

STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for

UPPER COOK INLET ANGLER USE AND STOCK ASSESSMENTS

By

Robert W. Bentz, Jr.

ALASKA DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

SPORT FISH DIVISION
Richard Logan, Director

RESEARCH PROJECT SEGMENT

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Study No: G-I Study Title: INVENTORY AND CATALOGING

Job No: G-I-D Job Title: Upper Cook Inlet Angler
Use and Stock Assessment
Studies

Cooperator: Robert W. Bentz, Jr.

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ABSTRACT

Six lakes, ranging in size from 21 to 161 acres, were surveyed within the Point MacKenzie area of northern Cook Inlet to determine their fisheries potential. Lost Lake is the only lake that contained sufficient rainbow trout, Salmo gairdneri Richardson, numbers necessary to support a fishery. Twin Island and Lorraine Lakes appear to be possible candidates for stocking but require further evaluation to determine their potential. Dairy and Farmer Lakes may not have sufficient winter dissolved oxygen levels to support game fish populations and will require monitoring of oxygen levels during critical winter months. Horseshoe Lake has a direct outlet to the Little Susitna River and is a rearing area for juvenile coho salmon, Oncorhynchus kisutch (Walbaum), and as such will not be considered as a candidate for stocking at the present time.

Relative growth and survival rates, determined by early winter gillnetting, are presented for coho salmon captured in nine Matanuska-Susitna Valley managed lakes. After six months of lake residency Age 0+ coho salmon attained lengths ranging from 105 to 139 millimeters with a catch per net hour of 0.09 to 1.69.

Habitat protection and preservation activities have increased proportionately with the accelerated rate of development that has occurred in recent years in northern Cook Inlet.

KEY WORDS

Southcentral Alaska, lake surveys, stocked lakes, escapement counts, coho salmon, habitat protection.

BACKGROUND

Lake Surveys

The northern Cook Inlet area is one of the fastest developing areas in Alaska. The lake survey program has been designed to provide basic physical, chemical and biological data on lakes within areas impacted by rapid agricultural and residential development. In recent years, the survey program has concentrated on lakes within the Point MacKenzie area immediately north of Anchorage across Knik Arm. This area has long been considered prime agricultural and recreational property. Until very recently, it has been relatively undeveloped. Approximately 14,000 acres are, or will soon be, used for agricultural purposes, including dairy farming and crop production. In the southeastern part of the area, port facilities and an industrial center are planned and a bridge providing direct access to Anchorage across Knik Arm has been proposed.

Survey data provides information necessary to develop management plans for lakes impacted by various land uses. The data aids other State and Federal agencies which are also conducting various hydrological survey programs in the Point MacKenzie area (Glass, 1983).

Table 1 lists all species mentioned in this report and Figure 1 is a map of the study area.

Stocked Lake Evaluation

A fish stocking program was initiated in 1960 to provide angling opportunities in landlocked lakes lacking game fish populations in the Matanuska-Susitna Valley. Lakes within this area exhibit a broad spectrum of environmental conditions ranging from deep and infertile to very shallow and rich in nutrients. The presence or absence of sticklebacks, a competitor species, in each of the lake types introduces an additional variable.

In an effort to determine the optimum productive capabilities of each of the various lake types, numerous studies have been conducted since the program began. Factors such as stocking density, size of fish stocked, time of stocking and multiple species stocking have been evaluated through actual stocking experiments throughout the range of lake environments. Results from these experiments have been utilized to develop strategies to maximize production of game fish populations in the specific environment into which they are stocked. Presently, 11 Matanuska-Susitna Valley lakes are stocked with approximately 235,000 coho salmon, while four lakes receive Arctic grayling.

Stocked game fish populations are sampled each fall to evaluate relative survival, growth and stocking densities. Chemical parameters are monitored during winter months in lakes having a history of low dissolved oxygen. The results of these evaluations are used to determine future management decisions to maintain or improve the quantity and quality of sport fishing.

Table 1. List of Common Names, Scientific Names and Abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Arctic grayling	<u>Thymallus articus</u> (Pallus)	GR
Coho salmon	<u>Oncorhynchus kisutch</u> (Walbaum)	SS
Longnose sucker	<u>Catostomus catostomus</u> Forster	LNS
Rainbow trout	<u>Salmo gairdneri</u> Richardson	RT
Round whitefish	<u>Prosopium cylindraceum</u> (Pallas)	RWF
Slimy sculpin	<u>Cottus cognatus</u> Richardson	SSC
Sockeye salmon	<u>Oncorhynchus nerka</u> (Walbaum)	RS
Threespine stickleback	<u>Gasterosteus aculeatus</u> Linnaeus	TS

