MONITORING OF WATER-SOURCE LAKES IN THE ALPINE DEVELOPMENT PROJECT: 2000

Final Report

February 2001

Prepared by:

MJM Research
1012 Shoreland Drive
Lopez Island, WA

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Phillips Alaska, Inc.
700 G Street
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INTRODUCTION

Two lakes, designated L9312 (or U6.1) and L9313 (or T6.1), provide the permanent water supply for the Alpine development (Figures 1 and 2). Two naming conventions are used to identify the lakes in the Colville Delta region – one name conveys information on initial sampling and the investigator responsible for the sampling, the other name conveys information on location within the North Slope Emergency Response grid (Moulton 1998).

Both of the water-source lakes support fish, with six species identified from each lake in sampling prior to 2000 (Moulton 1999). A series of permits have been issued by Alaska Department of Fish and Game (ADF&G) that allow water withdrawal from the lakes under restrictions intended to protect fish residing within the lakes (Appendix A). These permits have been modified as information on the lakes has improved and as project needs have changed. A permit stipulation added to the March 30, 1999 amendments was that each lake would be monitored for fish presence at least twice during the ice-free season. This report is intended to fulfill that permit stipulation.

The objectives of this study were to conduct the required monitoring for fish presence and compare the 2000 catch patterns to those observed in previous years.

Additional sampling was conducted at a small lake, M0018 (AA8.1), near the Arctic Slope Regional Corporation's Colville River mine site (Figure 1) at the request of Alaska Department of Natural Resources (Temporary Water Use Permit LAS 20580, Amendment 12/29/99). The objective of this sampling was to obtain information needed to estimate lake volume and evaluate fish habitat. This information will allow estimating the appropriate amount of water available for winter withdrawal.

METHODS

Alpine Water Source Lakes

Monitoring of the water-source lakes consisted of sampling with fyke nets combined with physical measurements. Sampling was by fyke net because the objective was to sample fish with non-lethal gear so that the sampling would not be the cause of any observed changes to the populations. As required by the monitoring stipulations, sampling was conducted during two periods: July 22-29 and August 15-22. Fish were measured and released, with no fish retained for laboratory analysis. Duration of each set was recorded to allow calculation of catch rates.

Water chemistry measurements included water temperature, specific conductance, and dissolved

oxygen. Twice during the summer, a profile of the same parameters was taken from the deepest part of the lake to evaluate potential stratification.

During break-up 2000, both lakes were flooded by the river, thus were fully re-charged prior to any sampling. Bathymetric data were collected from the lakes to allow re-estimating lake volume and relating these volumes to the bank-full water surface elevation observed after break-up. Depths were taken with an Eagle SupraPro ID depth sounder. Individual depth measurements were located with a hand-held GPS receiver while traversing the lake with either a boat or float tube. Depth measurements were plotted on base maps of each lake. U.S. Department of Defense scrambling of the civilian GPS signal was removed on May 1, 2000, thus the positions obtained in summer 2000 had an estimated accuracy of about 15 feet. A 2-foot contour map was prepared for each lake and the volume was estimated by summing the area covered by contours.

Mine Site Lake M0018

The lake near the Colville River mine site (M0018, also designated AA8.1) was sampled with multimesh gill nets (120 feet long, six panels of variable mesh, mesh size ranging from 1 to 3.5 inches stretched mesh). These nets have been previously used to collect inventory-level data from lakes throughout the delta and nearby areas. Sets were kept to a short duration to minimize the chance for entangling waterfowl and to minimize fish mortality. Fish captured were measured and released.

Lake volume for one-time water withdrawals is estimated by applying the formula for the volume of a cone to the surface area and maximum depth of each lake. Surface area is obtained from a GIS base map using the USGS 1:63,360 scale quads. In fish-bearing lakes, the amount allowed for winter water withdrawal is estimated as 15% of the volume of the lake deeper than 7 feet. Since ice cover in late winter approaches 7 feet, this volume is considered the minimum winter volume. The 15% criterion was established by ADF&G to allow some level of water use while retaining a measure of protection for overwintering fish. This method of volume estimation provides a rough estimate, but is currently accepted for a first estimate for a one-time use.

RESULTS AND DISCUSSION

History of Water Withdrawal

Water use has varied considerably in the two lakes over the last two winters (Table 1). In L9312, 87% of the permitted withdrawal was used in winter 1998/1999, while only 15% was used in 1999/2000. In L9313, only 3% was used in 1998/1999, with 85% used in 1999/2000.

Biological Observations

Lake L9312 (U6.1). Net location B identified in 1999 as the most appropriate monitoring site

(Moulton 1999) was re-occupied for the 2000 sampling (Figure 3). Fyke net sampling conducted July 22-29, 2000 produced a catch of 2,153 fish from 8 species, while sampling conducted August 15-22 produced 801 fish from 9 species (Table 2). The burbot caught on August 20 was the first record of this species from lake L9312, bringing the total number of species recorded from the lake to 10.

Least cisco was the most numerous species caught in 2000, with the total 1,545 fish representing 83% of the non-stickleback catch. The overall catch rate of least cisco increased from 9.0 per day in 1999 to 111.0 in 2000. The least cisco in 2000 likely represented many age groups (based on length frequency analysis – Appendix B), because the lengths ranged from 60 to 220 mm. Previous sampling in the lake demonstrated that the lake contains stunted least cisco (i.e. small size at a given age compared to the anadromous population, as per Moulton 1998), thus the fish caught during 2000 likely range from ages 1 to 8 or older. The peak catch was likely ages 3 to 4.

Catches in general were higher in 2000 than in 1999, with the exception of round whitefish (Table 2, Figure 4). The round whitefish catch in both years totaled 24 fish, but the greater effort in 2000 resulted in a lower catch rate. Humpback whitefish had not previously been reported from lake L9312. Based on examination of the length frequency, it is likely that humpback whitefish caught in 2000 were almost entirely age 1 fish, with a few older fish included (Appendix B).

Lake L9313 (T6.1). Net location B identified in 1999 as the most appropriate monitoring site (Moulton 1999) was re-occupied for the 2000 sampling (Figure 5). Fyke net sampling conducted July 22-29, 2000 produced a catch of 806 fish from 3 species, while sampling conducted August 15-22 produced 450 fish from 6 species (Table 2). Ninespine stickleback and Alaska blackfish were the most abundant species, with least cisco, broad whitefish, humpback whitefish and burbot also caught. Catch rates of Alaska blackfish were much higher in August than in July (Figure 6), while ninespine stickleback catches were higher in July. The burbot caught on August 17 was the first record of this species from lake L9313, bringing the total number of species recorded from the lake to 7.

The least cisco and whitefish caught during 2000 were all juveniles, most probably ages 2 and 3 (based on length frequency analysis – Appendix B). The large school of juvenile least cisco present in 1999 appeared to be absent since only 5 were caught in 331 net-hours in 2000, compared to the 975 caught in 172 net-hours in 1999 (Moulton 1999). The overall least cisco catch rate in 2000 was 0.36 fish per day, compared to 135.7 fish per day in 1999.

Sampling in lake L9313 prior to 1999 indicated few fish resided in the lake (Table 3), with ninespine stickleback and low densities of least cisco and Alaska blackfish present. The high catches of least cisco in 1999, along with the new records of broad whitefish, humpback whitefish, and round whitefish, likely indicate that fish have entered the lake during a high water period possibly in 1998 or 1999.

Sampling during July is conducted during 24-hours of daylight, while sampling in late August

includes periods of darkness at night. The catches in late August in both L9312 and L9313 may reflect this difference in daylight pattern. The pattern of daily catch indicates that both slimy sculpin and Alaska blackfish were more active at night (Figures 7 and 8), while least cisco and ninespine stickleback may reduce activity during darkness. Additionally, this was the first year that fyke net sampling was conducted in late August, and it coincided with the first catches of burbot in both lakes. Burbot are known to be strongly negative phototrophic (avoid light – Morrow 1980), thus it is highly unlikely that they would enter the shallow water sampled by fyke nets during daylight. Since most sampling throughout the delta has been conducted in July and early August, it is possible that burbot are more widely distributed in delta lakes than indicated by current sampling results.

Lake M0018 (AA8.1). Sampling with gill nets at lake M0018 produced 2 least cisco (360-361 mm) and 1 broad whitefish (500 mm). Since the objective of sampling was to identify presence or absence of fish, the gill nets were pulled after 1.7 hours of effort. Fish were not caught during 4.6 hours of effort with minnow traps.

Water Chemistry

The spring flood appeared to have a greater effect on the water chemistry of lake L9312 than on L9313. Specific conductance in L9312 decreased by 29% between July 1999 and July 2000, while that of L9313 decreased only 3% (Table 4). Specific conductance in L9313 remained high compared to recent years, while that in L9312 was at its lowest observed level. While data are sketchy at this point, the indication is there may be a decrease in specific conductance caused by water withdrawal (Table 5). Water being removed from under the ice has a higher ionic concentration because of ion exclusion during ice formation. The concentrated water is replaced with snow melt during break-up, thus ionic concentration should decrease. During winter 1999/2000, however, more water was withdrawn from lake L9313 than from L9312, yet the change in specific conductance was greater in L9312.

Water Volume Estimates

L9312 (U6.1) and L9313 (T6.1). The estimated volume of water in the two lakes has changed in recent years as the bathymetric data on the lakes have been refined. The initial estimates were calculated based on the formula used for calculating the volume of a cone, with the lake surface area used for the area of the base and the maximum depth used for the height. This estimating method is used for rough estimates of water volume when permits are requested for one-time withdrawals. When it became evident that the lakes were to be used as the permanent water sources for the Alpine Development, sufficient data were acquired to develop contour maps of the lakes. The volume was then estimated from the contours. However, the water surface elevation at the time of the bathymetric surveys was not known, thus the estimated volume was subject to uncertainty associated with the fluctuating lake level.

After break-up in 2000, when the lakes were assumed to be bank-full, the water surface elevation

was surveyed relative to mean sea level and staff gauges were installed. The bathymetry surveys were re-done and tied to the water surface elevation on the day of the survey. Volumes were re-calculated using the depth contour method. The new lake contours are presented in Figures 9 and 10. A rating curve was established so that the volume of water at any given staff gauge reading can be estimated – this is used to track water remaining for use under existing permits.

Based on the 2000 bathymetry and contour mapping, there is an estimated 312.95 million gallons in lake L9312 and 165.45 million gallons in L9313 at bank-full water levels (Table 7). In late winter under a 7 foot ice cover, these volumes are reduced 107.86 million gallons in L9312 and 34.47 million gallons in L9313. On September 1, 2000, ADF&G used these volumes to establish the permitted water withdrawal in the lakes to present levels (Table 7).

M0018 (AA8.1). Surface area of lake M0018 is estimated to be 15.4 acres, with a maximum depth of 16.0 feet. This lake represents fish habitat because broad whitefish and least cisco are present, so the potential water withdrawal is limited to 15% of the minimum winter volume. Based on these parameters, and applying the cone-volume formula, the total volume is estimated to be 26.45 million gallons, with 2.23 million gallons available for winter use.

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Table 1. Water withdrawal at Alpine Development lakes prior to break-up, 1999-2000.

Lake Name	Month	1998/1999 (gallons)	1999/2000 (gallons)
L9312	February	9,100,325	0
	March	1,847,370	0
	April	0	947,100
	May	0	1,865,161
	Total Use	10,947,695	2,812,261
	Permitted Use	12,600,000	19,000,000
L9313	December	0	765,600
	January	63,000	1,696,600
	February	126,000	1,039,800
	March	0	1,550,800
	April	0	843,900
	May	0	0
	Total Use	189,000	5,896,700
	Permitted Use	5,600,000	6,940,000

[1] These permitted use levels were used by Phillips Alaska, Inc. (formerly ARCO Alaska) for tracking purposes, some of these levels are less than permitted levels found in the ADF&G permits.

Table 2. Catches of fish from Alpine Area Lakes fyke net sampling, 2000.

	July 1999		July 2000		August 2000	
Species	**Number**	**CPUE**	**Number**	**CPUE**	**Number**	**CPUE**
L9312						
Least cisco	62	9.0	1,349	192.3	196	28.4
Arctic cisco	0	0.0	0	0.0	5	0.7
Broad whitefish	5	0.7	5	0.7	4	0.6
Humpback whitefish	0	0.0	27	3.8	15	2.2
Round whitefish	24	3.5	7	1.0	17	2.5
Burbot	0	0.0	0	0.0	1	0.1
Longnose sucker	0	0.0	1	0.1	0	0.0
Alaska blackfish	7	1.0	22	3.1	102	14.8
Slimy sculpin	83	12.0	13	1.9	93	13.5
Ninespine stickleback	184	26.7	729	103.9	368	53.3
Net Hours:	165.4		168.3		165.7	
L9313						
Least cisco	975	135.7	0	0.0	5	0.7
Broad whitefish	5	0.7	4	0.6	7	1.0
Humpback whitefish	0	0.0	0	0.0	5	0.7
Round whitefish	2	0.3	0	0.0	0	0.0
Burbot	0	0.0	0	0.0	1	0.1
Alaska blackfish	9	1.3	23	3.3	100	14.8
Ninespine stickleback	111	15.5	779	110.2	332	49.3
Net Hours:	172.4		169.7		161.6	

Table 3. Results of fish sampling in lakes L9312 and L9313 prior to 2000

Lake	Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
L9312	Fyke Net	Jul 14, 1995	23.9	Alaska blackfish	1	
				Slimy sculpin	1	
				Ninespine stickleback	10	
		Jul 26, 1995	20.0	Broad whitefish	1	428
				Ninespine stickleback	2	
		Jul 11-15 1997	116.6	Least cisco	1	56
				Alaska blackfish	5	70
				Slimy sculpin	8	38-84
				Ninespine stickleback	57	
		Jul 28-Aug 4 99	165.4	Least cisco	62	80-234
				Broad whitefish	5	146-477
				Round whitefish	24	123-233
				Alaska blackfish	7	80-109
				Slimy sculpin	83	47-81
				Ninespine stickleback	184	
	Gill Net	Nov 2, 1995	21.7	Least cisco	62	116-303
				Broad whitefish	5	334-470
	Minnow Trap	Jul 14, 1995	48.6	Slimy sculpin	2	
				Ninespine stickleback	1	
	Set Line	Jul 14, 1995	23.5	None	0	
L9313	Fyke Net	Jul 14, 1995	23.3	Least cisco	5	229-283
				Alaska blackfish	6	42-90
				Ninespine stickleback	63	
		Jul 26, 1995	20.7	Ninespine stickleback	9	
		Jul 11-15 1997	91.2	Least cisco	4	167-276
				Alaska blackfish	12	79
				Slimy sculpin	1	
		Jul 28-Aug 4 99	172.4	Least cisco	975	43-216
				Broad whitefish	5	124-152
				Humpback whitefish	2	95, 97
				Round whitefish	2	
				Alaska blackfish	9	70-117
				Ninespine stickleback	111	
	Gill Net	Nov 1, 1995	20.6	None	0	
		Aug 8, 1996	9.1	None	0	
	Minnow Trap	Jul 15, 1995	43.2	Ninespine stickleback	9	
	Set Line	Jul 15, 1995	21.6	None	0	
		Jul 16, 1995	24.3	None	0	

Table 4. Water chemistry parameters measured in conjunction with Alpine Area fish sampling at lakes L9312 and L9313.

