classes of trout should have been present in the lake--those stocked in 1974 and those stocked in 1980. None of the Age VIII fish were taken, probably due to low population numbers caused by angling pressure and natural mortality. Angling was excellent, however, for the Age II trout, both in March and in June. A sample of 30 rainbows taken in March had a fork length range from 261 to 355 mm, with a mean length of 285 mm. A sample of 13 out of 23 captured in June had a length range of 238 to 347 mm, with a mean length of 321 mm.

At least two sport fishing guide services were utilizing Koole Lake during the summer of 1982. One had a tent set up on the lake, with a raft and outboard motor nearby. The other had two small boats pulled up in the woods. There was evidence of airplanes landing on the lake during early spring (February - April) and several parties of snowmobilers went into the lake after March 4 and reported good angling success.

Spencer Lake

On October 5, 1982, Spencer Lake was treated with rotenone at a concentration of slightly more than 1.3 ppm. By the time that two-thirds of the toxicant was in the water, dying fish were starting to appear briefly on the surface. Freeze-up occurred within a week. Based on observations after the fall treatment of Chena Lake (Hallberg, in press), Spencer Lake should remain toxic all winter, with the rotenone decaying shortly after breakup in May or June. The lake should be ready for stocking in June or July.

Salcha River

Chinook Salmon Fishery:

A limited effort was made to monitor the Salcha River chinook salmon sport fishery. The chinooks were late in 1982, not appearing until the week of July 11-16, in contrast to their usual appearance in the first week of July and their exceptionally early arrival in 1981, when they arrived in the third week of June. The run was the fourth largest to have been documented in the Salcha, with an aerial count of 2,534 fish (Fred Andersen, Commercial Fish Division, pers. comm.). Angler interest was high when the chinooks were present.

Angler effort in the Salcha River was concentrated in the 1 1/2-mile stretch from the Richardson Highway bridge downriver to the confluence with the Tanana River. A total of 159 anglers was interviewed during four periods between July 16 and July 25. They had spent 379 man-hours to catch 14 chinook salmon, for a CPUE of 0.04 fish per hour. This is the same CPUE during the interviewing of 689 fishermen in 1979 (Doxey, 1980).

Table 9. Winter dissolved oxygen sampling, Koole Lake, March 18, 1982.

Station No.	Water Depth (in.)	Snow Depth (in.)	Ice Thickness (in.)	Sample Depth (in.)	Water Temp (^o F)	D.O. ppm.	Comments
1	120	10	31	36	33.8	11.0	All stations at fishing area at east end of the lake
1	120	10	31	60	37.2	5.5	
1	120	10	31	108	39.2	1.2	
2	96	10	31	60	36.5	9.0	
2	96	10	31	84	37.4	3.6	

The average number of anglers seen during eight counts on the lower river was 37. Indications are that the creel census crew missed some "hot" fishing periods when the fishing was considerably better. The 159 fishermen had also taken 41 chinooks during periods when they had not been interviewed. The total documented take of 55 chinook salmon comes to 0.34 salmon taken per angler, which compares favorably with the take of 0.33 chinooks per angler in 1979. These indices (CPUE and fish per angler) may be low, however, since the bag limit is one chinook, and fishermen generally leave when enough people in the party have taken fish. Thus, many successful fishermen may have just left the river during any given interview period. Small numbers of chum salmon are taken incidentally to the chinook salmon fishery.

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