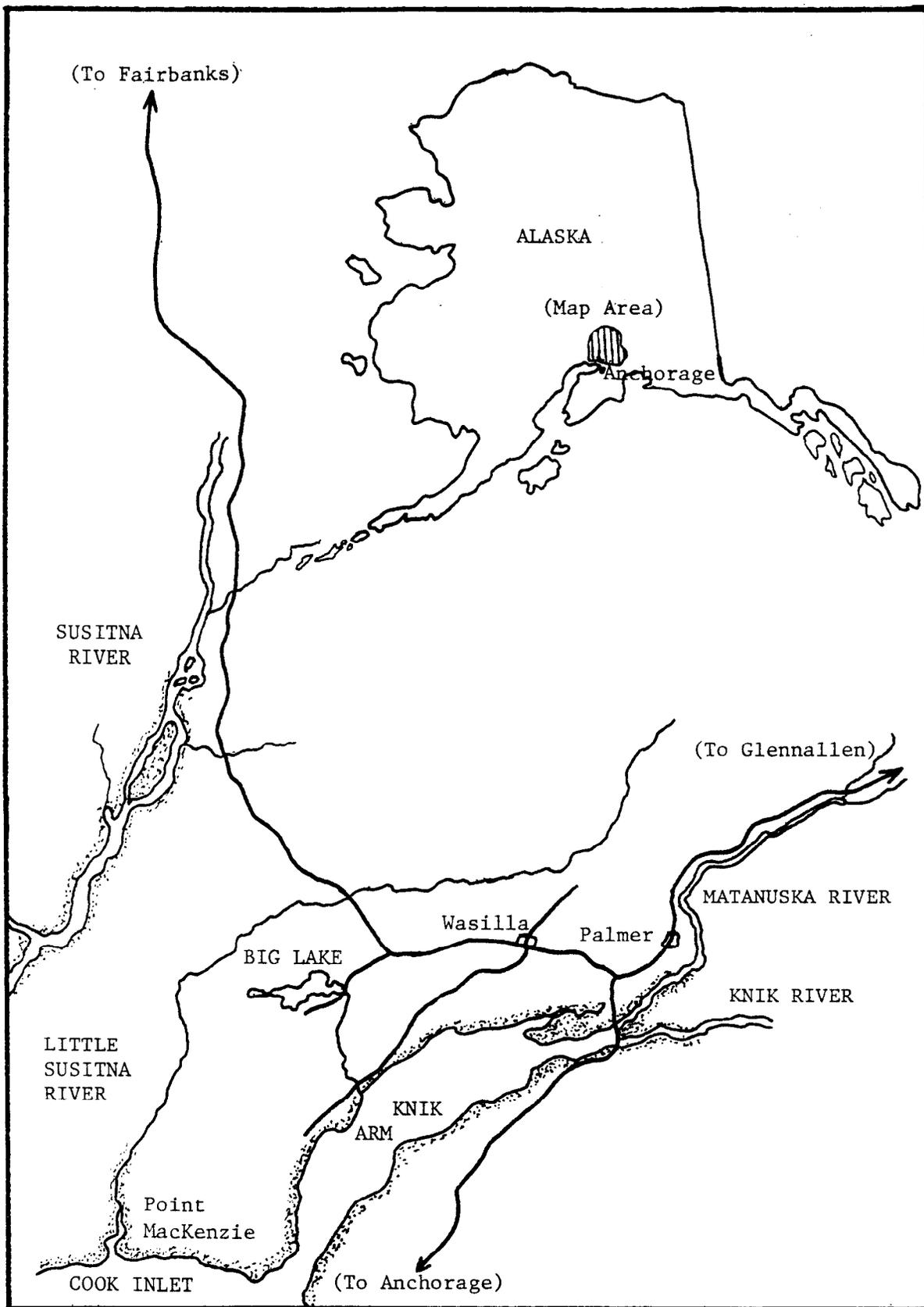


Figure 1. Vicinity Map Showing Point MacKenzie Study Area.

Coho Salmon Escapement Surveys

Coho stocks of the northern Cook Inlet area experienced declines to very low levels in the early 1970's. An intense commercial fishery harvest in Cook Inlet and possible habitat degradation or loss are probable factors associated with this decline. Escapement surveys were initiated to enumerate coho spawning populations on major streams within the area. These annual surveys provided a means of evaluating the various sport fishing regulations enacted to increase coho escapement. As a result of these stringent regulations and more favorable environmental conditions, the northern Cook Inlet coho salmon populations began to increase substantially in 1975. Escapement counts in 1980 were the highest since these counts were initiated in the early 1960's.

Habitat Protection

Habitat protection and preservation activities have increased proportionately with the accelerated rate of development that has occurred in recent years within the northern Cook Inlet area. These activities ranged from review and comment on small, individual permit applications to participation in complex, multi-agency planning groups that met over a period of years.

A creel census to estimate angling effort and harvest of coho and sockeye salmon was conducted at Cottonwood Creek in 1981 and 1982. This census was not done in 1983 due to budget reductions.

RECOMMENDATIONS

1. A creel census should be conducted on Campbell Creek to assess harvest and effort on stocked catchable-size rainbow trout.
2. Evaluate the success of the no-kill rainbow trout regulation on the Talachulitna River.
3. Seasonal movements of stocked catchable-size rainbow trout in Campbell Creek should be determined.
4. Efforts should be made to protect and enhance fish habitat in Chester and Campbell Creeks.
5. Fishing programs designed to educate youths should be presented through the Community Schools program.

OBJECTIVES

1. To determine levels of abundance of anadromous coho salmon in four streams and resident coho salmon and rainbow trout in twelve lakes of upper Cook Inlet from September through November.

2. To determine anadromous coho and sockeye salmon harvest levels and fishing effort during July and August on Cottonwood Creek.
3. To determine and record environmental characteristics during the fall and winter on approximately ten lakes.
4. To make recommendations, upon completion of data analysis, for the proper management of various sport fish waters in the area.
5. To ensure and enhance public access and provide protection to aquatic and riparian habitat within upper Cook Inlet.

TECHNIQUES USED

Lake Surveys

A Hach AL-36-WR kit and Hach 2510 conductivity meter were used to chemically analyze water samples and a Raytheon recording fathometer was used to collect data for preparation of volumetric contour maps. Fish populations were sampled with 6 ft x 120 ft variable mesh monofilament gill nets composed of six mesh sizes ranging from 1/2-inch to 2-inch square mesh and 1/8-inch square wire mesh minnow traps baited with salmon eggs. Traps and nets were fished approximately 16 hours.

Stocked Lake Evaluations

Monofilament gill nets 6 ft x 135 ft, having six mesh sizes ranging from 1/2-inch to 2-inch bar measure, were used to collect fish specimens from stocked lakes. Nets were normally set for approximately 24 hours in each lake. All captured fish were weighed to the nearest gram and snout to fork lengths were recorded to the nearest millimeter.

Coho Salmon Escapement Surveys

Coho salmon spawning populations were enumerated by foot survey within established index areas on major coho streams in the area.

Habitat Protection

Most of the permit applications are forwarded to field staff for review and comment. This review may be completed within the office or may require on-site analysis. On-going projects are inspected periodically to ensure that permit stipulations are adhered to. Surveillance and investigative activities take place when permit violations are discovered.