Lake	Parameter	Date	Mean	Standard Deviation	Number	Range	
L9312							
	Water Temperature (°C)						
		Jul 13, 1995	13.4	--	1	13.4	
		Nov 2, 1995	0.8	0.7	8	0-1.8	(under ice)
		Jul 9-15, 1997	8.3	0.7	5	7.7-9.5	
		Jul 28-Aug 3, 1999	10.4	1.9	7	8.6-13.5	
		Jul 24-29, 2000	10.7	0.8	6	10.0-12.1	
		Aug 16-21, 2000	7.6	0.6	6	6.6-8.5	
	Dissolved Oxygen (% Saturation)						
		Jul 13, 1995	--	--	0	--	
		Nov 2, 1995	--	--	0	--	
		Jul 9-15, 1997	99.4	6.9	5	90.8-110.0	
		Jul 28-Aug 3, 1999	98.8	0.2	2	98.6-98.9	
		Jul 24-29, 2000	97.4	1.4	4	95.5-99.0	
		Aug 16-21, 2000	--	--	0	--	
	Specific Conductance (µS/cm)						
		Jul 13, 1995	60.0	--	1	60.0	
		Nov 2, 1995	133.2	2.6	8	130.6-137.8	(under ice)
		Jul 9-15, 1997	83.5	0.5	5	82.7-83.9	
		Jul 28-Aug 3, 1999	77.2	1.5	7	76.2-79.5	
		Jul 24-29, 2000	54.8	0.2	6	54.5-55.2	
		Aug 16-21, 2000	55.7	0.4	6	55-56.3	
L9313							
	Water Temperature (°C)						
		Jul 13, 1995	13.1	--	1	13.1	
		Oct 31, 1995	0.4	0.4	6	0.0-1.0	(under ice)
		Jul 9-15, 1997	8.0	0.4	5	7.7-8.6	
		Jul 28-Aug 3, 1999	10.2	1.9	7	8.3-12.7	
		Jul 24-29, 2000	10.6	0.4	5	10.3-11.2	
		Aug 16-21, 2000	7.7	0.5	6	6.9-8.5	
	Dissolved Oxygen (% Saturation)						
		Jul 13, 1995	--	--	0	--	
		Oct 31, 1995	--	--	0	--	
		Jul 9-15, 1997	96.3	2.1	5	93.9-99.1	
		Jul 28-Aug 3, 1999	100.7	2.2	2	99.1-102.2	
		Jul 24-29, 2000	98.6	1.3	3	97.4-100.0	
		Aug 16-21, 2000	--	--	0	--	
	Specific Conductance (µS/cm)						
		Jul 13, 1995	107.0	--	1	107.0	
		Oct 31, 1995	184.1	7.5	6	169.9-189.5	(under ice)
		Jul 9-15, 1997	126.2	2.0	5	123.3-128.5	
		Jul 28-Aug 3, 1999	172.8	3.3	7	170.2-177.9	
		Jul 24-29, 2000	167.7	1.1	5	166.7-169.2	
		Aug 16-21, 2000	174.1	2.5	6	170.3-176.5	

Table 5. Water chemistry profiles measured in conjunction with Alpine Area sampling at lakes L9312 and L9313 during 2000.

Lake	Date	Time	Depth (m)	Water Temp. (oC)	Dissolved Oxygen (mg/l)	Dissolved Oxygen Percent Saturation	Specific Conductance (µS/cm)	Turbidity (NTU)
L9312	8/15/00	12:17	0.5	6.2	11.6	93.8	55.1	4.0
			1.5	6.0	11.7	93.7	55.1	4.1
			2.5	5.9	11.9	95.3	55.1	3.9
			3.5	5.9	11.7	94.3	55.1	5.7
	7/21/00	11:30	0.5	10.4	11.1	100.2	53.3	10.5
			1.5	10.0	11.2	98.8	53.4	7.6
			2.5	9.8	11.1	98.5	53.4	7.5
			3.5	9.6	11.1	98.3	53.4	8.6
L9313	7/18/00	14:55	0.5	11.2	10.6	96.8	161.8	3.6
			1.5	11.1	10.5	96.4	162.2	3.3
			2.5	10.8	10.8	98.0	162.6	3.3
			3.5	10.8	10.9	98.1	162.7	3.5
	8/15/00	12:17	0.5	6.6	12.3	99.8	170.4	5.5
			1.5	5.9	12.4	98.0	171.1	5.7
			2.5	5.7	12.6	100.4	171.3	15.0
			3.5	5.7	12.5	100.3	171.4	7.5

Table 6. Variation in specific conductance observed at lakes L9312 and L9313 from 1995 to 2000 as measured at fyke net stations.

Lake	Year	Winter Water Withdrawal (million gals.)	July Specific Conductance (µS/cm)
L9312	1997	--	83.5
	1998	--	--
	1999	10,947,695	77.2
	2000	2,812,261	54.8
L9313			
	1997	--	126.2
	1998	--	--
	1999	189,000	172.8
	2000	5,896,700	167.7

Table 7. Comparison of estimated available winter water based on volume-of-cone method and contour method.

Lake Number	Area (acres)	Max. Depth (ft)	Volume Estimating Method	Estimated Volume (million gals)	Volume below 7 ft (million gals)	Permitted Withdrawal 30% of Vol.below 7 ft (million gals)
L9312	99.9	14.1	Cone Volume	151.39	76.23	22.87
			Contours-1998	297.99	94.33	28.30
			Contours-2000	312.95	107.86	32.36
L9313	68.9	12.3	Cone Volume	91.08	39.24	11.77
			Contours-1998	184.64	44.93	13.48
			Contours-2000	165.45	34.47	10.34

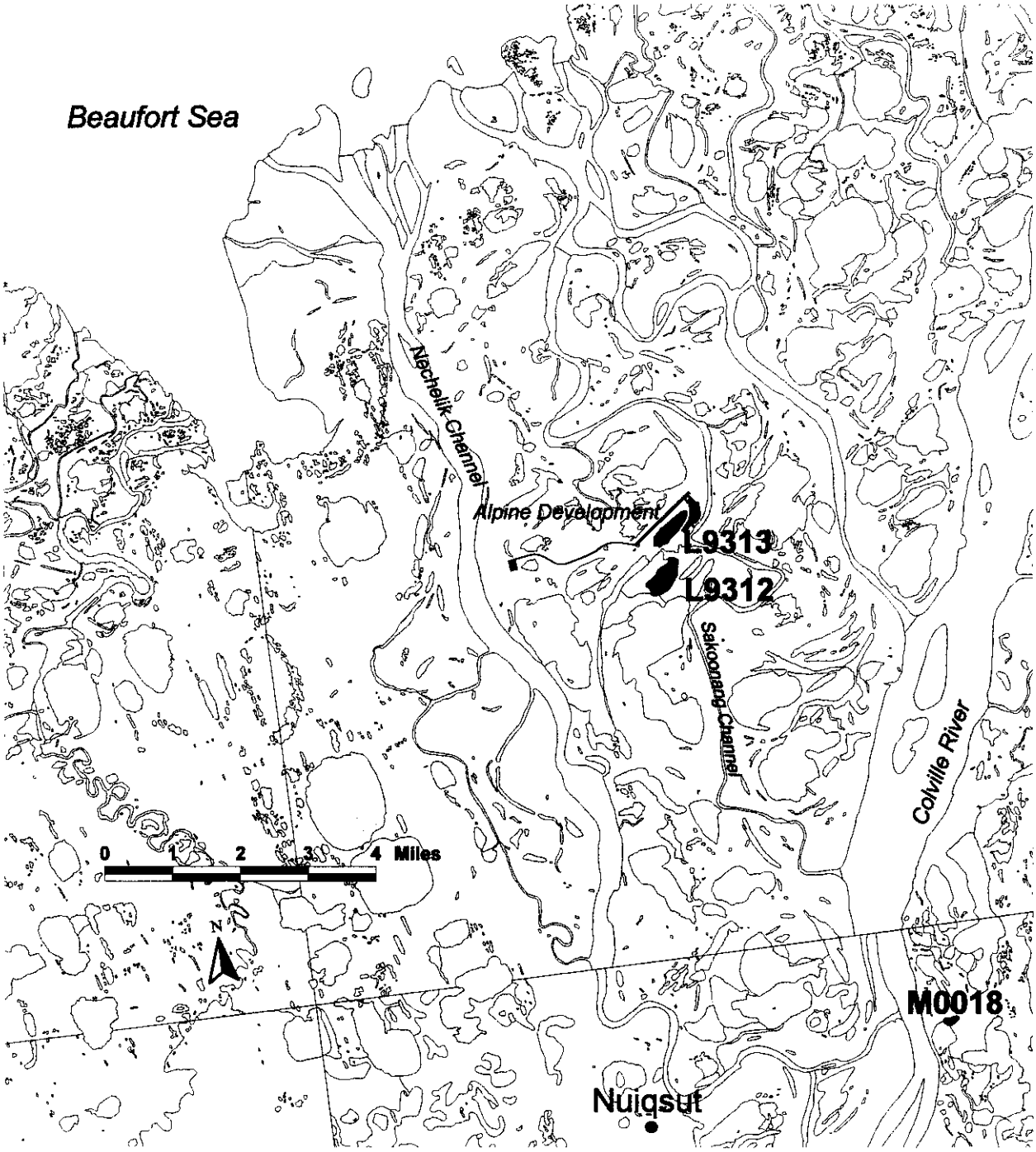


Figure 1. Lakes sampled in 2000, Alpine Development Area.

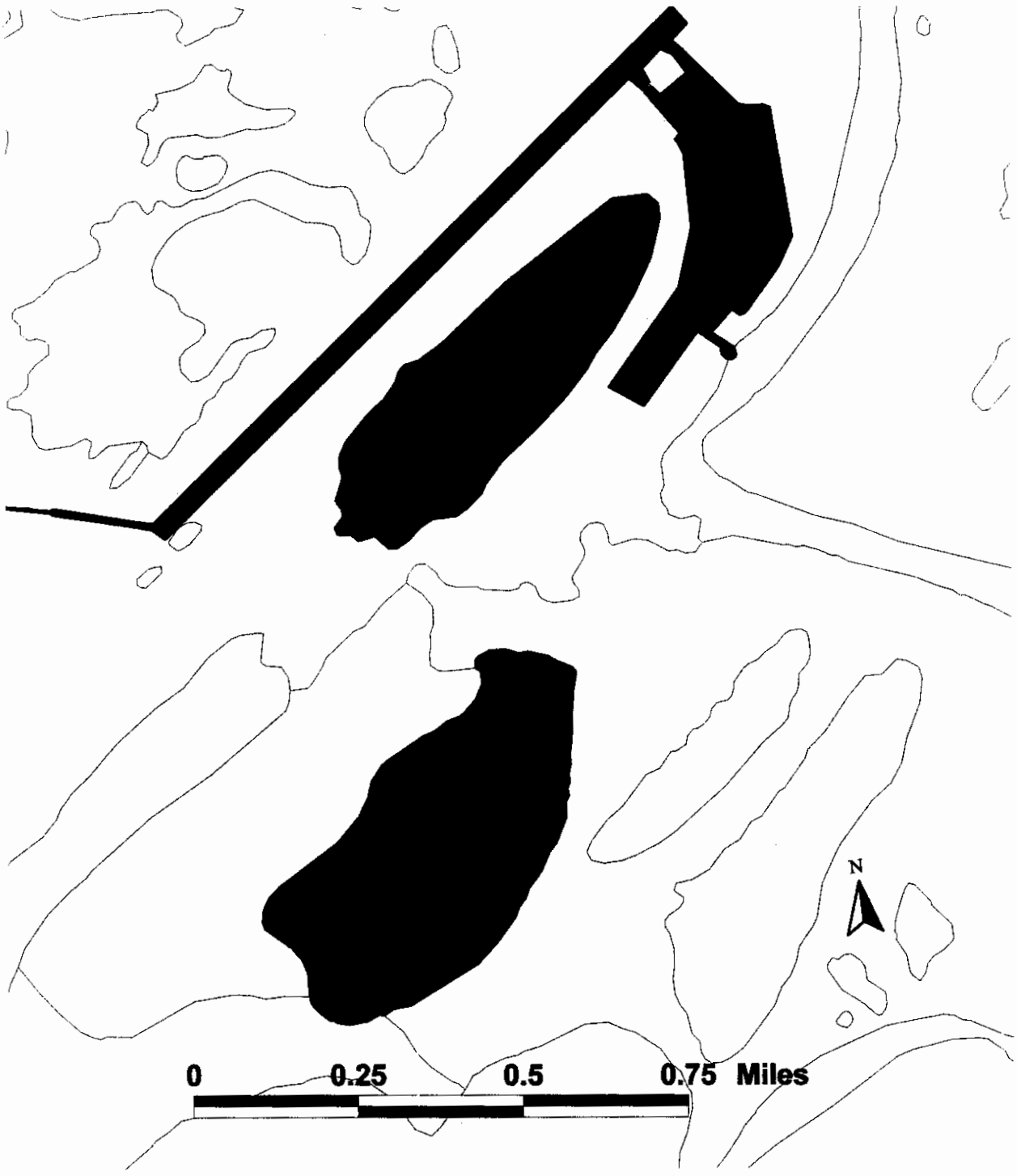


Figure 2. Water-source lakes in the Alpine Development Area.

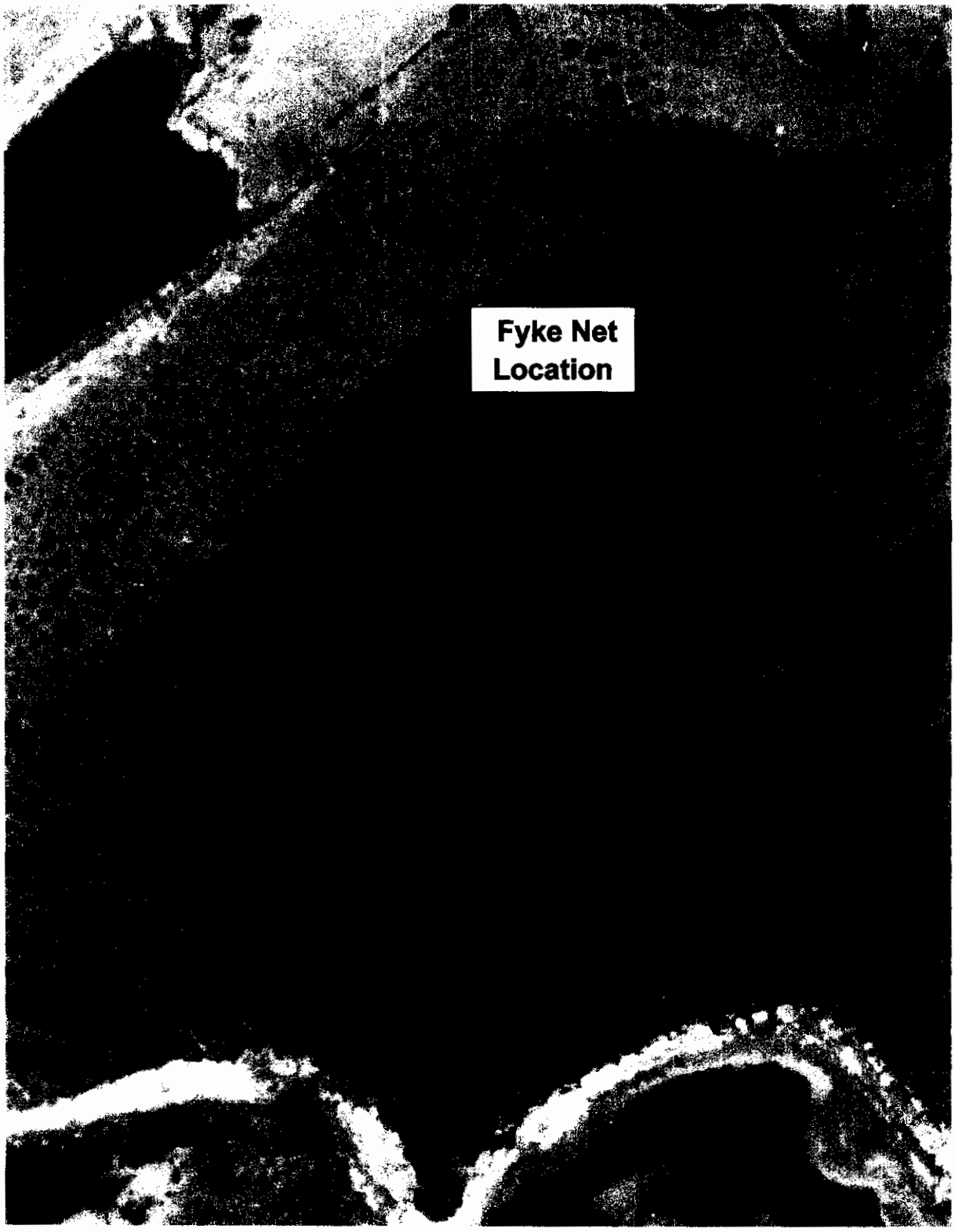


Figure 3. Fyke net station used for long-term monitoring in lake L9312.

