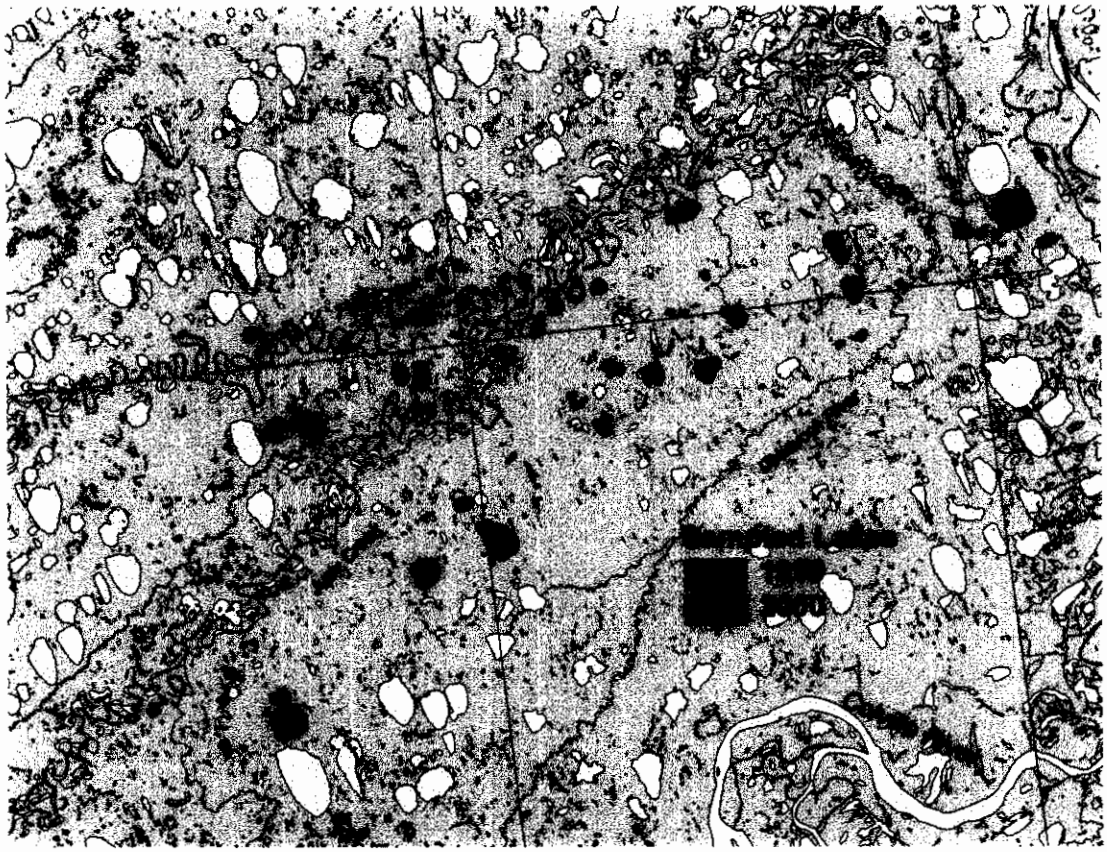
FISH UTILIZATION OF LAKES IN EASTERN NPR-A: 1999-2000

Final Data Report

November 2000



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INTRODUCTION

Phillips Alaska Inc. has begun exploring for oil within the eastern portion of the National Petroleum Reserve–Alaska (NPR-A). Exploration includes crossing rivers and lakes with ice roads and withdrawal of water from lakes to support both industrial and domestic needs.

During review of exploration, and potentially development, permits, information is required on the biological sensitivity of lakes in the region. The study was designed to provide physical and biological information on these lakes to understand their use by various fish species. In addition, results of the survey can be used, in concert with previous surveys within the area, to direct any future investigations that may be needed.

The objectives of the study are to document fish presence and habitat use in eastern NPR-A lakes. Selected lakes include those that may be used to support exploration. The area surveyed during 1999-2000 lies between the Nechelik Channel of the Colville River and the confluence of Fish and Judy creeks, then continues south along Judy Creek (Figure 1).

The 1999-2000 field effort was the first sampling in the eastern NPR-A Exploration Area since 1979 (McElderry and Craig 1981). In that study, the objective was to locate arctic cisco spawning sites in or near the Colville River. Three lakes in NPR-A were sampled, but arctic cisco spawning sites were not located. The sampling identified broad whitefish, least cisco, round whitefish and arctic grayling from the study region. An additional lake was sampled by Netsch et al. (1977), but fish were not caught.