FINDINGS

Lake Surveys

Surveys were conducted during June and July, 1983 on six lakes in the Point MacKenzie area to determine fish species present and the potential for future game fish stocking. Horseshoe, "Dairy" and "Farmer" Lakes were selected because of development following recent State and local government agricultural land sales and improved road access. The development of a Knik Arm bridge could create road access to Lorraine, Twin Island and Lost Lakes. Physical, chemical and biological data are shown in Tables 2, 3 and 4, respectively, and contour maps are presented in Figures 2 through 7.

Horseshoe Lake:

The largest of the six lakes surveyed (161.2 surface acres), Horseshoe Lake drains into the Little Susitna River and provided the greatest variety of fish species captured by minnow trap and gill net. Juvenile coho salmon dominated the catch. At this time, Horseshoe Lake is not considered a candidate for game fish stocking as it is an open system containing indigenous game fish.

Lost Lake:

Lost Lake, at 158.4 surface acres appears to have an excellent population of naturally reproducing rainbow trout. A length-frequency histogram of trout captured by gill nets and minnow traps indicated five age classes including young-of-the-year. The only other species captured in Lost Lake or its outlet stream was threespine stickleback. This lake could be considered for stocking if development of future road access leads to intensive fishing pressure and natural reproduction cannot keep up with demand.

Twin Island Lake:

Records indicate that the 150.6 surface acre Twin Island Lake had a natural population of kokanee which supported a good fishery until 1957. The lake was stocked with rainbow trout, coho salmon and grayling between 1960 and 1969. Although gill nets and minnow traps captured only two rainbow trout, 305 and 432 mm in length from the lake, rainbow fry were dip-netted from the lake's outlet stream indicating some natural reproduction. Sculpins and stickleback were the only other species captured in the lake. A more intensive survey of the inlet and outlet may indicate whether this lake could support a natural reproducing rainbow trout fishery if an Alaskan strain of hatchery trout were introduced or whether an outlet control structure would make it feasible for stocking on a continuing basis.

Lorraine Lake:

This 131.7 surface acre landlocked lake has good possibilities for future management. Lorraine Lake appears to be of sufficient size and depth to overwinter stocked game fish and, because it is landlocked,

Table 2. Physical Data for Selected Lakes of the Matanuska-Susitna Valley.

<u>Lake</u>	<u>Surface Area (Acres)</u>	<u>Lake Landlocked</u>	<u>Maximum Depth (feet)</u>	<u>Mean** Depth (feet)</u>	<u>Volume (Acre feet)</u>	<u>Shoreline Distance (miles)</u>	<u>Littoral*** Area (%)</u>	<u>Surface Elevation (feet)</u>	<u>Location (U.S.G.S. 1:63,360 Topographical Maps)</u>
Horseshoe	161.2	No	23	9.8	1,578	4.685	85	83	Tyonek (B-1) T15N R5W Sec. 27
Lost	158.4	No	15	6.2	988	4.180	99	141	Anchorage (B-8) T14N R4W Sec. 4
Twin Island	150.6	No	61	14.8	2,229	3.133	59	140	Tyonek (B-1) T14N R4W Sec. 9
Lorraine	131.7	Yes	24	9.1	1,195	2.273	92	220	Anchorage (B-8) T14N R4W Sec. 23
"Dairy"*	51.2	Yes	24	7.8	403	1.802	92	140	Tyonek (B-1) T14N R4W Sec. 6
"Farmer"**	21.1	Yes	9	4.1	86	0.803	100	140	Tyonek (B-1) T14N R5W Sec. 24

* Lakes not named on United State Geological Survey 1:63,360 topographical maps.

** Mean depth is volume ÷ surface area.

*** Littoral area is that portion of lake 15 feet or less in depth.

Table 3. Chemical Data for Selected Lakes of the Matanuska-Susitna Valley*.

<u>Lake</u>	<u>Survey Date</u>	<u>Surface H₂O Temperature (°F)</u>	<u>Alkalinity (mg/l)</u>	<u>Hardness (mg/l)</u>	<u>pH</u>	<u>Specific Conductances (mhos/cm)</u>
Horseshoe	7/28/83	61°	85	85	6.3	141
Lost	6/27/83	64°	51	34	6.8	87
Twin Island	6/28/83	60°	68	51	6.8	108
Lorraine	6/23/83	62°	51	34	7.0	75
"Dairy"	7/26/83	64°	51	34	5.8	83
"Farmer"	7/26/83	63°	26	17	5.3	26

* Sub-surface water samples.

Table 4. Biological Data for Selected Lakes of the Matanuska-Susitna Valley.

Lake	Lake Landlocked	Sample Date	Sample Gear*	Fish Captured			Length Range (mm)	Mean Length (mm)
				Species**	Number	Catch/ Trap Hour		
Horseshoe	NO	7/28/83	MT	SS	6	.03	...	...
				LNS	3	.02	...	...
				TS	193	1.03	...	...
			GN	RT	23	0.58	103-365	200
				SS	31	0.83	110-265	130
				RWF	1	.03	...	485
Lost	NO	6/28/83	MT	RT	21	.05	...	...
				TS	159	0.38	...	...
			GN	RT	69	1.78	95-350	201
				SS	1	.03	...	188
Twin Island	NO	6/29/83	MT	TS	441	1.23	...	...
				SSC	2	.01	...	...
			GN	RT	2	.06	300-435	368
Lorraine	YES	6/23/83	MT	TS	508	1.27	...	...
			GN		0			
"Dairy"	YES	7/26/83	MT		0			
			GN		0			

Table 4 (cont.). Biological Data for Selected Lakes of the Matanuska-Susitna Valley.

<u>Lake</u>	<u>Lake Landlocked</u>	<u>Sample Date</u>	<u>Sample Gear*</u>	<u>Fish Captured</u>			<u>Length Range (mm)</u>	<u>Mean Length (mm)</u>
				<u>Species**</u>	<u>Number</u>	<u>Catch/Trap Hour</u>		
"Farmer"	YES	7/26/83	MT	TS	570	2.64	...	...
			GN		0			

* MT = Minnow trap; GN = Gill net.