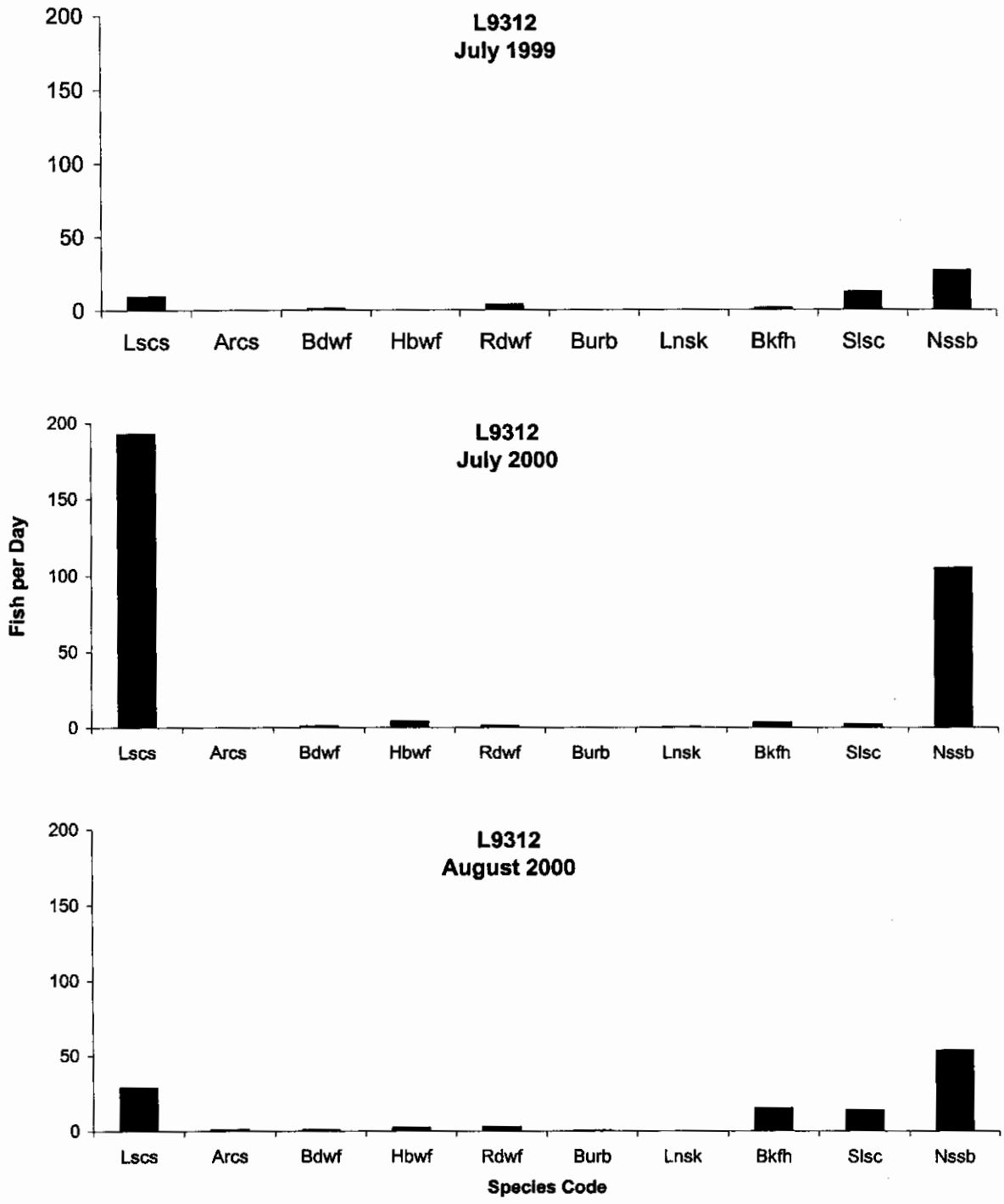


Figure 4. Abundance of fish by species in lake L9312 during 1999 and 2000 (based on fyke net catches expressed as fish per day).

Figure 5. Fyke net station used for long-term monitoring in lake L9313.

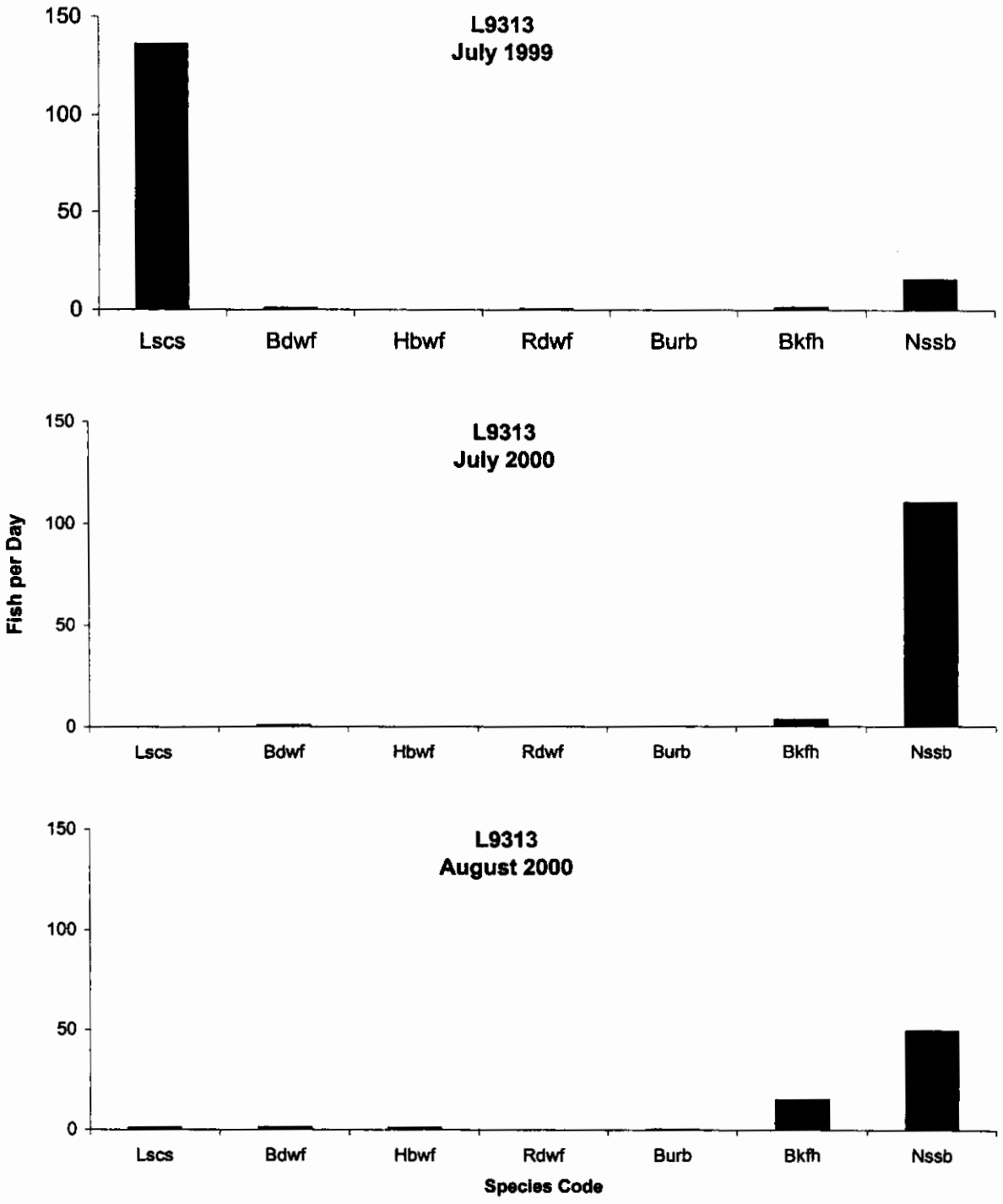


Figure 6. Abundance of fish by species in lake L9313 during 1999 and 2000 (based on fyke net catches expressed as fish per day).

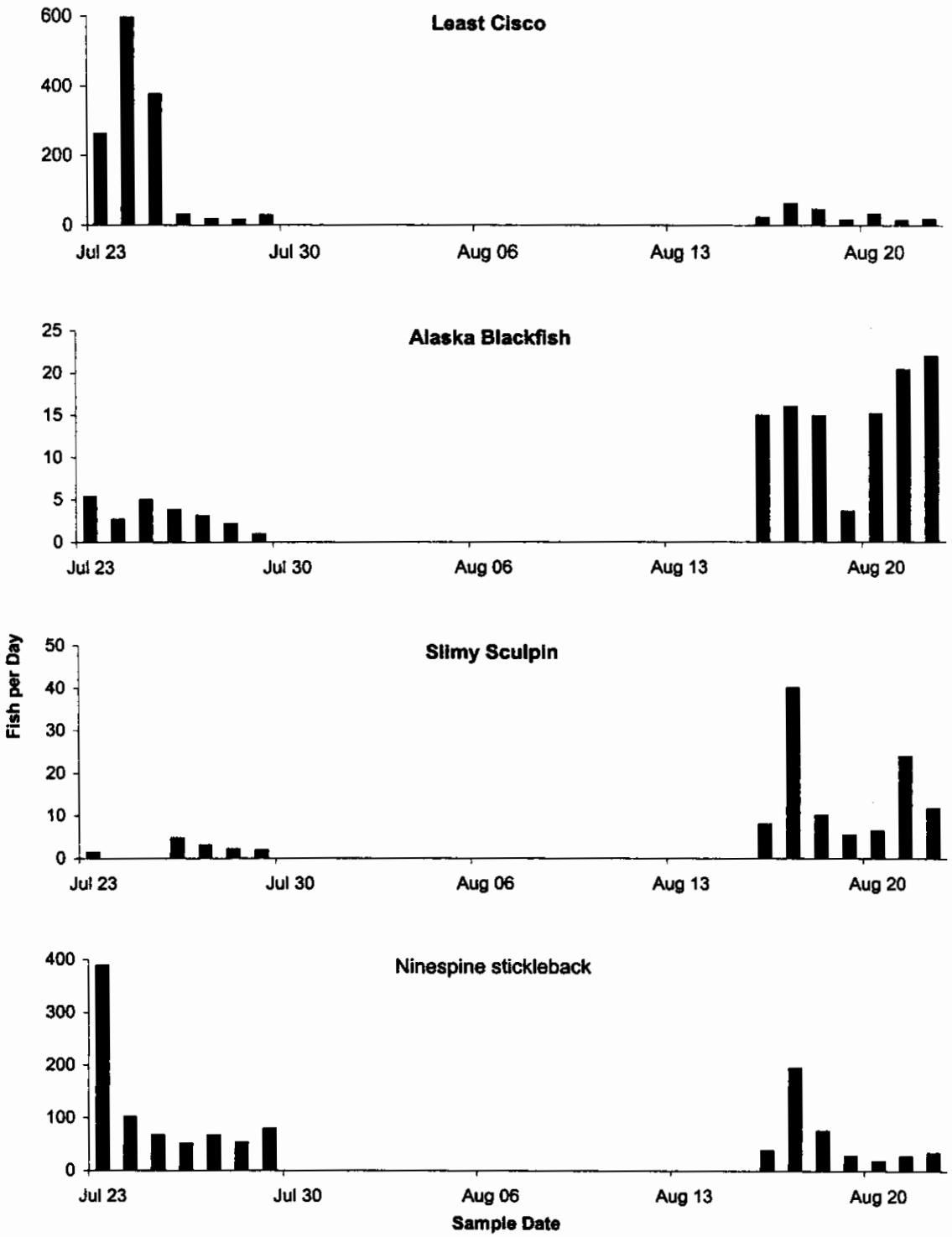


Figure 7. Daily pattern of catch for dominant species in lake L9312 during 2000 fyke net sampling (catches in fish per day).

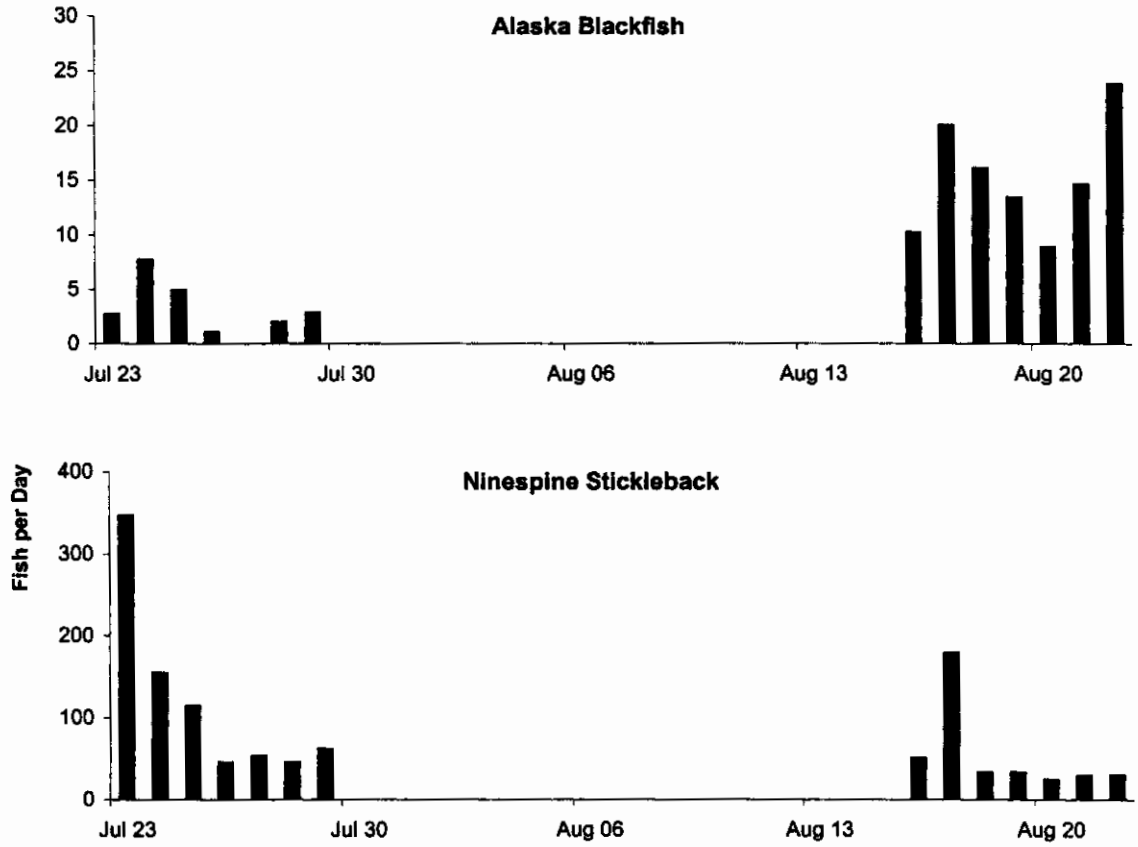


Figure 8. Daily pattern of catch for dominant species in lake L9313 during 2000 fyke net sampling (catches in fish per day).

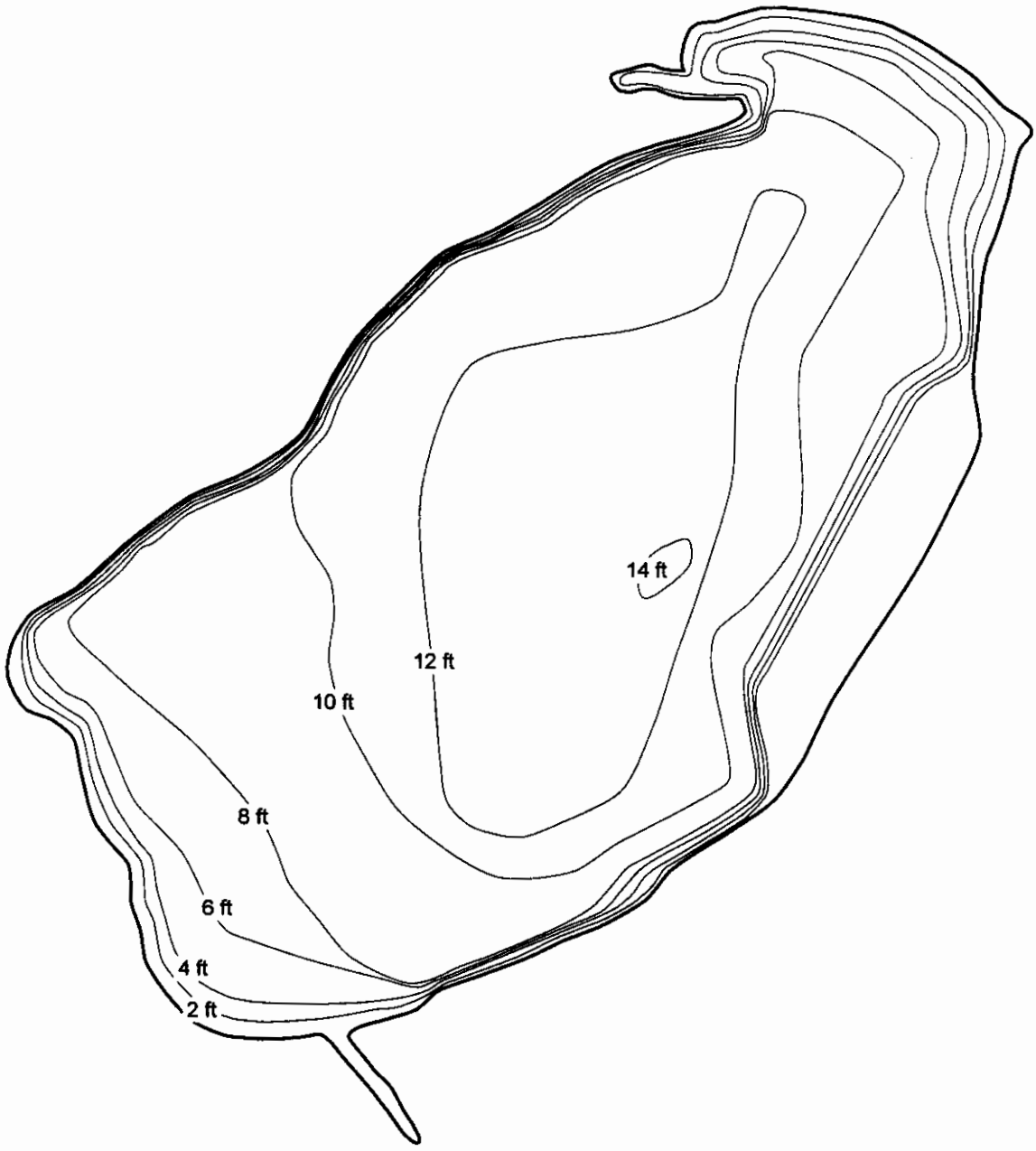


Figure 9. Contour map of lake L9312 based on depth measurements taken during 2000, corrected to a water surface elevation of 8.1 feet.