The objectives of the survey were to:

1) inventory fish species in the various lakes within the project study areas (sampling areas identified in Figure 1),

2) obtain information on relative abundance of species in different water bodies sampled, especially from lakes that may be proposed for water withdrawal during exploration and field development,

3) obtain basic descriptive population data for the species captured,

4) measure lake depths to estimate lake volumes, and

5) measure water chemistry parameters to assess suitability of water for potential uses.

The study was confined to lakes within sampling regions identified on Figure 1. The sampling regions are arbitrarily-defined to assist with identifying lake locations. The study began after ice melted from the lakes in early July and continued into early August. Areas investigated include areas in eastern NPR-A scheduled for oil exploration in 2000/2001,

The 2000 field effort continued sampling begun in 1999 in the NPR-A Exploration Area (see figures). The NPR-A area lies between the Nechelik Channel of the Colville River and the vicinity of the confluence of Fish and Judy creeks. Lakes in the area may be desirable sources of freshwater during oil exploration. Water withdrawal will need to consider potential impacts to fish that depend on an adequate water supply for surviving winter. The inventory of fish and fish habitat will provide information for assisting permitting decisions regarding water use and ice road routing. The surveys in lakes consisted of short-duration gill net sampling in July and August.

Bathymetric and water chemistry data were collected in conjunction with fish sampling. The bathymetric information allows estimating lake volumes. Water chemistry parameters measured include water temperature, specific conductance, dissolved oxygen, and pH.

METHODS

The biological survey consisted of sampling with gill nets and minnow traps combined with physical measurements. Lakes were sampled with short-duration gill net sets using a multimesh gill net (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 Colville Delta and nearby areas. The 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 if not severely injured. Duration of each set was recorded to allow calculation of catch rates.

Minnow traps were used to identify smaller fish species that may not be detected by gill nets. Minnow traps baited with preserved salmon eggs were set in pairs at the edge of surveyed lakes. The traps were set and retrieved in concert with the gill net sampling.

Water chemistry parameters were measured to assess habitat conditions and provide information on the suitability of the water for domestic and industrial uses. Water chemistry measurements included water temperature, specific conductance or salinity, dissolved oxygen, and pH. In many of the lakes, a water sample was taken and sent to Northern Test Labs for more detailed analysis. The laboratory analysis included determining levels of chloride, sodium, calcium, magnesium, hardness and total dissolved solids (TDS).

Bathymetric data were collected to allow estimating lake volume. Depths were taken with an Eagle SupraPro ID depth sounder. Transect positions were determined by marking the beginning and end locations of transects on base maps of the lakes. Individual depth measurements were located with a hand-held GPS receiver while traversing the lake with either a boat or float tube. The readings were converted to distance measurements and the resulting points were plotted on the known location of the transect.

The lake volume is estimated by applying the formula for the volume of a cone to the surface area and maximum depth of each lake. The surface area is obtained from a GIS base map using the USGS 1:63,360 scale quads. The amount allowed for winter water withdrawal is estimated as 15%

of the volume of the lake deeper than 7 feet. The volume estimation is a rough estimate, but is

of the volume of the lake deeper than 7 feet. The volume estimation is a rough estimate, but is currently accepted for a first estimate for a one-time use. For lakes that are proposed for long-term use, volume is estimated based on contour maps of the lake.

Lake Summaries

When possible, this report uses lake numbering based on the Emergency Response Grid (ERG) used by Alaska Clean Seas, the response organization for the North Slope oilfield region. This numbering system allows the lakes to be quickly located on area maps. The lake number corresponds to the grid within which the lake occurs, along with a sequence number. In most cases, there is only one lake within a grid. Where two or more lakes occur within the same grid, the lakes are numbered sequentially beginning from the west and south sides of the grid. However, the ERG ends just west of the Colville Delta, thus is not useful for most sampling in NPR-A.

For lakes not covered by the ERG, the lake number uses a researcher/year code. The lake number contains several pieces of information, including the code of the sampler and the year of sampling.

Sampler Code:

MC = McElderry and Craig (1981); sampling in 1979
B = Bendock and Burr (1986); sampling in 1985
L = Lobdell; water chemistry sampling in 1991-1999
M = Moulton; fish sampling in 1999

First Two Numerals:

Year of Initial Sampling
(if Moulton sampled a lake previously sampled by McElderry and Craig, then the McElderry and Craig lake number is used)

Last Two Numerals:

Numbers from 1 to 99 used to identify the individual lake sampled within a given year

Information contained for each surveyed lake (if measured) includes:

1. A diagram of the lake,
2. Other names utilized for the same lake,
3. Lake location, in latitude/longitude,
4. The USGS quadrangle sheet and the township and range in which the lake is situated
5. Habitat classification,
6. Surface area in acres, obtained from USGS digital maps,
7. Maximum depth in feet,
8. Presence or absence of an outlet,
9. pH,
10. Calculated lake volume and volume of water permitted for winter withdrawal,
11. Water chemistry measurements,
12. Catch record, including gear used, date sampled, species caught and size range,

13. Where appropriate data exist, the length frequency of dominant species is plotted,

14. The depth distribution based on bathymetric transects that were recorded.

Five different lake types are defined, based primarily on the potential for access by fish. Definitions for the lake types are as follows:

Perched (Frequent Flooding) = Perched lake near a floodplain with an obvious high water channel, likely subject to annual flooding.