** Species: RT = rainbow trout; SS = silver salmon; RWF = round whitefish; LNS = longnose sucker; SSC = slimy sculpin; TS = threespine stickleback.

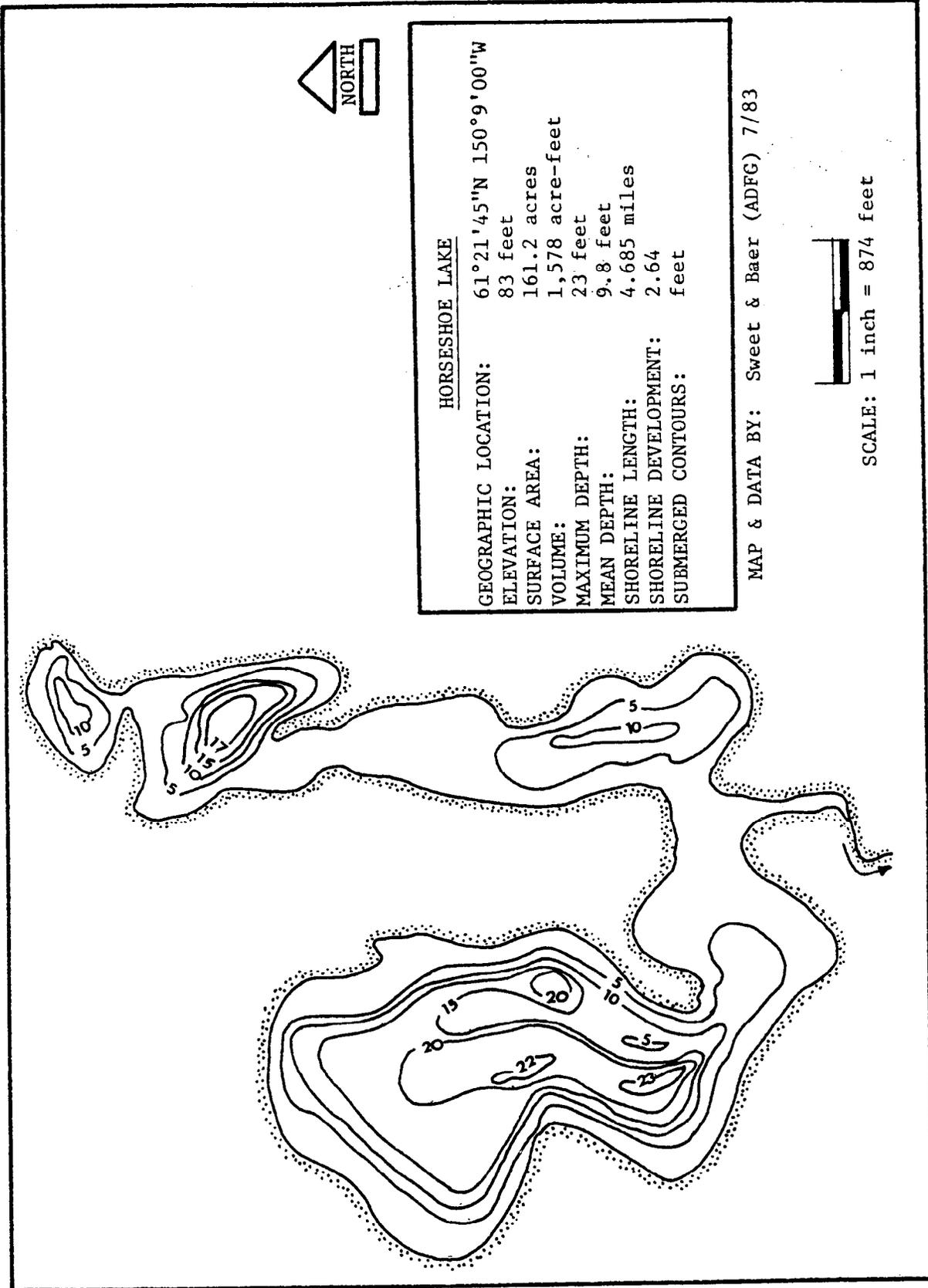


Figure 2. Contour map of Horseshoe Lake.