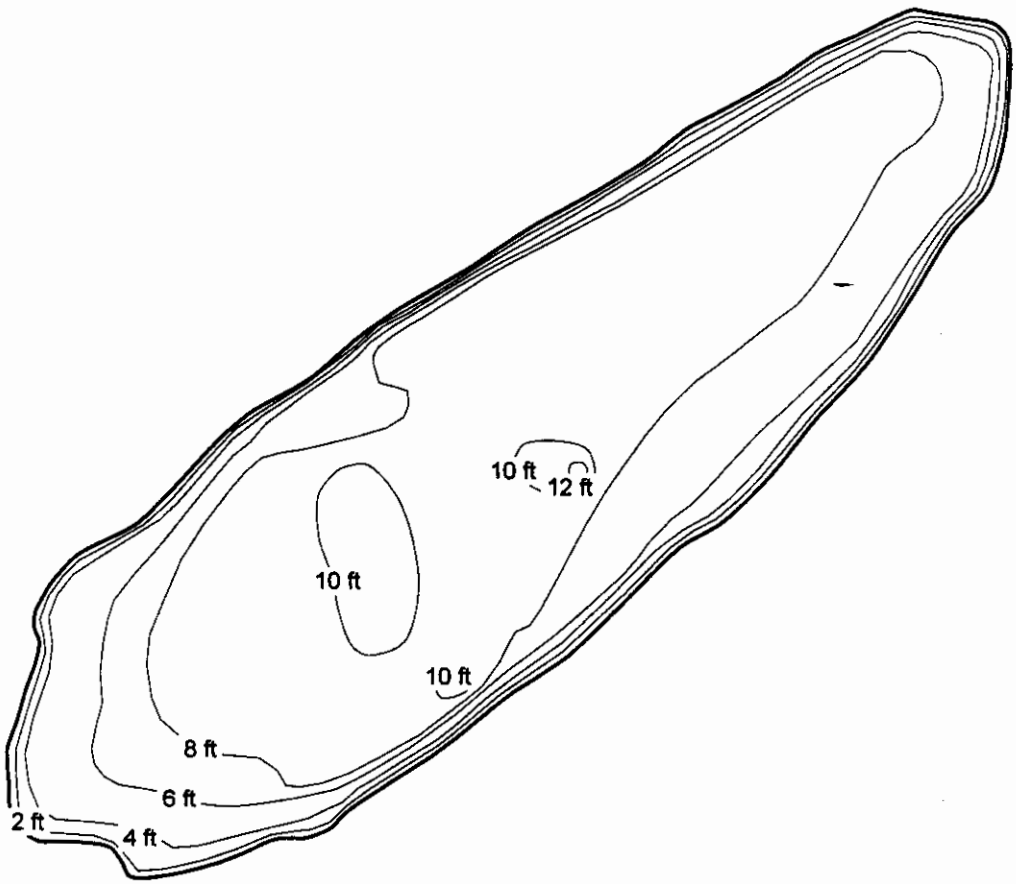


Figure 10. Contour map of lake L9313 based on depth measurements taken during 2000, corrected to a water surface elevation of 6.3 feet.

APPENDIX A
Water Withdrawal Permits for L9312 and L9313

Appendix Table A-1. Permits issued by Alaska Dept of Fish and Game regarding water withdrawal from Alpine Development water-source lakes L9312 and L9313.

Lake	ADF&G Permit	Amendment Number	Date Issued	Authorized Withdrawal (million gals.)
L9312				
	FG97-III-0280		December 15, 1997	11.43
	FG99-III-0051		March 30, 1999	19.00
	FG99-III-0051	1	January 27, 2000	19.00
	FG99-III-0051	3	September 1, 2000	32.36
L9313				
	FG97-III-0190		December 13, 1997	7.80
	FG97-III-0190	1	March 30, 1999	13.40
	FG97-III-0190	3	September 1, 2000	10.34

APPENDIX B
Length frequencies of fish caught in lakes L9312 and L9313 during 2000

Appendix Table B-1. Daily length frequencies of fish caught in lake L9312 by fyke net during 2000.

Least cisco

Fork Length (mm)	Jul 23	Jul 24	Jul 25	Jul 26	Jul 27	Jul 28	Jul 29	July Total	Aug 16	Aug 17	Aug 18	Aug 19	Aug 20	Aug 21	Aug 22	August Total
0								0								0
10								0								0
20								0								0
30								0								0
40								0								0
50								0								0
60	3	2						5				1				1
70	12	55	8	3	5	9	3	95		2			1			3
80	1	24	5		2	2	5	39	6	20	8	1	2		1	38
90			1	1				2	5	4	2	1	2			14
100	2	20	9			1	4	36	1				1		1	3
110	7	32	42		3		6	90	1	1	3	2	6	2	5	20
120	10	47	27	2			1	87	1	1	6		1	1	1	11
130	67	258	159	8	3	1	6	502	1	4	8	2	8	3	4	30
140	46	141	77	5	1		1	271	2	7	8	3	9	4	1	34
150	19	51	22	4	1		2	99		5	7	1	3		1	17
160	6	14	11	1	2		1	35	2	1	1	2	1	1	1	9
170	14	14	9	2		1		40	1		1	1	1	1		5
180	5	13	7	2				27	2	2	1	1				6
190	1		2	2				5								0
200		2	1	2				5	2							2
210	1	5						6	1			2				3
220	1	2						3								0
230								0								0
240	1						1	2								0
250								0								0
260								0								0
270								0								0
280								0								0
290								0								0
300								0								0
310								0								0
320								0								0
330								0								0
340								0								0
350								0								0
360								0								0
370								0								0
380								0								0
390								0								0
400								0								0
410								0								0
420								0								0
430								0								0
440								0								0
450								0								0
460								0								0
470								0								0
480								0								0
Total:	196	680	380	32	17	14	30	1349	25	47	45	17	35	12	15	196

Appendix Table B-1. Daily length frequencies of fish caught in lake L9312 by fyke net during 2000.

Broad Whitefish

Fork Length (mm)	Jul 23	Jul 27	July Total	Aug 16	Aug 17	Aug 19	Aug 20	August Total
0			0					0
10			0					0
20			0					0
30			0					0
40			0					0
50			0					0
60			0					0
70			0					0
80			0					0
90			0					0
100			0					0
110			0					0
120			0			1		1
130			0					0
140			0					0
150			0					0
160		1	1					0
170			0					0
180			0	1				1
190			0					0
200			0					0
210			0					0
220			0					0
230			0					0
240			0		1			1
250			0					0
260			0					0
270			0					0
280			0					0
290			0					0
300			0					0
310			0					0
320			0					0
330			0					0
340			0					0
350			0					0
360			0					0
370		1	1					0
380			0					0
390	1		1					0
400			0					0
410			0				1	1
420			0					0
430			0					0
440			0					0
450			0					0
460			0					0
470			0					0
480	2		2					0
Total:	3	2	5	1	1	1	1	4

Humpback whitefish

Fork Length (mm)	Jul 23	Jul 24	Jul 25	Jul 26	Jul 27	Jul 28	Jul 29	July Total
0								0
10								0
20								0
30								0
40								0
50								0
60	1	2	5	2	3	3	1	17
70		3	1	1	1		1	7
80		1						1
90								0
100								0
110								0
120								0
130								0
140								0
150								0
160								0
170								0
180	1							1
190								0
200	1							1
210								0
220								0
230								0
240								0
250								0
260								0
270								0
280								0
290								0
300								0
310								0
320								0
330								0
340								0
350								0
360								0
370								0
380								0
390								0
400								0
410								0
420								0
430								0
440								0
450								0
460								0
470								0
480								0
Total:	3	6	6	3	4	3	2	27

Appendix Table B-1. Daily length frequencies of fish caught in lake L9312 by fyke net during 2000.

Humpback whitefish

Fork Length (mm)	Aug 16	Aug 17	Aug 18	Aug 19	Aug 20	August Total
0						0
10						0
20						0
30						0
40						0
50						0
60	1	1				2
70	2	3				5
80	3					3
90				1		1
100						0
110						0
120						0
130						0
140						0
150						0
160						0
170						0
180						0
190	1					1
200					1	1
210						0
220						0
230						0
240						0
250						0
260						0
270						0
280	1					1
290						0
300						0
310						0
320						0
330						0
340						0
350						0
360						0
370						0
380						0
390			1			1
400						0
410						0
420						0
430						0
440						0
450						0
460						0
470						0
480						0
Total:	8	4	1	1	1	15

Alaska blackfish

Fork Length (mm)	Jul 23	Jul 24	Jul 25	Jul 26	Jul 27	Jul 28	Jul 29	July Total
0								0
10								0
20								0
30								0
40								0
50				1				1
60	1			1				2
70			2	1	1	1		5
80	3	2	2		2		1	10
90		1	1	1		1		4
100								0
110								0
120								0
130								0
140								0
150								0
160								0
170								0
180								0
190								0
200								0
210								0
220								0
230								0
240								0
250								0
260								0
270								0
280								0
290								0
300								0
310								0
320								0
330								0
340								0
350								0
360								0
370								0
380								0
390								0
400								0
410								0
420								0
430								0
440								0
450								0
460								0
470								0
480								0
Total:	4	3	5	4	3	2	1	22

Appendix Table B-1. Daily length frequencies of fish caught in lake L9312 by fyke net during 2000.

	Alaska blackfish								Longnose sucker		Round Whitefish					
Fork Length (mm)	Aug 16	Aug 17	Aug 18	Aug 19	Aug 20	Aug 21	Aug 22	August Total	Jul 23	July Total	Jul 24	Jul 25	Jul 26	Jul 27	Jul 29	July Total
0								0		0						0
10								0		0						0
20								0		0						0
30								0		0						0
40								0		0						0
50			1					1		0						0
60	1				1		1	3	1	1				1		1
70	1	3	1		8	2	3	18		0						0
80	7	6	4	1	5	8	10	41		0	2					2
90	8	3	8	3	3	8	4	37		0						0
100								0		0						0
110							1	1		0						0
120			1					1		0						0
130								0		0						0
140								0		0						0
150								0		0						0
160								0		0	1					1
170								0		0						0
180								0		0						0
190								0		0						0
200								0		0						0
210								0		0						0
220								0		0						0
230								0		0					1	1
240								0		0		1				1
250								0		0						0
260								0		0						0
270								0		0						0
280								0		0			1			1
290								0		0						0
300								0		0						0
310								0		0						0
320								0		0						0
330								0		0						0
340								0		0						0
350								0		0						0
360								0		0						0
370								0		0						0
380								0		0						0
390								0		0						0
400								0		0						0
410								0		0						0
420								0		0						0
430								0		0						0
440								0		0						0
450								0		0						0
460								0		0						0
470								0		0						0
480								0		0						0
Total:	17	12	15	4	17	18	19	102	1	1	3	1	1	1	1	7

Appendix Table B-1. Daily length frequencies of fish caught in lake L9312 by fyke net during 2000.

Round Whitefish						Slimy sculpin													
Fork Length (mm)	Aug 16	Aug 17	Aug 18	Aug 22	August Total	Jul 23	Jul 26	Jul 27	Jul 28	Jul 29	July Total	Aug 16	Aug 17	Aug 18	Aug 19	Aug 20	Aug 21	Aug 22	August Total
0					0						0								0
10					0						0								0
20					0						0								0
30					0						0								0
40					0		2	2	1	1	6			1			1		2
50					0		1		1		2	4	3		1	2	7	2	19
60					0		1	1			2	3	15	7	4	4	4	5	42
70					0		1			1	2	2	10	1	1	1	9	2	26
80		1	2	1	4	1			1		2		2	1				1	4
90	1				1						0								0
100			1		1						0								0
110					0						0								0
120				1	1						0								0
130					0						0								0
140					0						0								0
150					0						0								0
160	1				1						0								0
170					0						0								0
180	1				1						0								0
190		1		1	2						0								0
200		2			2						0								0
210			1		1						0								0
220					0						0								0
230					0						0								0
240					0						0								0
250			1		1						0								0
260		1			1						0								0
270					0						0								0
280			1		1						0								0
290					0						0								0
300					0						0								0
310					0						0								0
320					0						0								0
330					0						0								0
340					0						0								0
350					0						0								0
360					0						0								0
370					0						0								0
380					0						0								0
390					0						0								0
400					0						0								0
410					0						0								0
420					0						0								0
430					0						0								0
440					0						0								0
450					0						0								0
460					0						0								0
470					0						0								0
480					0						0								0
Total:	3	5	6	3	17	1	5	3	3	2	14	9	30	10	6	7	21	10	93

Appendix Table B-1. Daily length frequencies of fish caught in lake L9312 by fyke net during 2000.

Arctic Cisco

Fork Length (mm)	Aug 18	Aug 19	Aug 19	August Total
0				0
10				0
20				0
30				0
40				0
50				0
60				0
70				0
80				0
90	1			1
100				0
110		2		2
120				0
130		1		1
140			1	1
150				0
160				0
170				0
180				0
190				0
200				0
210				0
220				0
230				0
240				0
250				0
260				0
270				0
280				0
290				0
300				0
310				0
320				0
330				0
340				0
350				0
360				0
370				0
380				0
390				0
400				0
410				0
420				0
430				0
440				0
450				0
460				0
470				0
480				0
Total:	1	3	1	5

Appendix Table B-2. Daily length frequencies of fish caught in lake L9313 by fyke net during 2000.

Least cisco						Broad whitefish							
Fork Length (mm)	Aug 16	Aug 18	Aug 19	Aug 22	August Total	Jul 23	July Total	Aug 16	Aug 17	Aug 18	Aug 19	Aug 22	August Total
0					0		0						0
10					0		0						0
20					0		0						0
30					0		0						0
40					0		0						0
50					0		0						0
60					0		0						0
70					0		0						0
80					0		0						0
90					0		0						0
100					0		0						0
110					0		0						0
120					0		0						0
130					0		0						0
140					0		0						0
150	2		1	1	4		0						0
160					0		0					1	1
170					0		0						0
180					0		0						0
190					0		0						0
200					0		0			1			1
210			1		1		0						0
220					0		0					1	1
230					0		0						0
240					0		0						0
250					0		0						0
260					0		0						0
270					0		0						0
280					0		0				1		1
290					0		0						0
300					0		0	1					1
310					0		0						0
320					0		0			1			1
330					0		0						0
340					0		0						0
350					0		0						0
360					0		0						0
370					0		0						0
380					0		0						0
390					0		0						0
400					0		0						0
410					0	1	1						0
420					0		0						0
430					0		0						0
440					0		0						0
450					0		0						0
460					0		0						0
470					0		0						0
480					0		0						0
490					0		0						0
500					0		0						0
Total:	2		1	1	5	1	1	1		1	1	2	6
												+535 mm	

Appendix Table B-2. Daily length frequencies of fish caught in lake L9313 by fyke net during 2000.