Perch (Infrequent Flooding) = Perched lake near a floodplain with no obvious high water channel, likely subject to flooding on an infrequent basis (every five years or more).

Drainage = Drainage Lake, a lake that is part of a defined drainage system, i.e. there is an active connection to a creek.

Oxbow = Oxbow lake, formed from abandoned river channels.

Tundra = Tundra Lake, a thaw lake not within or connected to a river drainage, little potential for fish access on a regular basis.

RESULTS AND DISCUSSION

Biological Observations

A total of 28 lakes were sampled for the first time in NPR-A in 2000 (Table 1). This brings the total number of lakes sampled to 78 when combined with the 50 lakes sampled in 1999 (Moulton 2000). Two lakes surveyed in 1999 were re-visited. Sampling in 1999 covered the region from the Colville River to the confluence of Fish and Judy creeks, while much of the 2000 sampling was upstream of the confluence of Fish Creek and Judy Creek (Figure 1).

Broad whitefish, least cisco, arctic grayling and Alaska blackfish were the only species captured by gill net in the NPA-A lakes, which is consistent with earlier reports from the region (Netsch et al. 1977, McElderry and Craig 1981, Bendock and Burr 1984). Ninespine stickleback were also caught in minnow traps. Lakes in the Ublutuoch region along the Colville River consistently produced fish, while those in other regions were less likely to be fish-bearing. Most of the fish occurrence was in lakes along the major drainages, such as Fish Creek, Judy Creek and the Ublutuoch River (Figures 2 to 4). A list of fish captured by gill net is presented in Table 2, catches by minnow trap are listed in Table 3. Length information is presented for each fish-bearing lake in the Lake Summaries.

In the regions not influenced by the Colville River, only 25% of the surveyed lakes contained fish. In contrast, over 85% of the perched and drainage lakes sampled with similar methods in the

Colville Delta supported fish (Moulton 1998). Most of the fish presence in the NPR-A lakes appears to be a function of ready access from fish-bearing streams. Least cisco and broad whitefish, in particular, were found only in lakes near Fish Creek (Figures 5 and 6). One exception to this pattern was lake M9917, which contained arctic grayling. In this case, there may be a seasonal connection to Judy Creek, which is 1.8 miles away (Figure 7).

In contrast to 1999, fish densities in 2000 were very low and often non-existent, despite much longer fishing times (Tables 2 and 3). It presently appears that upstream from the confluence of these creeks, fish do not make significant use of lake habitat. As observed in 1999, fish use of lakes near and downstream of the confluence is quite high for those lakes near the creeks and for those lakes connected to the creeks by streams. Fish have, however, been reported from lakes farther up in the Fish Creek/Judy Creek system. Bendock and Burr (1984) reviewed available data and identified five lakes in the upper portion of the drainages that held least cisco, broad whitefish, humpback whitefish, arctic grayling and lake trout.

Water Chemistry Measurements

Water chemistry parameters measured in the studied lakes are presented Table 4. During the 1999 survey (Jul 9 to Aug 4, 1999), water temperature averaged 12.8 °C (range: 7.4 to 15.3°C), while in 2000 (Jul 13 to Aug 4, 2000), temperature in the lakes was significantly cooler ($p>0.01$), averaging 11.3 °C (range: 7.0 to 14.8°C). Dissolved oxygen was high, averaging 95.8% saturation in 1999 and 96.4% in 2000. Specific conductance and pH values obtained for each lake are graphed in Figures 9 and 10.

Evaluation of Fish Concerns

Information from fish sampling and depth measurements was used to evaluate each lake regarding its potential to support fish. Obviously, if fish were captured during gill net sampling, the lake was classified as fish-bearing. Gill net sets were relatively short, however, so absence of catch does not necessarily mean a lake does not support fish. Lakes also were assessed for their proximity to fish-bearing streams and their depth. Lakes deeper than 7 feet are likely to retain unfrozen water during winter, thus have potential to overwinter fish. Deep lakes near fish-bearing streams are classified as potential fish-bearing lakes, with additional sampling needed if further clarification of the designation is desired. Results of the evaluation are included in Table 1.