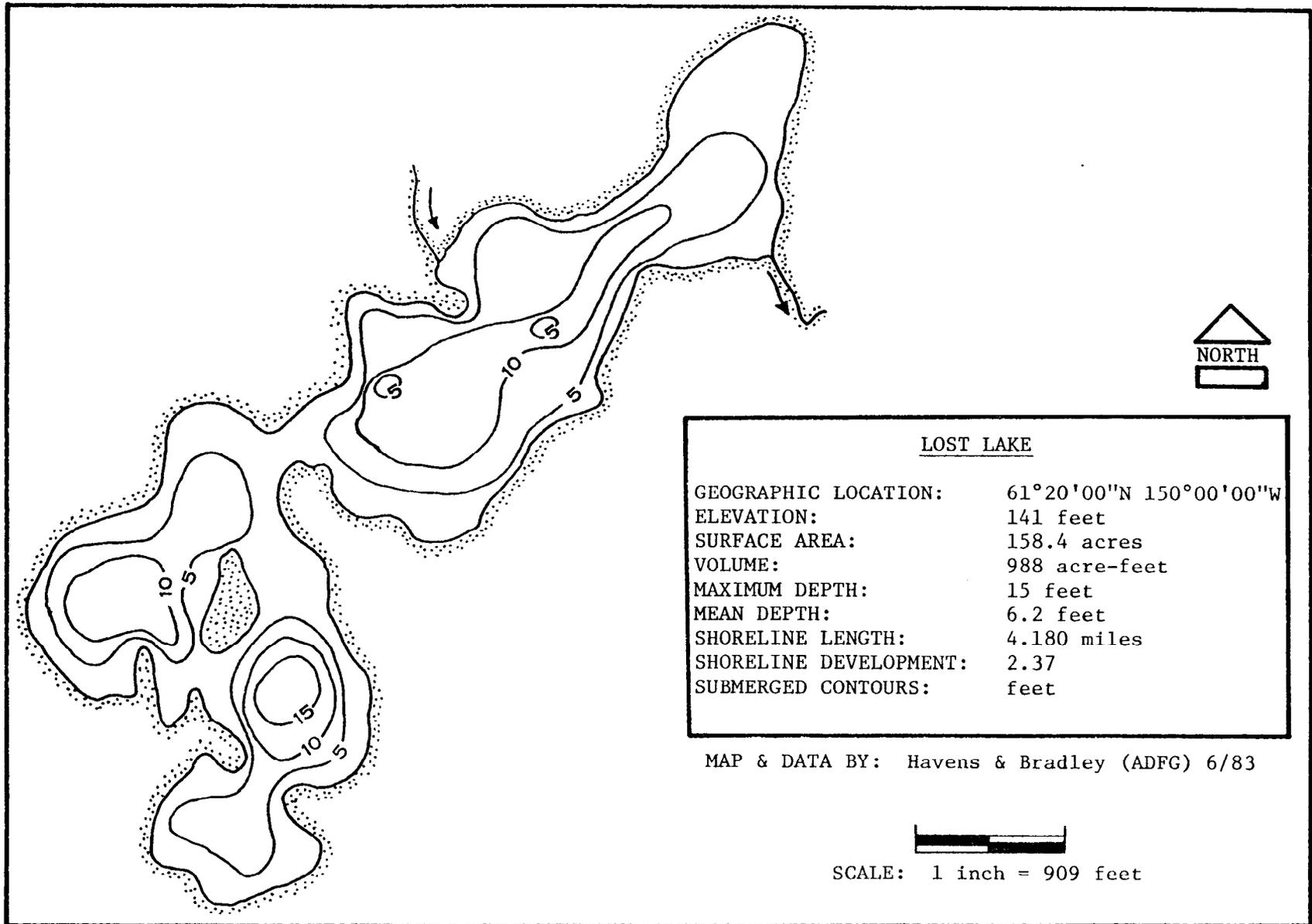


Figure 3. Contour map of Lost Lake.

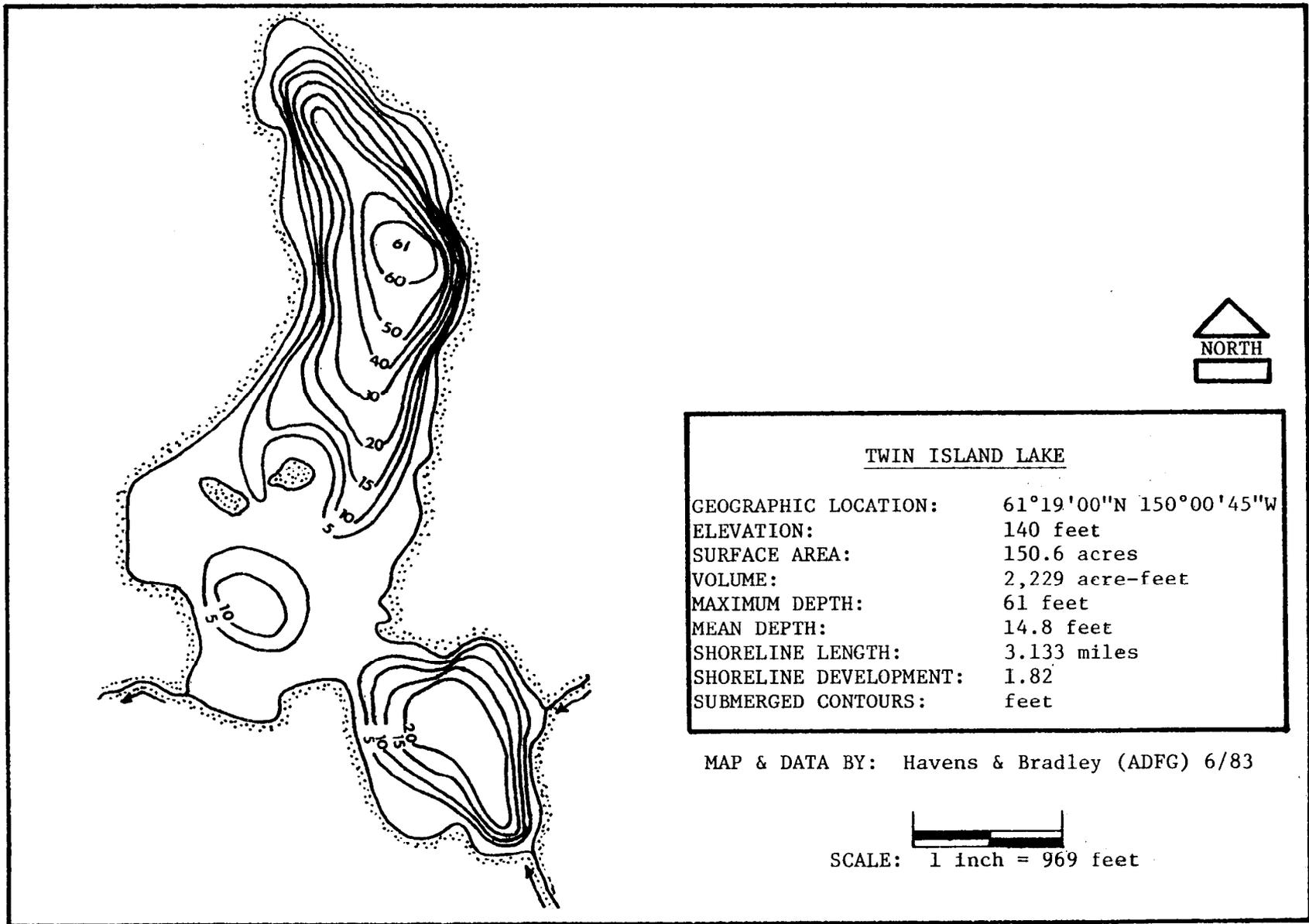


Figure 4. Contour map of Twin Island Lake.