Humpback whitefish

Fork Length (mm)	July Jul 23	July Total	August Aug 16	August Aug 20	August Total
0		0			0
10		0			0
20		0			0
30		0			0
40		0	2	1	3
50		0	2		2
60		0			0
70		0			0
80		0			0
90		0			0
100		0			0
110		0			0
120		0			0
130		0			0
140		0			0
150		0			0
160		0			0
170	1	1			0
180	1	1			0
190		0			0
200		0			0
210	1	1			0
220		0			0
230		0			0
240		0			0
250		0			0
260		0			0
270		0			0
280		0			0
290		0			0
300		0			0
310		0			0
320		0			0
330		0			0
340		0			0
350		0			0
360		0			0
370		0			0
380		0			0
390		0			0
400		0			0
410		0			0
420		0			0
430		0			0
440		0			0
450		0			0
460		0			0
470		0			0
480		0			0
490		0			0
500		0			0
Total:	3	3	4	1	5

Alaska blackfish

Fork Length (mm)	Jul 23	Jul 24	Jul 25	Jul 26	Jul 28	Jul 29	July Total
0							0
10							0
20							0
30							0
40							0
50							0
60	1	4	2				7
70	1	4	3		1	2	11
80		2		1	1	1	5
90							0
100							0
110							0
120							0
130							0
140							0
150							0
160							0
170							0
180							0
190							0
200							0
210							0
220							0
230							0
240							0
250							0
260							0
270							0
280							0
290							0
300							0
310							0
320							0
330							0
340							0
350							0
360							0
370							0
380							0
390							0
400							0
410							0
420							0
430							0
440							0
450							0
460							0
470							0
480							0
490							0
500							0
Total:	2	10	5	1	2	3	23

Appendix Table B-2. Daily length frequencies of fish caught in lake L9313 by fyke net during 2000.

Alaska blackfish

Fork Length (mm)	Aug 16	Aug 17	Aug 18	Aug 19	Aug 20	Aug 21	Aug 22	August Total
0								0
10								0
20								0
30								0
40								0
50						1		1
60	1	2	1	1				5
70	6	4	4	4	5	4	6	33
80	1	5	9	5	3	3	4	30
90	2	3	3	1	1	4	5	19
100		1	2	1		1	1	6
110				1			2	3
120								0
130					1		1	2
140								0
150			1					1
160								0
170								0
180								0
190								0
200								0
210								0
220								0
230								0
240								0
250								0
260								0
270								0
280								0
290								0
300								0
310								0
320								0
330								0
340								0
350								0
360								0
370								0
380								0
390								0
400								0
410								0
420								0
430								0
440								0
450								0
460								0
470								0
480								0
490								0
500								0
Total:	10	15	20	13	10	13	19	100

APPENDIX C

Relationship between staff gauge readings and water volume in lakes L9312 and L9313 based on depth information taken during 2000

Appendix Table C-1. Relationship between staff guage reading (Water Surface Elevation) and lake volume for lake L9312 (based on depth measurements obtained during 2000).

L9312		
WSE (ft)	Million Gallons Remaining	Million Gallons Used
8.1	312.95	0.000
8.0	309.70	3.254
7.9	306.45	6.507
7.8	303.19	9.761
7.7	299.94	13.014
7.6	296.68	16.268
7.5	293.43	19.521
7.4	290.18	22.775
7.3	286.92	26.028
7.2	283.67	29.282
7.1	280.42	32.391
7.0	277.31	35.501
6.9	274.20	38.610
6.8	271.09	41.720
6.7	267.98	44.829
6.6	264.87	47.938
6.5	261.76	51.048
6.4	258.65	54.157
6.3	255.54	57.267
6.2	252.43	60.376
6.1	249.32	63.341
6.0	246.36	66.307
5.9	243.39	69.272
5.8	240.43	72.237
5.7	237.46	75.203
5.6	234.50	78.168
5.5	231.53	81.133
5.4	228.57	84.098
5.3	225.60	87.064
5.2	222.64	90.029
5.1	219.67	92.939
5.0	216.76	95.849
4.9	213.85	98.759
4.8	210.94	101.669
4.7	208.03	104.579
4.6	205.12	107.489
4.5	202.21	110.399
4.4	199.30	113.309
4.3	196.39	116.219
4.2	193.48	119.129
4.1	190.57	121.984
4.0	187.72	124.838

L9312		
WSE (ft)	Million Gallons Remaining	Million Gallons Used
3.9	184.86	127.693
3.8	182.01	130.548
3.7	179.15	133.402
3.6	176.30	136.257
3.5	173.44	139.112
3.4	170.59	141.966
3.3	167.73	144.821
3.2	164.88	147.676
3.1	162.02	150.433
3.0	159.27	153.190
2.9	156.51	155.947
2.8	153.75	158.704
2.7	150.99	161.461
2.6	148.24	164.218
2.5	145.48	166.975
2.4	142.72	169.733
2.3	139.97	172.490
2.2	137.21	175.247
2.1	134.45	177.906
2.0	131.79	180.566
1.9	129.13	183.225
1.8	126.47	185.885
1.7	123.81	188.544
1.6	121.15	191.204
1.5	118.50	193.863
1.4	115.84	196.523
1.3	113.18	199.182
1.2	110.52	201.842
1.1	107.86	204.362
1.0	105.34	206.883
0.9	102.82	209.403
0.8	100.30	211.924
0.7	97.78	214.445
0.6	95.25	216.965
0.5	92.73	219.486
0.4	90.21	222.006
0.3	87.69	224.527
0.2	85.17	227.047
0.1	82.65	229.429
0.0	80.27	231.811

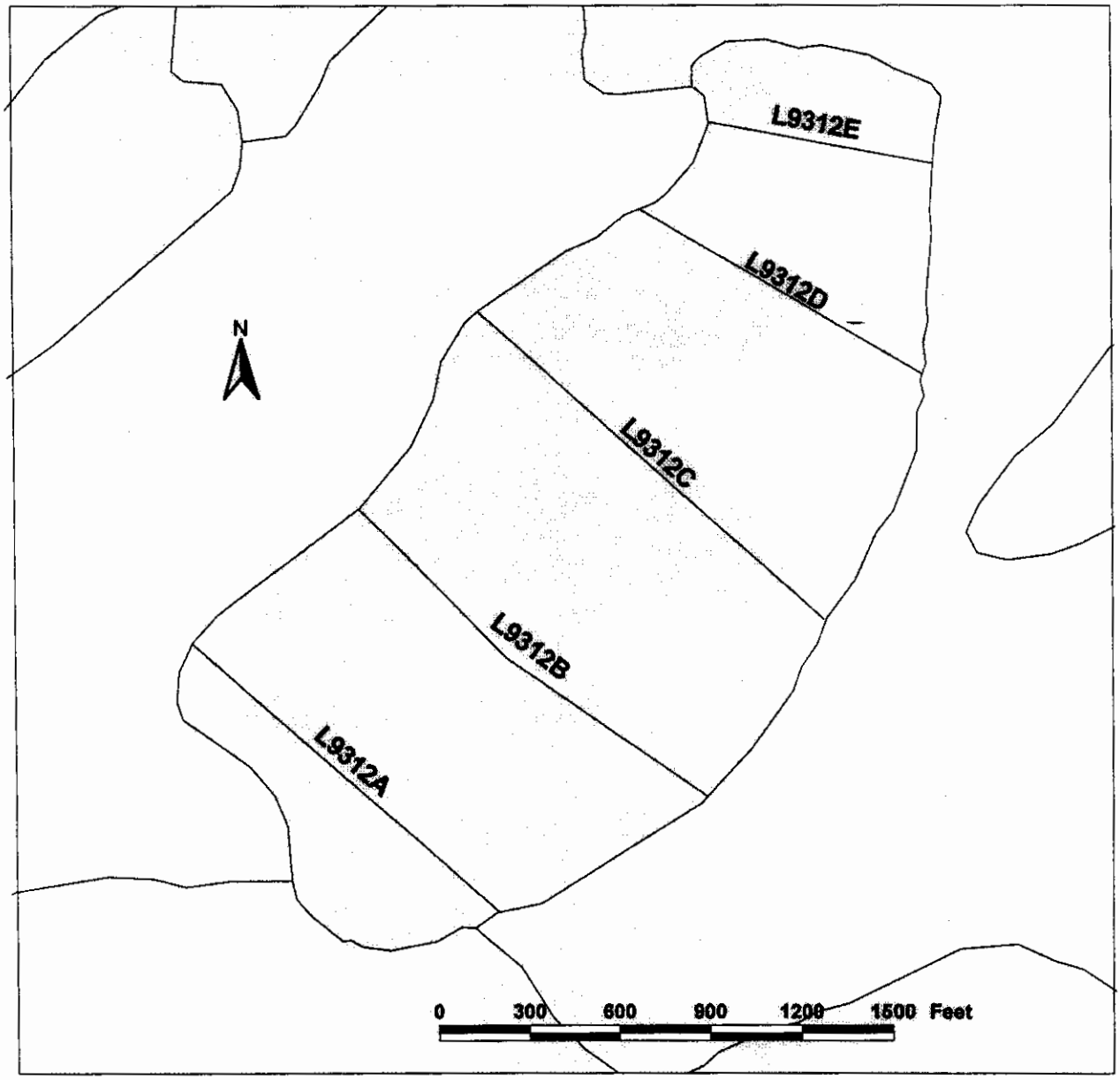
Appendix Table C-2. Relationship between staff guage reading (Water Surface Elevation) and lake volume for lake L9313 (based on depth measurements obtained during 2000).

L9313		
WSE (ft)	Million Gallons Remaining	Million Gallons Used
6.3	165.45	0.000
6.2	163.21	2.244
6.1	160.96	4.488
6.0	158.72	6.731
5.9	156.48	8.975
5.8	154.23	11.219
5.7	151.99	13.463
5.6	149.74	15.707
5.5	147.50	17.951
5.4	145.26	20.194
5.3	143.01	22.258
5.2	140.95	24.322
5.1	138.89	26.385
5.0	136.82	28.449
4.9	134.76	30.513
4.8	132.69	32.576
4.7	130.63	34.640
4.6	128.57	36.703
4.5	126.50	38.767
4.4	124.44	40.831
4.3	122.38	42.714
4.2	120.49	44.598
4.1	118.61	46.481
4.0	116.73	48.364
3.9	114.84	50.248
3.8	112.96	52.131
3.7	111.08	54.015
3.6	109.19	55.898
3.5	107.31	57.781
3.4	105.43	59.665
3.3	103.54	61.495
3.2	101.71	63.325
3.1	99.88	65.155
3.0	98.05	66.985
2.9	96.22	68.814
2.8	94.39	70.644
2.7	92.56	72.474
2.6	90.73	74.304
2.5	88.90	76.134
2.4	87.07	77.964
2.3	85.24	79.740
2.2	83.47	81.517
2.1	81.69	83.293
2.0	79.91	85.070

L9313		
WSE (ft)	Million Gallons Remaining	Million Gallons Used
1.9	78.14	86.846
1.8	76.36	88.622
1.7	74.58	90.399
1.6	72.81	92.175
1.5	71.03	93.952
1.4	69.26	95.728
1.3	67.48	97.505
1.2	65.79	99.281
1.1	64.09	101.057
1.0	62.40	102.834
0.9	60.71	104.610
0.8	59.02	106.387
0.7	57.32	108.163
0.6	55.63	109.939
0.5	53.94	111.716
0.4	52.25	113.492
0.3	50.56	115.269
0.2	48.95	117.045
0.1	47.34	118.821
0.0	45.73	120.598

APPENDIX D

Information Packet for Lake L9312 (U6.1)



Lake L9312 - location of bathymetry transects occupied during July 2000.

Lake U6.1

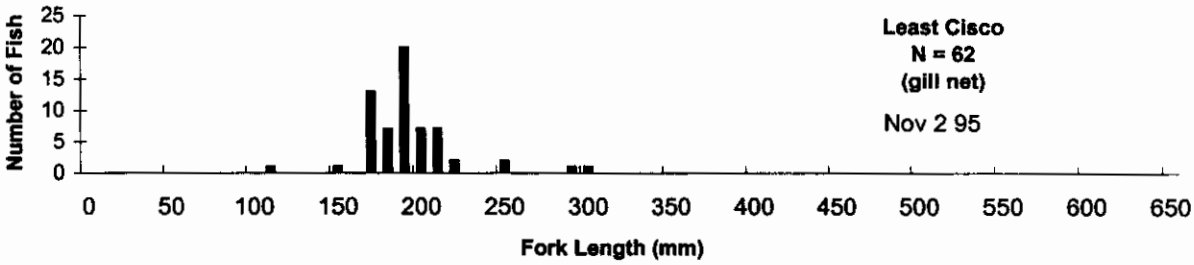
Other Names: L9312
Location: 70°19.91'N 150°56.76'W
USGS Quad Sheet: Harrison Bay B-2: T11N R5E, Sect 5
Habitat: Perched Lake (Infrequent Flooding)
Area: 100 acres
Maximum Depth: 14.1 feet
Active Outlet: No
Spec. Conductance: 60-84 µS/cm
pH: 7.7-8.2

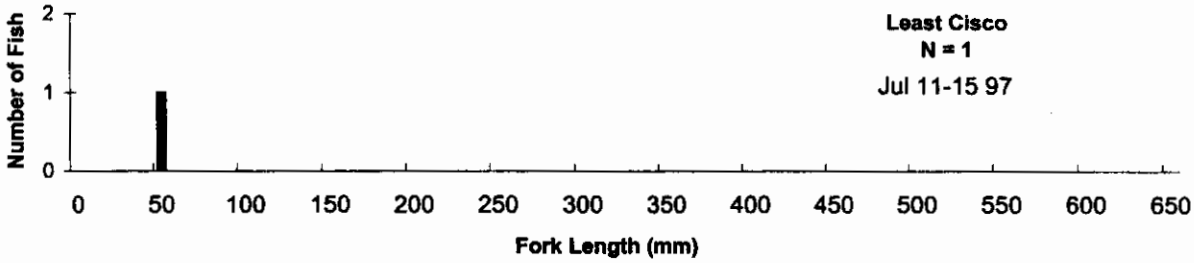
Water Quality:

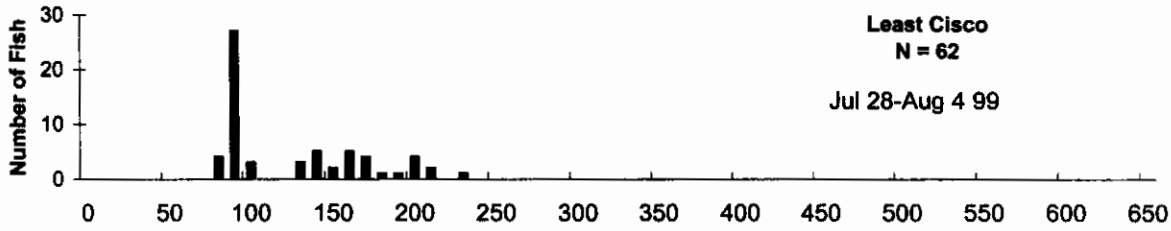
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Magnesium (mg/l)	Calcium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
1993	8	4.5	2.1	7.2	27	150	J. Lobdell

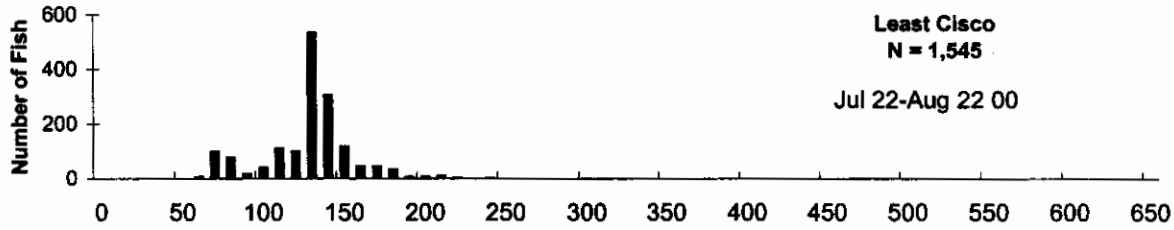
Catch Record:

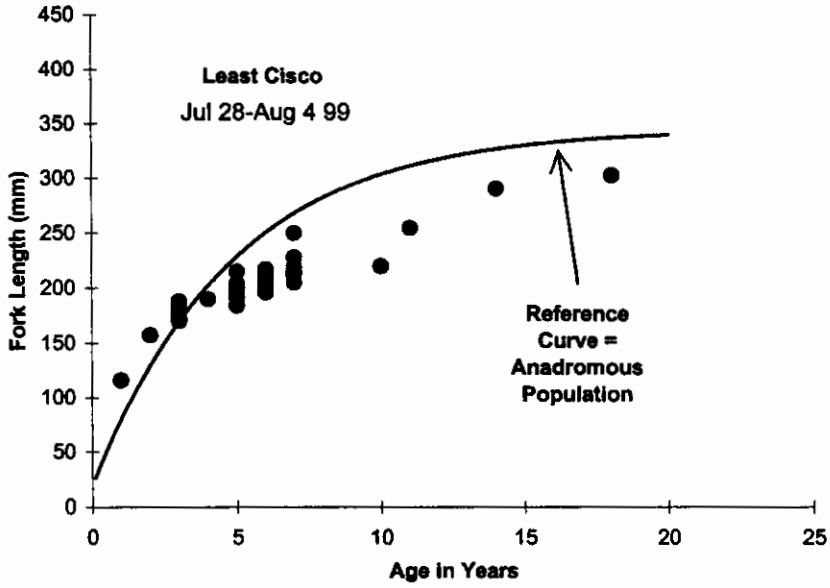
Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 14 95	23.9	Alaska blackfish	1	
			Slimy sculpin	1	
			Ninespine stickleback	10	
Fyke Net	Jul 26 95	20.0	Broad whitefish	1	428
			Ninespine stickleback	2	
Fyke Net	Jul 11-15 97	116.6	Least cisco	1	56
			Alaska blackfish	5	70
			Slimy sculpin	8	38-84
			Ninespine stickleback	57	
Fyke Net	Jul 28-Aug 4 99	165.4	Least cisco	62	80-234
			Broad whitefish	5	146-477
			Round whitefish	24	123-233
			Alaska blackfish	7	80-109
			Slimy sculpin	83	47-81
			Ninespine stickleback	184	
Fyke Net	Jul 22-Aug 22 00	334.0	Least cisco	1,545	62-244
			Arctic cisco	5	90-141
			Broad whitefish	9	123-485
			Humpback whitefish	42	58-395
			Round whitefish	24	65-288
			Burbot	1	670
			Longnose sucker	1	65
			Alaska blackfish	124	57-120
			Slimy sculpin	106	41-85
			Ninespine stickleback	1,097	
Gill Net	Nov 2 95	21.7	Least cisco	62	116-303
			Broad whitefish	5	334-470
Minnow Trap	Jul 14 95	48.6	Slimy sculpin	2	
			Ninespine stickleback	1	
Set Line	Jul 14 95	23.5	None	0	

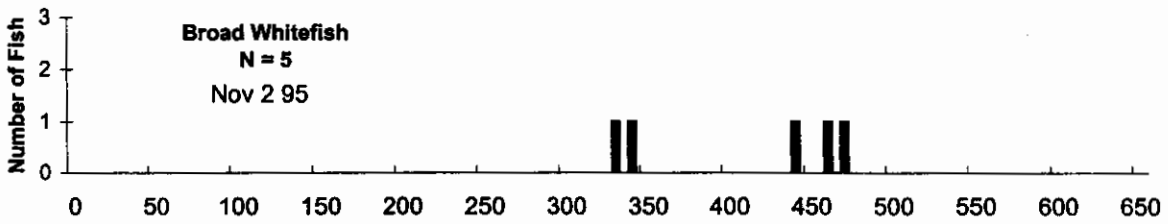

Number of Fish
Least Cisco
N = 62
(gill net)
Nov 2 95
Fork Length (mm)

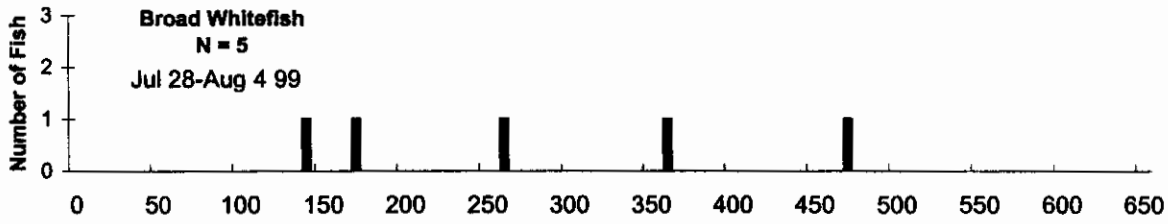

Number of Fish
Least Cisco
N = 1
Jul 11-15 97
Fork Length (mm)

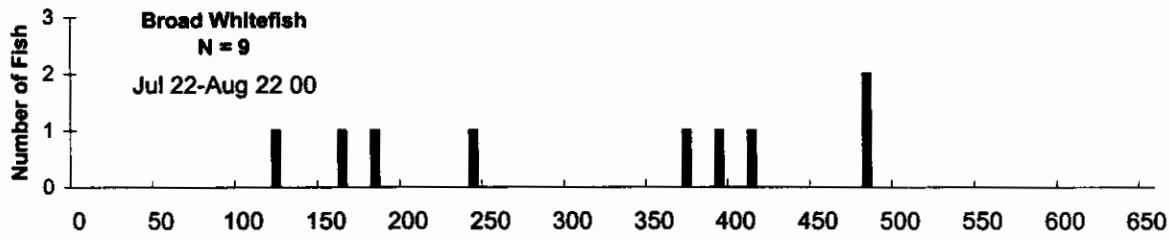

Number of Fish
Least Cisco
N = 62
Jul 28-Aug 4 99

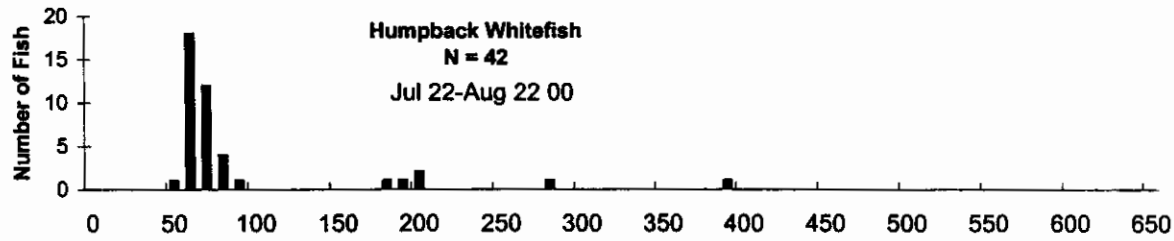

Number of Fish
Least Cisco
N = 1,545
Jul 22-Aug 22 00

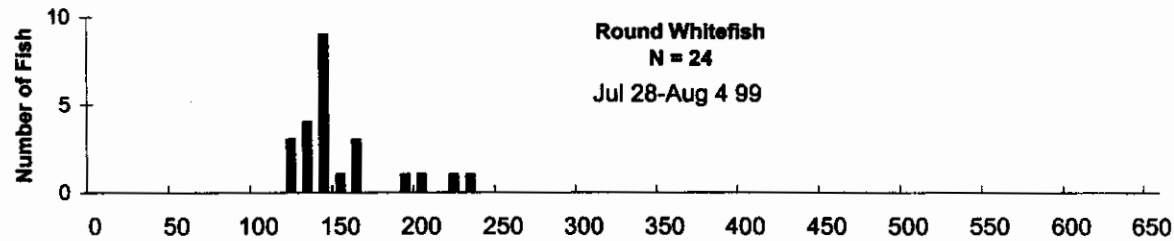

Fork Length (mm)
Least Cisco
Jul 28-Aug 4 99
Reference
Curve =
Anadromous
Population
Age in Years

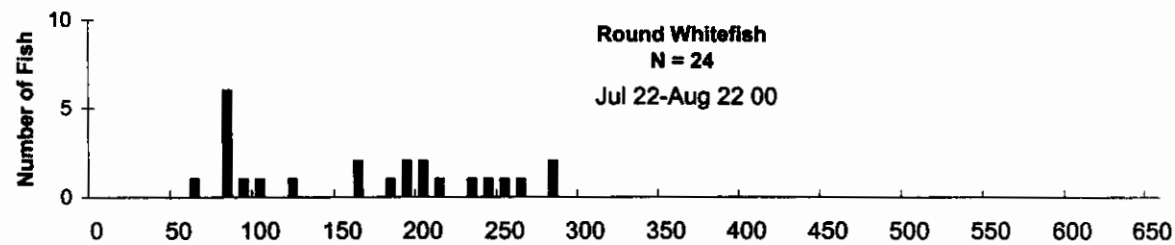

Broad Whitefish
N = 5
Nov 2 95
Number of Fish
0
1
2
3
0 50 100 150 200 250 300 350 400 450 500 550 600 650

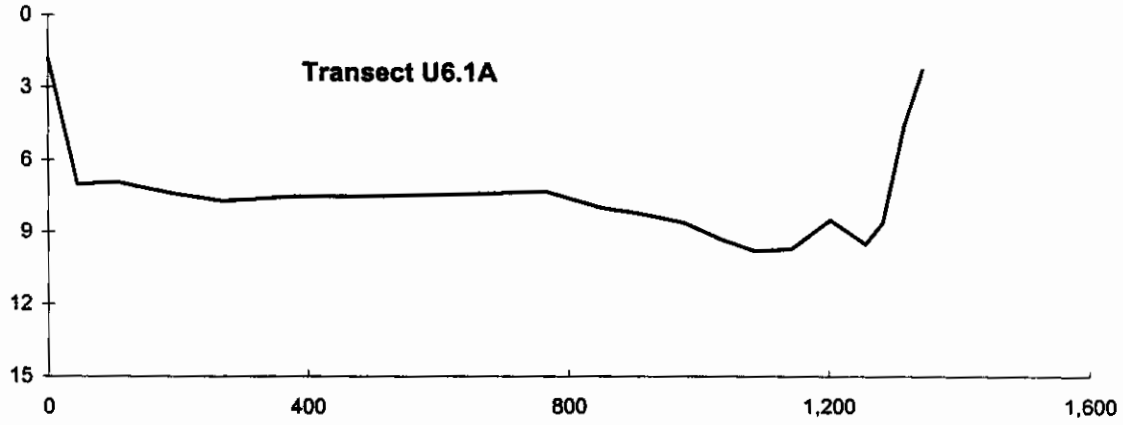

Broad Whitefish
N = 5
Jul 28-Aug 4 99
Number of Fish
0
1
2
3
0 50 100 150 200 250 300 350 400 450 500 550 600 650

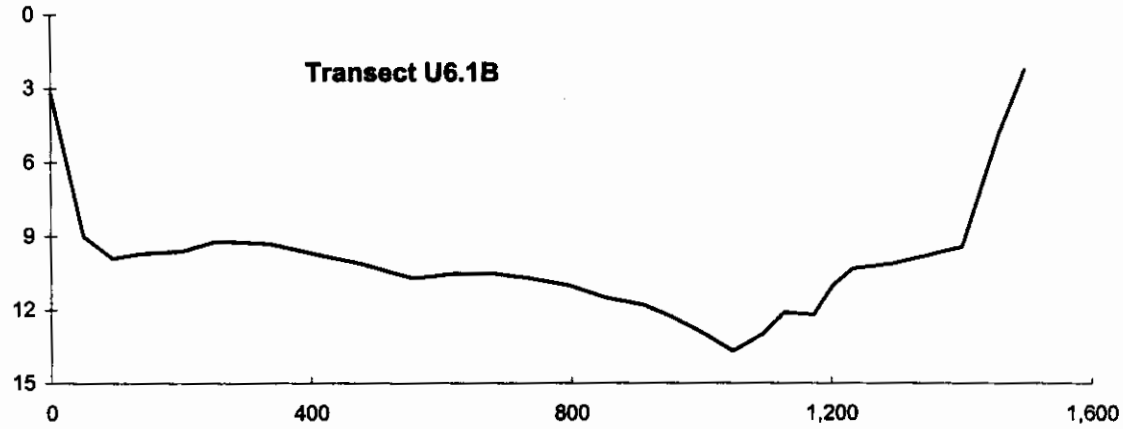

Broad Whitefish
N = 9
Jul 22-Aug 22 00
Number of Fish
0
1
2
3
0 50 100 150 200 250 300 350 400 450 500 550 600 650

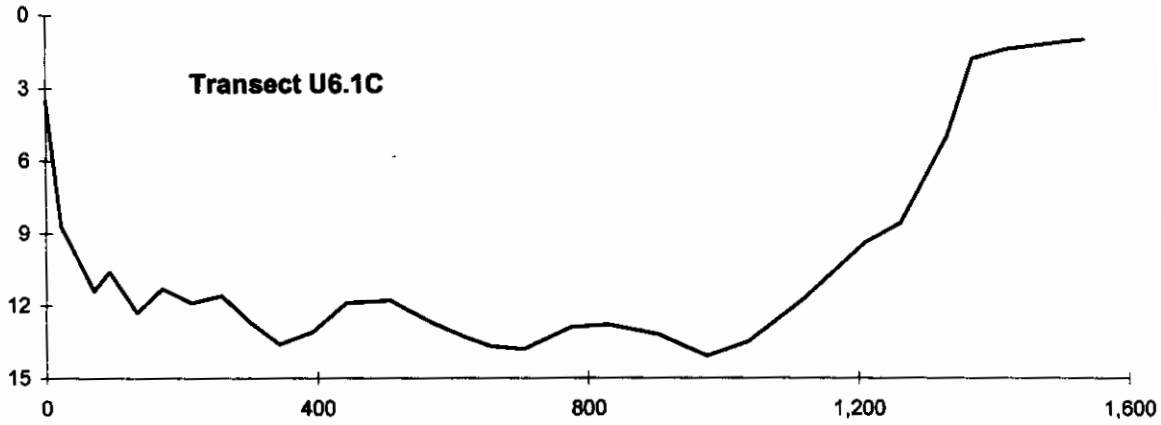

Humpback Whitefish
N = 42
Jul 22-Aug 22 00
Number of Fish
0
5
10
15
20
0 50 100 150 200 250 300 350 400 450 500 550 600 650

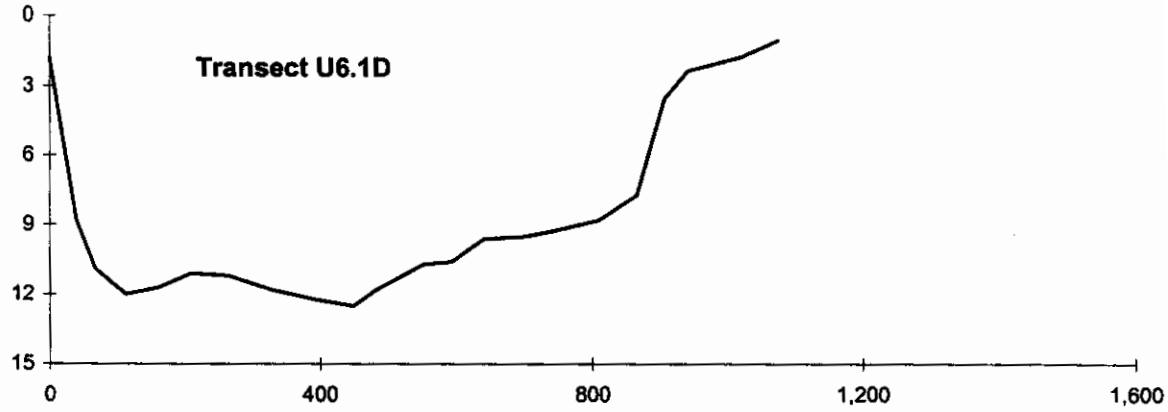

Round Whitefish
N = 24
Jul 28-Aug 4 99
Number of Fish
0
5
10
0 50 100 150 200 250 300 350 400 450 500 550 600 650

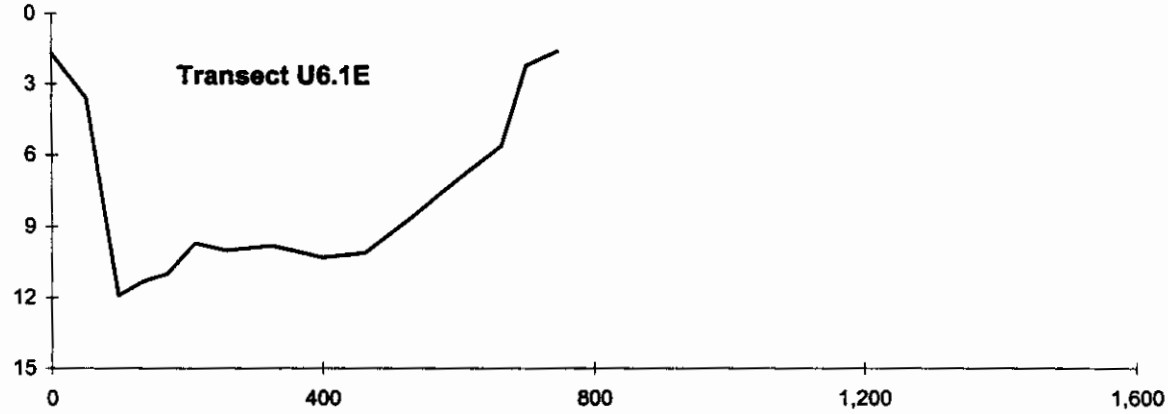

Round Whitefish
N = 24
Jul 22-Aug 22 00
Number of Fish
0
5
10
0 50 100 150 200 250 300 350 400 450 500 550 600 650