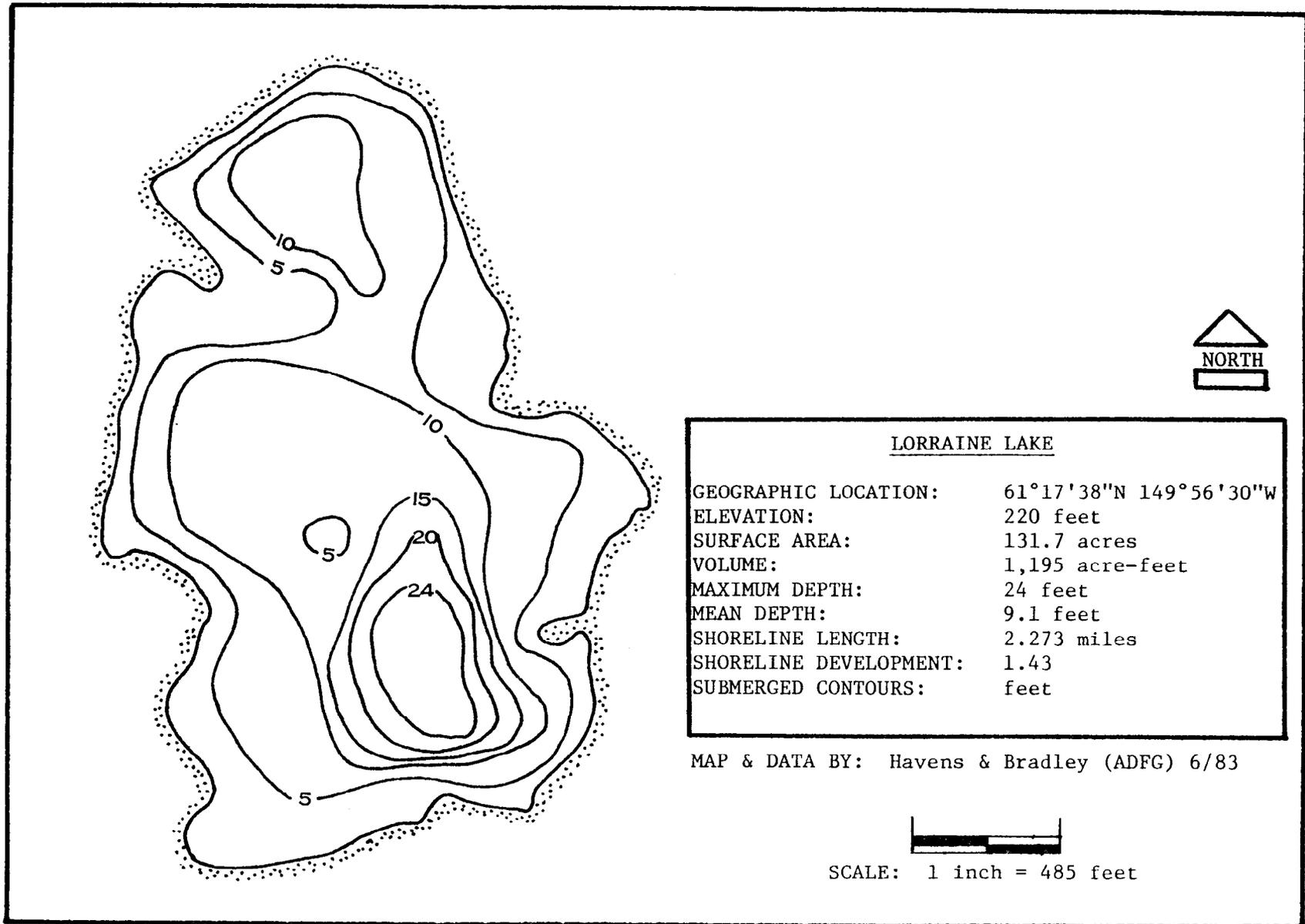


Figure 5. Contour map of Lorraine Lake.