Transect U6.1A
0
3
6
9
12
15
0
400
800
1,200
1,600


Transect U6.1B
0
3
6
9
12
15
0
400
800
1,200
1,600

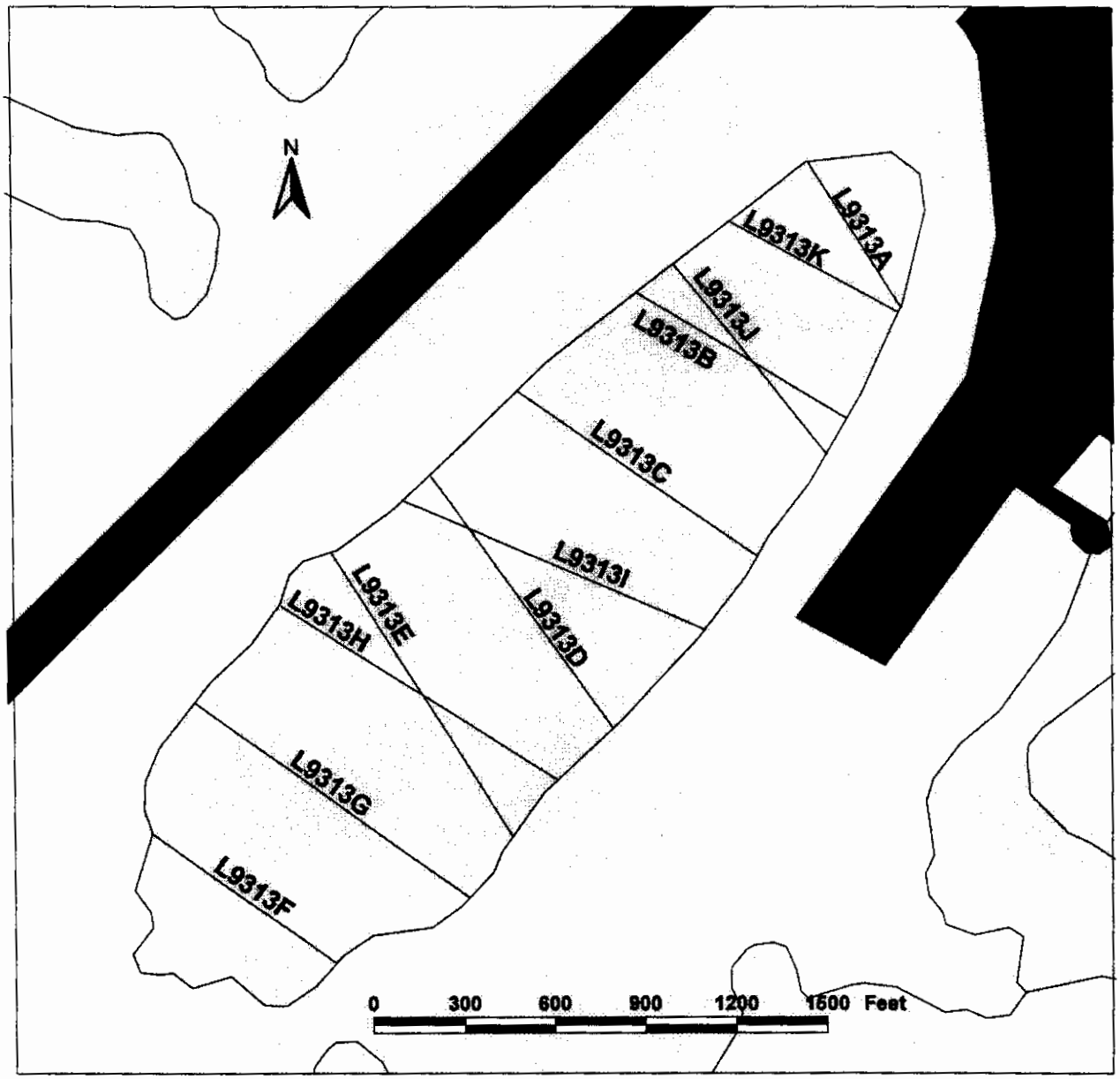

Transect U6.1C
0
3
6
9
12
15
0
400
800
1,200
1,600


Transect U6.1D
0
3
6
9
12
15
0
400
800
1,200
1,600


Transect U6.1E
0
3
6
9
12
15
0
400
800
1,200
1,600

APPENDIX E

Information Packet for Lake L9313 (T6.1)



Lake L9313 - location of bathymetry transects occupied during July 2000.

Lake T6.1

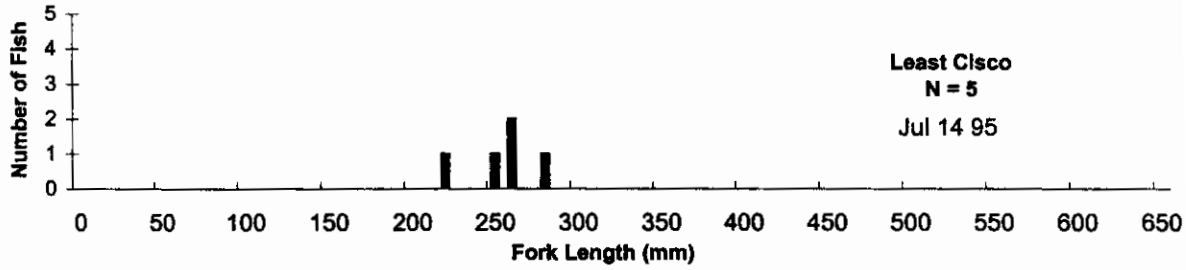
Other Names: L9313
Location: 70°20.52'N 150°56.36'W
USGS Quad Sheet: Harrison Bay B-2: T11N R5E, Sect 5
Habitat: Perched Lake (Infrequent Flooding)
Area: 69 acres
Maximum Depth: 12.3 feet
Active Outlet: No
Spec. Conductance: 107 µS/cm
pH: 7.7

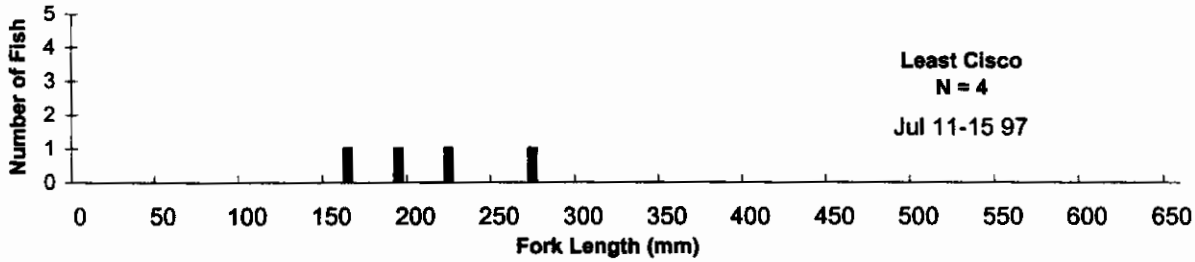
Water Quality:

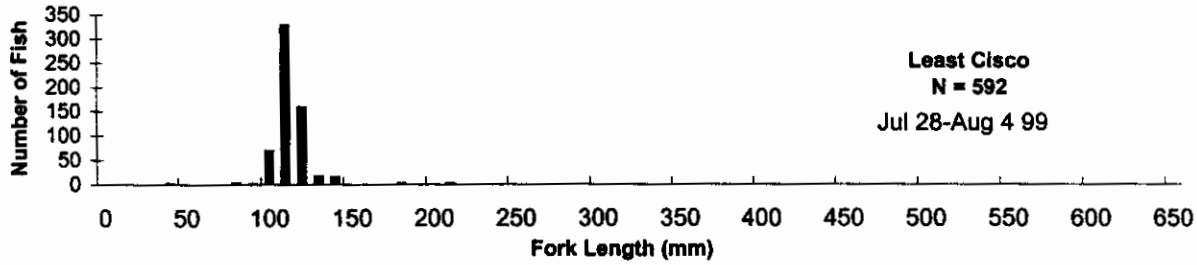
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Magnesium (mg/l)	Calcium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
1993	19	9.3	3.1	8	33	54	J. Lobdell

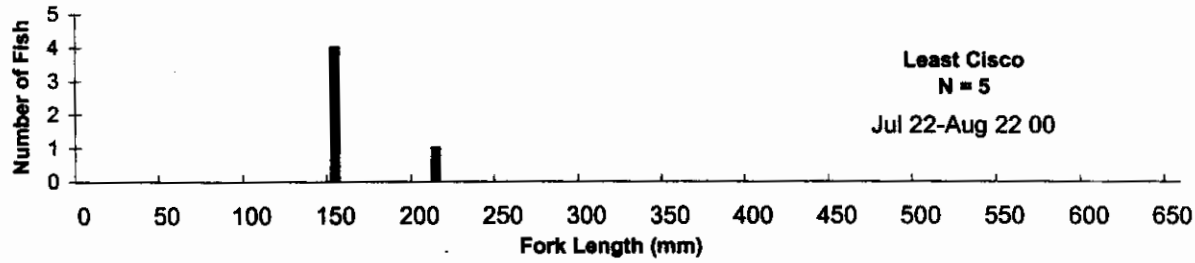
Catch Record:

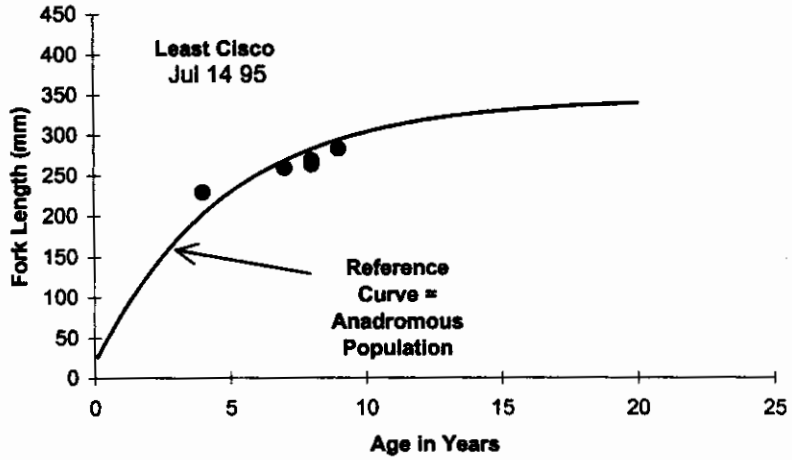
Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 14 95	23.3	Least cisco	5	229-283
			Alaska blackfish	6	42-90
			Ninespine stickleback	63	
Fyke Net	Jul 26 95	20.7	Ninespine stickleback	9	
Fyke Net	Jul 11-15 97	91.2	Least cisco	4	167-276
			Alaska blackfish	12	79
			Slimy sculpin	1	
Fyke Net	Jul 28-Aug 4 99	172.4	Least cisco	975	43-216
			Broad whitefish	5	124-152
			Humpback whitefish	2	95, 97
			Round whitefish	2	
			Alaska blackfish	9	70-117
			Ninespine stickleback	111	
Fyke Net	Jul 22-Aug 22 00	331.3	Least cisco	5	150-212
			Broad whitefish	11	164-535
			Humpback whitefish	5	41-51
			Burbot	1	653
			Alaska blackfish	123	55-155
			Ninespine stickleback	1,111	
Gill Net	Nov 1 95	20.6	None	0	
Gill Net	Aug 8 96	9.1	None	0	
Minnow Trap	Jul 15 95	43.2	Ninespine stickleback	9	
Set Line	Jul 15 95	21.6	None	0	
	Jul 16 95	24.3	None	0	

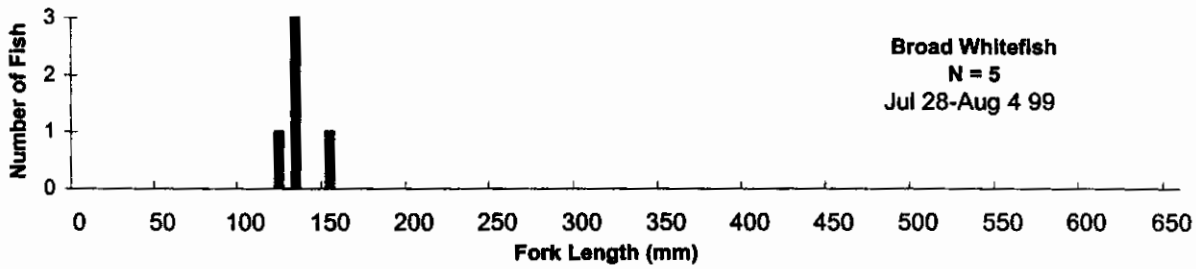

Number of Fish
Least Cisco
N = 5
Jul 14 95
Fork Length (mm)

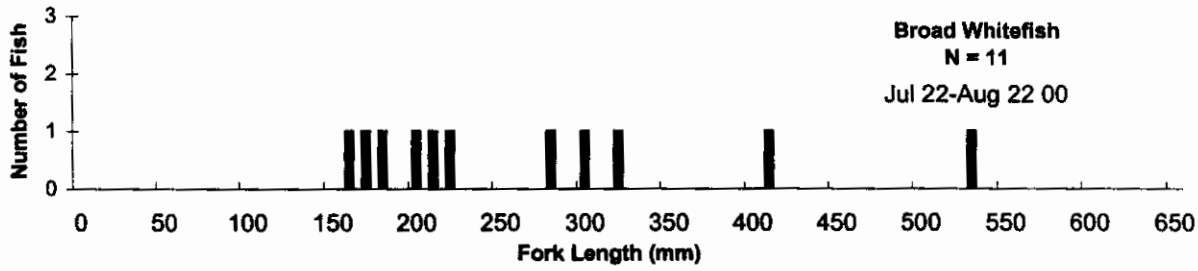

Number of Fish
Least Cisco
N = 4
Jul 11-15 97
Fork Length (mm)

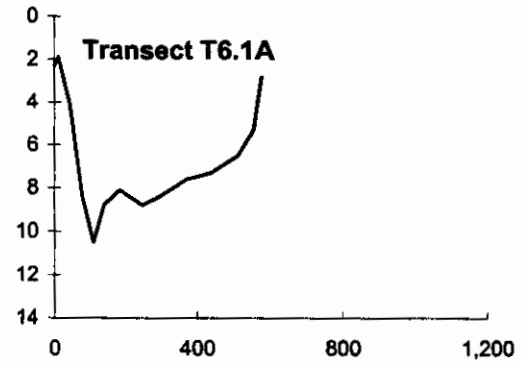

Number of Fish
Least Cisco
N = 592
Jul 28-Aug 4 99
Fork Length (mm)

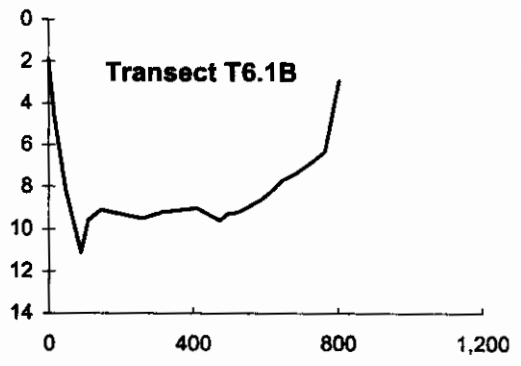

Number of Fish
Least Cisco
N = 5
Jul 22-Aug 22 00
Fork Length (mm)

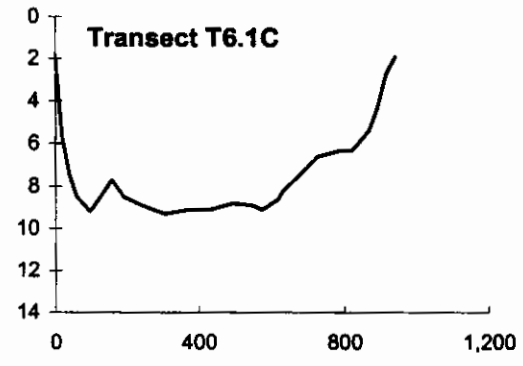

Fork Length (mm)
Least Cisco
Jul 14 95
Reference
Curve =
Anadromous
Population
Age in Years

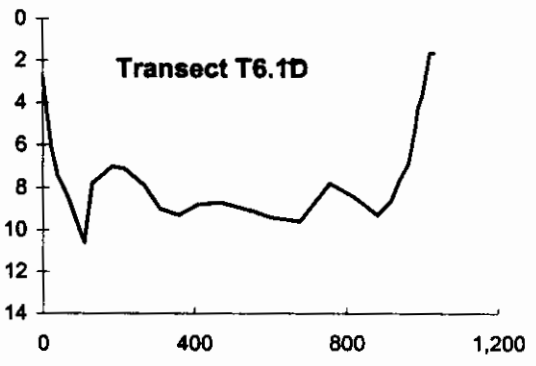

Number of Fish
3
2
1
0
Broad Whitefish
N = 5
Jul 28-Aug 4 99
0
50
100
150
200
250
300
350
400
450
500
550
600
650
Fork Length (mm)

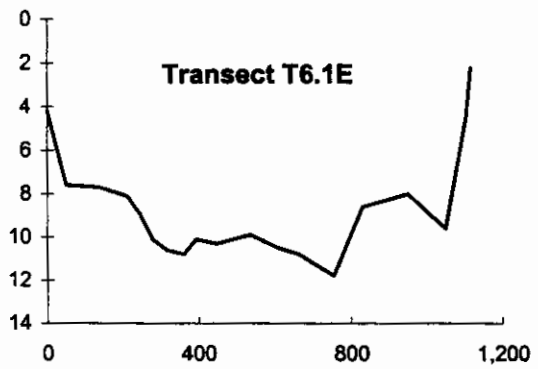

Number of Fish
3
2
1
0
Broad Whitefish
N = 11
Jul 22-Aug 22 00
0
50
100
150
200
250
300
350
400
450
500
550
600
650
Fork Length (mm)

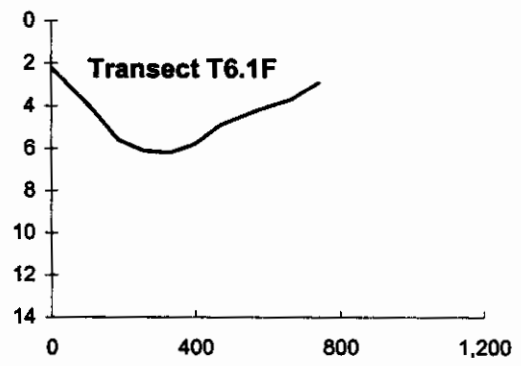

Transect T6.1A
0
2
4
6
8
10
12
14
0
400
800
1,200

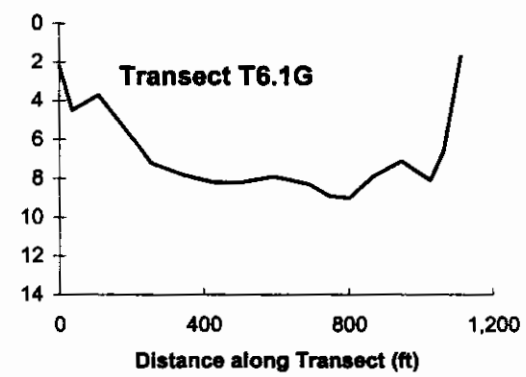

Transect T6.1B
0
2
4
6
8
10
12
14
0
400
800
1,200

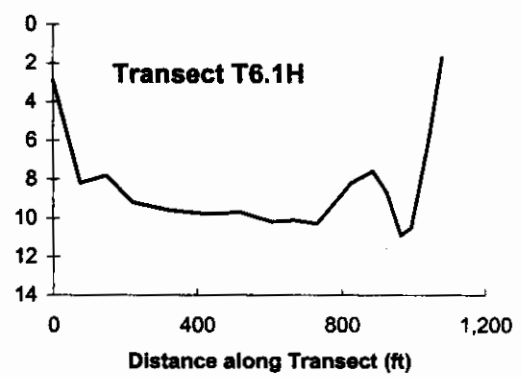

Transect T6.1C
0
2
4
6
8
10
12
14
0
400
800
1,200

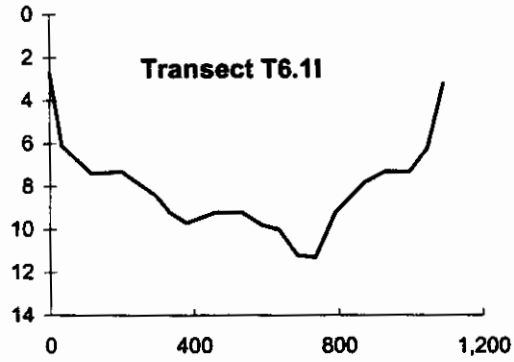

Transect T6.1D
0
2
4
6
8
10
12
14
0
400
800
1,200

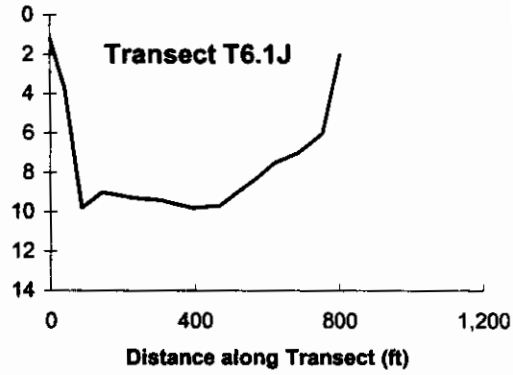

Transect T6.1E
0
2
4
6
8
10
12
14
0
400
800
1,200

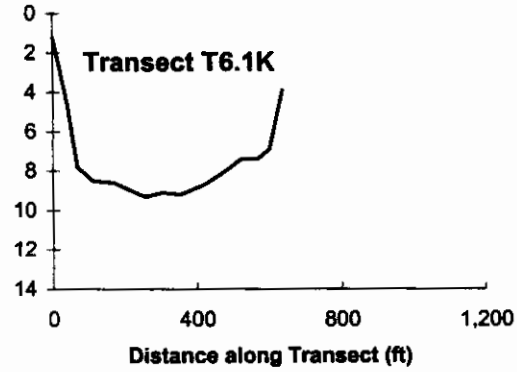

Transect T6.1F
0
2
4
6
8
10
12
14
0
400
800
1,200


Transect T6.1G
0
2
4
6
8
10
12
14
0
400
800
1,200
Distance along Transect (ft)


Transect T6.1H
0
2
4
6
8
10
12
14
0
400
800
1,200
Distance along Transect (ft)

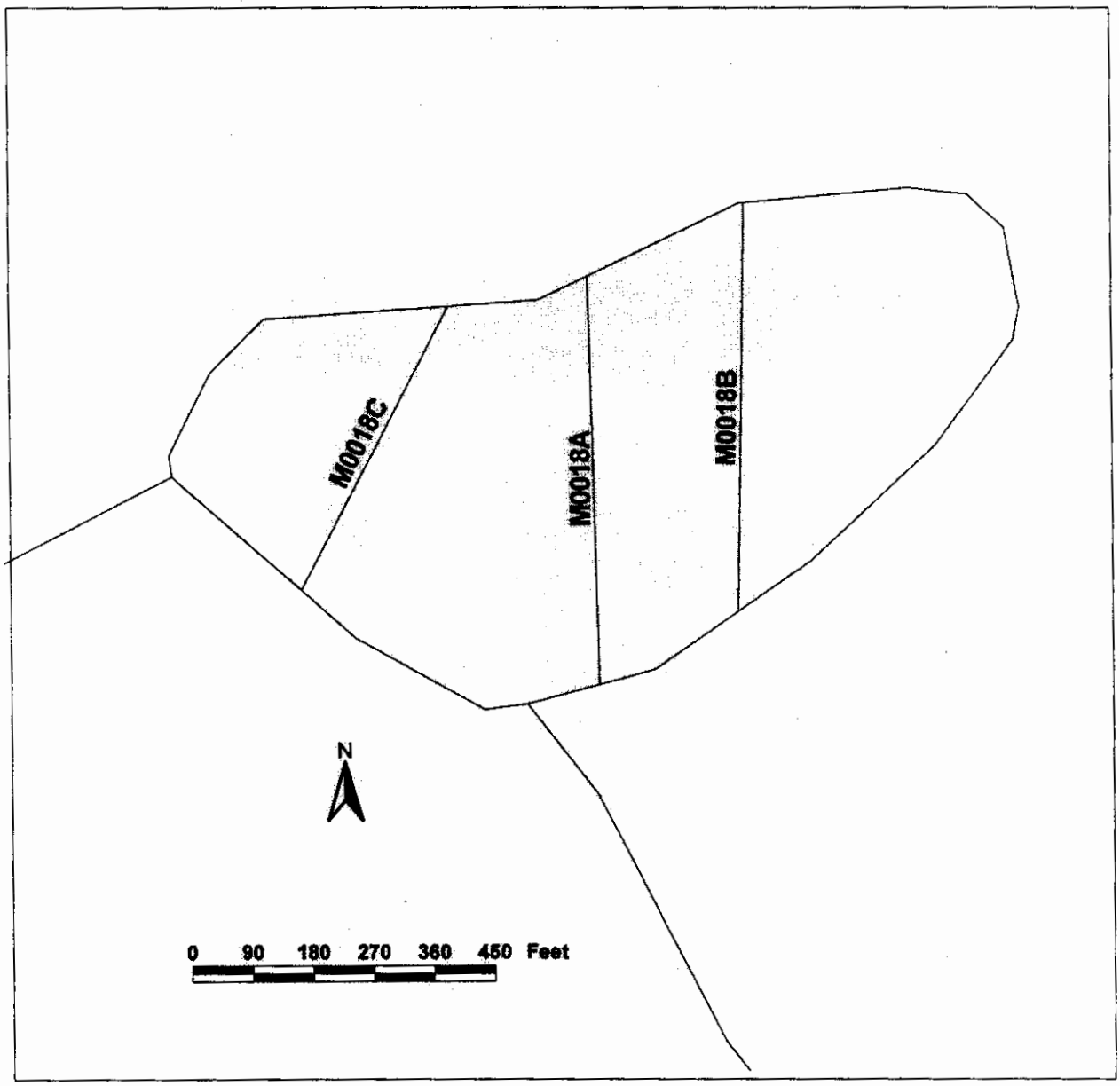

Transect T6.1I
0
2
4
6
8
10
12
14
0
400
800
1,200


Transect T6.1J
0
2
4
6
8
10
12
14
0
400
800
1,200
Distance along Transect (ft)


Transect T6.1K
0
2
4
6
8
10
12
14
0
400
800
1,200
Distance along Transect (ft)

APPENDIX F

Information Packet for M0018 (AA8.1)



Lake M0018 - location of bathymetry transects occupied during July 2000.

Lake AA8.1

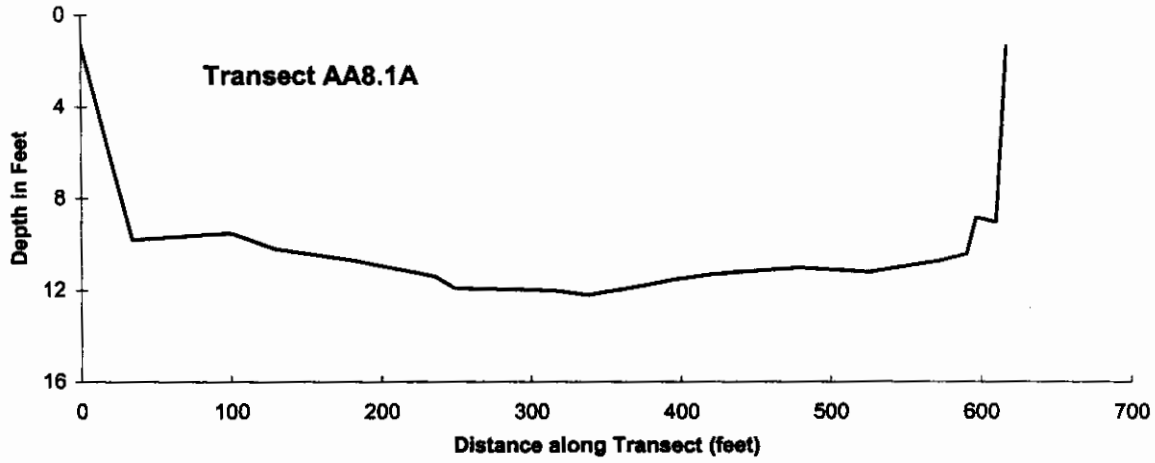
Other Names: M0018
Location: 70°13.74N 150°48.24W
USGS Quad Sheet: Harrison Bay A-2: Section 11 of T10N R5E
Habitat: Perched Lake (Infrequent Flooding)
Area: 15 acres
Maximum Depth: 16.0 feet
Active Outlet: No
Spec. Conductance: 124 µS/cm
pH: 8.0
Calculated Volume: 26.5 million gallons
Permittable Volume: 2.2 million gallons

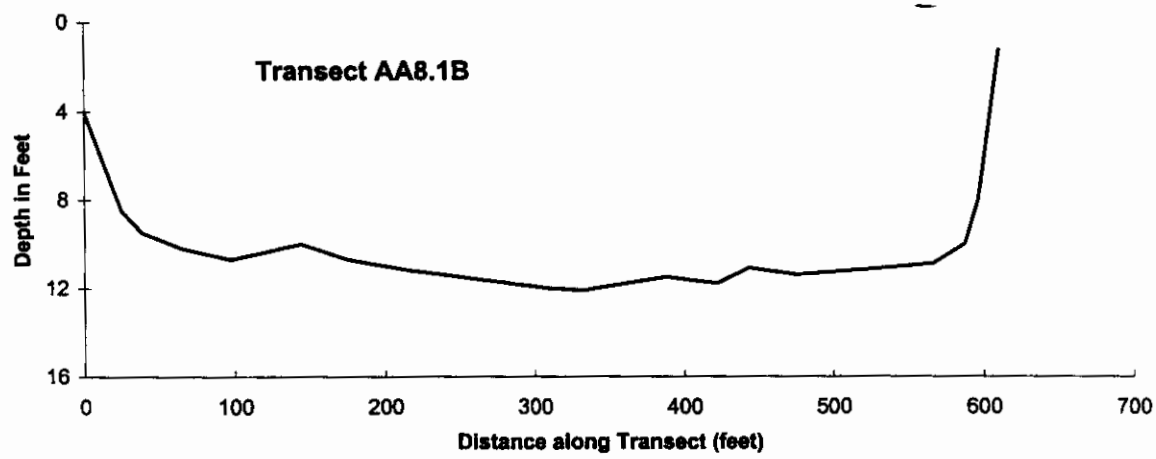
Water Quality:

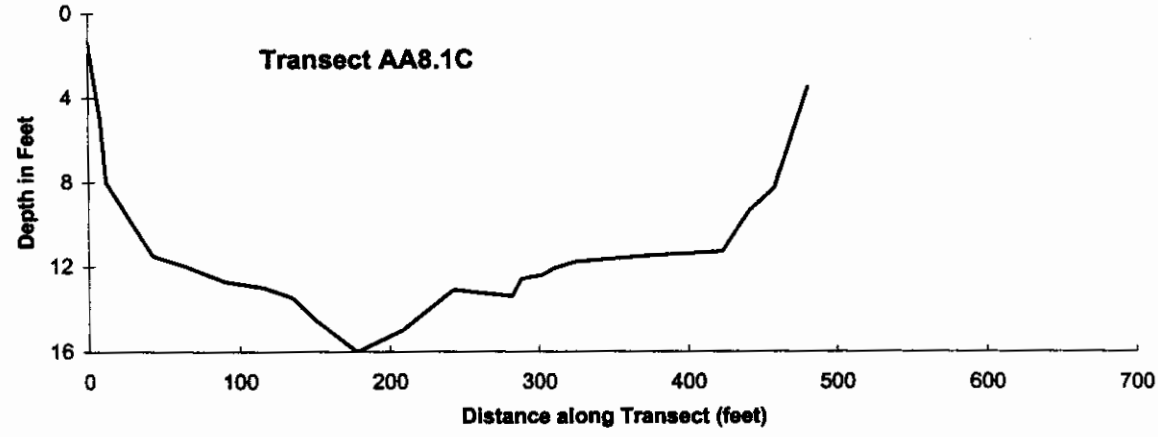
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
1999	6.7	4.0	11.6	5.2	51	<35	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 24 00	1.7	Least cisco	2	360, 361
			Broad whitefish	1	500
Minnow Traps	Jul 24 00	4.6	None	0	


Transect AA8.1A
Depth in Feet
0
4
8
12
16
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect AA8.1B
Depth in Feet
0
4
8
12
16
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect AA8.1C
Depth in Feet
0
4
8
12
16
0
100
200
300
400
500
600
700
Distance along Transect (feet)