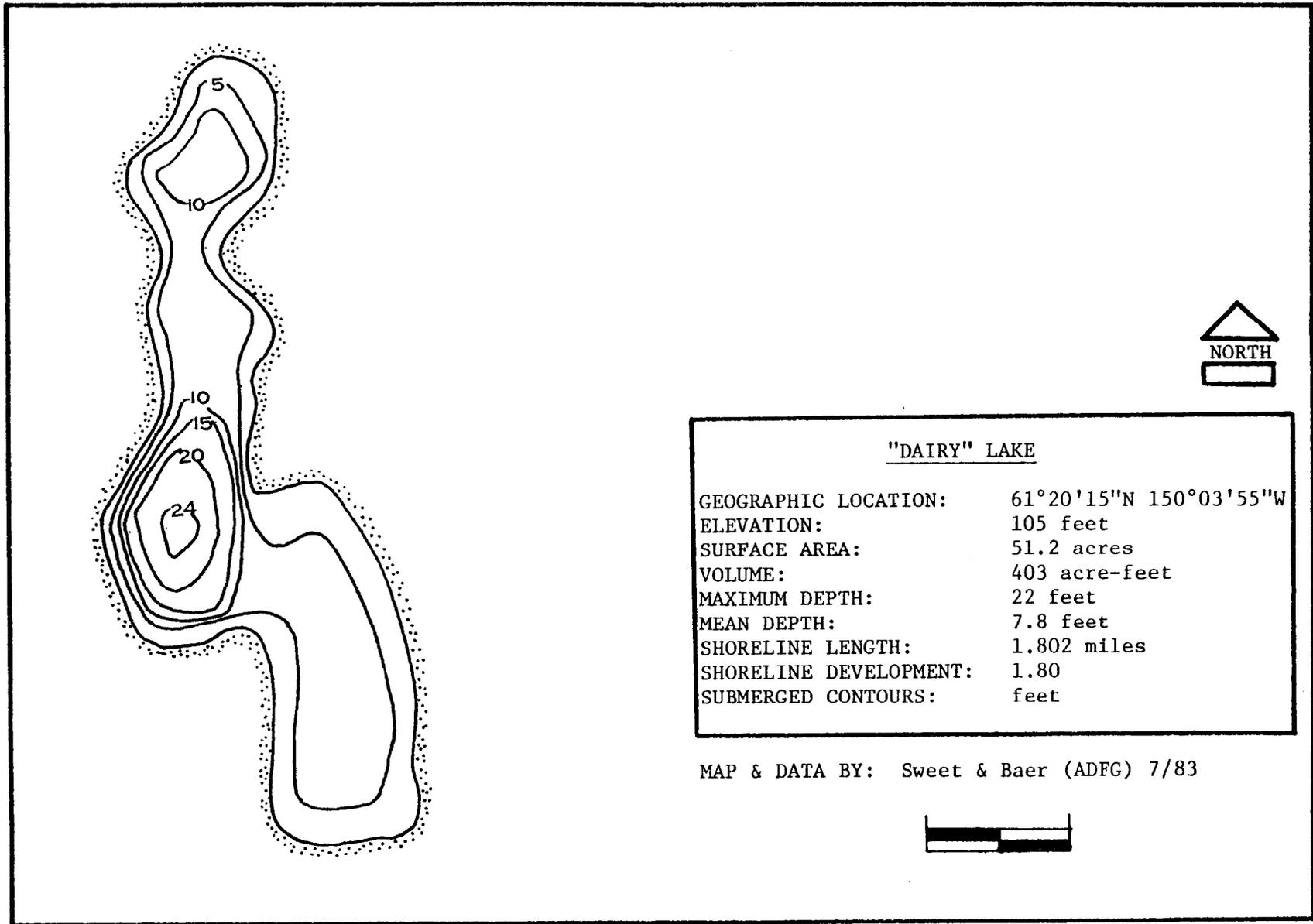


Figure 6. Contour map of "Dairy" Lake.

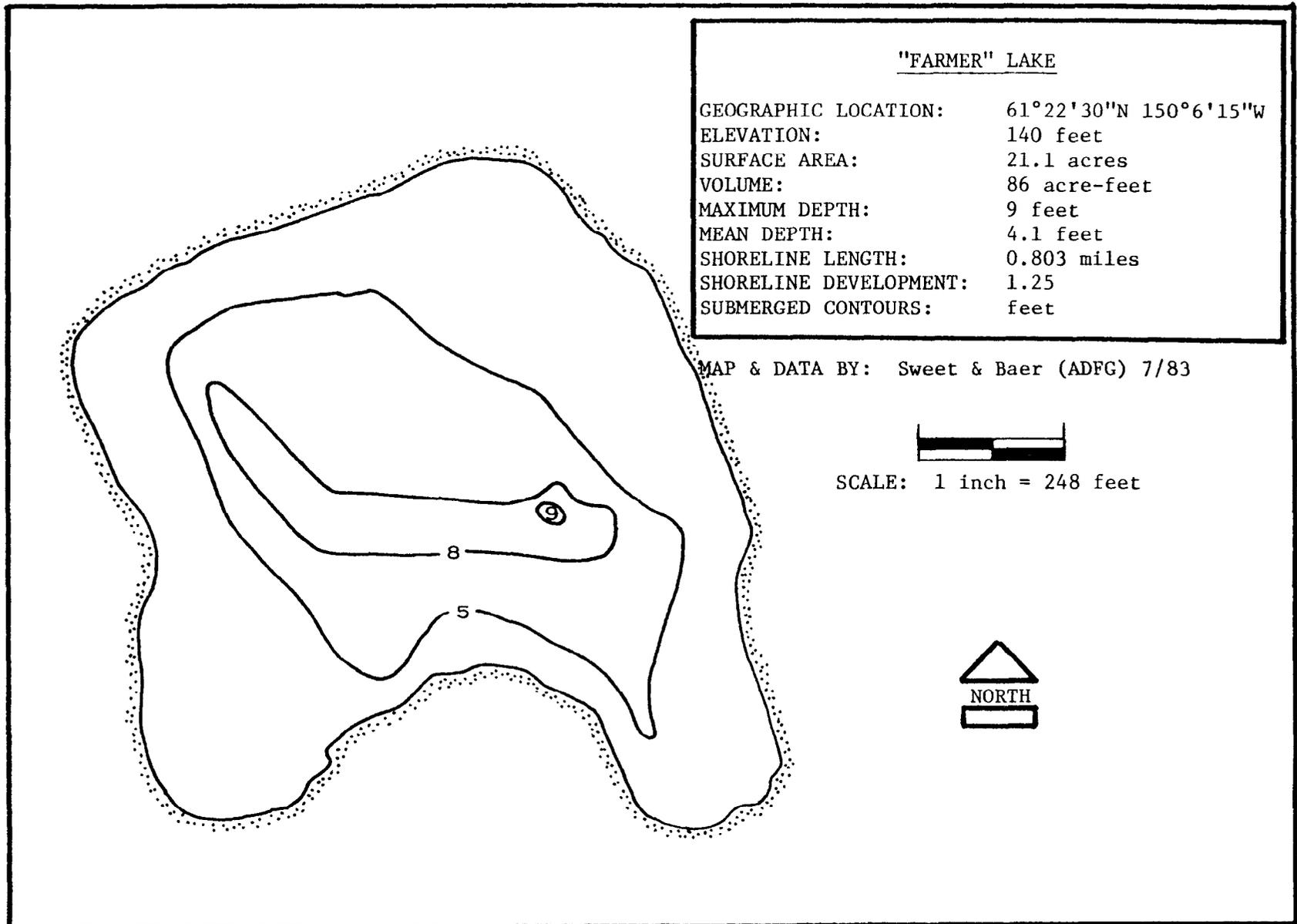


Figure 7. Contour map of "Farmer" Lake.

would be a candidate for rehabilitation to remove threespine stickleback and subsequent stocking of game fish.

"Dairy" Lake:

At 51.2 surface acres, "Dairy" Lake is landlocked and no fish species were captured. The absence of threespine stickleback indicate this lake, at some point, may have experienced a complete winterkill. Because of its size and depth, "Dairy" Lake has a potential for future game fish stocking but should be monitored for oxygen content for several winters prior to stocking.

"Farmer" Lake:

The smallest lake at 21.1 surface acres, "Farmer" Lake is landlocked and has a mean depth of only 4.1 feet. Although threespine stickleback were captured in this lake it probably would not support stocked game fish through a winter season.

Stocked Lake Evaluations

Nine stocked lakes containing landlocked coho salmon were sampled in 1983 with variable mesh gill nets to determine relative growth and survival rates (Table 5). Results are within the range experienced during previous years (Watsjold, 1980, 1981; Bentz, 1982, 1983).

Coho Salmon Escapement Surveys

Coho salmon spawning populations were enumerated by foot surveys in established index areas on Cottonwood Creek during early October. A summary of escapement counts is presented in Table 6. Persistent high water conditions throughout the spawning season prevented surveys on 4 streams.

Habitat Protection

During the past year over 400 permits or review actions were administered for the northern Cook Inlet area. These permit and review actions constitute a myriad of development projects including: waste discharges and disposal; land use permits on State lands; highway and road construction; water use and appropriations; tideland leases and developments; hydro-electric projects; logging; placer mining; subdivision developments; gravel extraction operations from streams; grazing; wetland developments and State land disposals.

Proposed development activities that could singularly have major impacts on northern Cook Inlet aquatic habitat are the Susitna hydro-electric project, extraction of coal from the Beluga area and land management plans that prioritize land use activities for large tracts of land. Planning activities for these projects have received intensive input and review because of their potential impacts on habitat resources. Completed planning documents have included habitat preservation measures within their project design, (Environmental Research and Technology, 1984; Alaska Department of Natural Resources, 1982, 1984).

Table 5. Gill Net Results and Stocking Histories of Matanuska-Susitna Valley Lakes Sampled in 1983.

Lake	Date Sampled	Species	Age Class	Length (mm)				Catch Net Hr.	Date Stocked	Total Number	Fish/	
				n	x	+ SD	Range				lb.	Acre
Benka	12/1/83	SS	I+	2	133	0.71	132-133	0.05	6/15/82	6,500	253	53
Christiansen	12/1/83	SS	I+	37	229	25.34	180-290	1.04	6/15/82	11,540	253	65
Echo	11/19/83	SS	0+	12	136	7.23	128-152	0.62	6/8/83	7,000	698	304
		SS	I+	11	273	15.48	233-292	0.56	5/21/82	4,600	300	200
Finger	12/2/83	SS	I+	36	250	21.39	192-291	0.88	5/21/82	72,400	300	200
Loon	12/8/83	SS	I+	29	221	14.45	190-245	0.62	6/15/82	5,700	253	53
		SS	II+	1	321			0.02	5/20/81	10,797	354	100
Lucille	11/30/83	SS	0+	4	125	11.62	113-135	0.09	6/8/83	28,708	698	79
		SS	I+	8	272	34.49	197-305	0.17	5/21/82 8/9/82	72,400 32,000	300 162	288
		SS	II+	7	399	34.47	360-456	0.15	5/13/81	72,838	310	201
Memory	11/30/83	SS	0+	72	128	6.57	105-138	1.69	6/8/83	25,231	698	304
		SS	I+	51	200	16.51	166-228	1.20	5/21/82	12,400	300	149
Rocky	12/6/83	SS	0+	23	105	4.26	98-115	0.55	6/8/83	17,538	698	299
		SS	I+	25	210	30.49	163-270	0.60	6/15/82	3,135	253	53
Victor	11/29/83	SS	0+	27	139	11.40	116-163	1.44	6/8/83	6,846	698	507
		SS	I+	4	318	3.78	315-322	0.21	5/21/82	2,700	300	200

Table 6. Number of Coho Salmon in Escapement Index Areas (foot count), Northern Cook Inlet, 1971-1983.

Stream	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980*	1981	1982	1983*
Wasilla (a)	104	19	28	30	49	151	...	74	61	...	58	28	...
Wasilla (b)	...	...	...	...	158	162	...	76	187	...	180	143	...
Cottonwood (a)	29	21	10	2	73	100	25	100	64	340	175	187	145
Cottonwood (b)	...	...	...	19	163	104	90	164	...	530	195	634	361
Birch	138	69	106	49	92	27	96	103	120	121	121	41	...
Question	...	...	59	3	111	126	87	45	384	321	230	397	...
Rabideaux	...	...	...	...	67	91	...	88	...	...	...	...	...
Total	271	109	203	103	713	761	298	650	816	1,312	959	1,430	506

* High water conditions made several index areas uncountable.

LITERATURE CITED

Alaska Department of Natural Resources. 1982. Land use plan for public lands in the Willow Sub-Basin. 348 pp.

_____. 1984. Susitna area plan (Agency review draft). 510 pp.

Bentz, R.W. 1982. Inventory and cataloging of the sport fish and sport fish waters in upper Cook Inlet. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Performance, 1981-1982, Project F-9-14, 23(G-I-D): 76-112.

_____. 1983. Inventory and cataloging of the sport fish and sport fish waters in upper Cook Inlet. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Performance, 1982-1983, Project F-9-15, 24(G-I-D): 60-104.

Environmental Research and Technology, Inc., 1984. Diamond Chuitna project, aquatic biology baseline studies report. 78 pp.

Glass, R.L. 1983. Hydrologic data for Point MacKenzie area, southcentral Alaska, October 1983. U.S. Geological Survey, Open-File Report 83-142. 34 pp.

Watsjold, D. 1980. Inventory and cataloging of the sport fish and sport fish waters in upper Cook Inlet. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Performance, 1979-1980, Project F-9-12, 21(G-I-D): 91-120.

_____. 1981. Inventory and cataloging of the sport fish and sport fish waters in upper Cook Inlet. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Performance, 1980-1981, Project F-9-13, 22(G-I-D): 63-85.

Prepared By:

Robert W. Bentz
Fishery Biologist

Approved By:

Richard Logan, Ph.D., Director
Division of Sport Fish

Louis S. Bandirola, Deputy Director
Division of Sport Fish