Nuiqsut elders provided Phillips Alaska personnel an evaluation of 23 lakes during tours of the region in fall 1999 (Moulton 2000). For 18 lakes, the evaluation reached in this study was the same as the elders evaluation. For three lakes considered potentially fish-bearing, the elders expressed no fish concern (L9822, M9904, and Y2.1). Two lakes that were classified as having no fish concern were identified by the elders as being potentially fish-bearing (M9914 and M9923). These two lakes are large, shallow tundra lakes remote from fish-bearing streams. The elders expressed the opinion that these large lakes tend to have pressure ridges form in winter due to cracks in the lake ice that are kept open by shifting currents and that this type of lake will have fish. They indicated that when this phenomenon is observed on any lake of this size, caution should be exercised to

avoid affecting potential fish present. Lake M9923 was re-sampled in 2000 to further evaluate potential fish presence, but again no fish were caught. The shallow depth (6.5 ft), lack of access and lack of use indicate that the lake does not provide significant fish habitat. It is likely the phenomenon described by the elders is more prevalent in deeper lakes that are likely to provide sufficient winter habitat to allow survival.

Based on the above lake evaluation, 22 lakes were confirmed to contain fish other than Alaska blackfish and sticklebacks, another 16 have to potential to be fish-bearing (based on this report and information from Nuiqsut elders), and 41 likely do not represent fish habitat.

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Table 1. Summary of eastern NPR-A lake data obtained during 1999-2000.

Region	Lake	Township/ Range	Habitat[1]	Estimated Area (acres)	Max. Depth (feet)	Calculated Volume (mil. gals)	15% Winter Volume (mil. gals)	Fish Species Caught[2]	Fish Concern?	Available Water (mil. gals)
Ublutuoch										
	L9306 (W2.1)	T11 R4E Sect. 22	Perched Lake (FF)	64.0	10.2	70.2	3.3	BDWF,LSCS	Yes	3.3
	L9307 (X2.1)	T11N R4E Sect. 28	Tundra Lake	650.0	6.1	426.3		NONE	No	426.3
	L9341b (W3.1	T11N R4E Sect. 23	Perched Lake (FF)	30.0	19.3	62.3	6.0	BDWF,LSCS	Yes	6.0
	L9801 (X1.2)	T11N R4E Sect. 32	Tundra Lake	40.1	5.0	21.6		NONE	No	21.6
	L9802 (X1.1)	T11N R4E Sect. 31/32	Tundra Lake	221.9	6.0	143.1		NONE	No	143.1
	L9807 (Y2.1)	T11N R4E Sect. 34	Tundra Lake	94.1	8.2	83.0	1.8	NONE	No	83.0
	L9808 (X3.1)	T11N R4E Sect. 27	Drainage Lake	5.0	14.2	7.7	0.6	GRAY	Yes	0.6
	L9817	T10N R3E Sect. 10	Tundra Lake	74.6	9.0	72.2	2.4	NONE	No	72.2
	L9818	T10N R3E Sect. 10	Tundra Lake	32.7	4.0	14.1		NONE	No	14.1
	L9819	T10N R3E Sect. 34	Tundra Lake	244.5	7.9	207.7	3.5	NONE	No	207.7
	L9822	T10N R3E Sect. 3	Oxbow Lake	11.6	11.0	13.8	0.8	NONE	Y?	0.8
	L9823	T10N R3E Sect. 3	Tundra Lake	5.0	12.0	6.4	0.4	NONE	No	6.4
	L9824	T11N R3E Sect. 25	Perched Lake (FF)	21.6	11.0	25.5	1.4	NONE	Y?	1.4
	L9825	T11N R3E Sect. 24	Perched Lake (FF)	12.3	15.3	20.2	1.6	LSCS,GRAY	Yes	1.6
	L9832	T10N R3E Sect. 3	Tundra Lake	242.5	2.8	73.0		NONE	No	73.0
	L9901 (X4.2)	T10N R4E Sect. 25	Perched Lake (FF)	16.3	25.0	43.7	4.7	BDWF,LSCS	Yes	4.7
	L9902 (X4.1)	T10N R4E Sect. 26	Perched Lake (FF)	15.7	16.6	28.1	2.4	BDWF,LSCS	Yes	2.4
	L9914	T11N R3E Sect. 7	Perched Lake (IF?)	24.4	16.0	42.0	3.5	NONE	Y?	3.5
	L9915	T11N R3E Sect. 18	Perched Lake (FF?)	24.4	14.4	37.7	2.9	LSCS	Yes	2.9
	M9912	T10N R2E Sect. 2	Tundra Lake	32.9	7.8	27.6	0.4	NONE	No	27.6
	M9913	T10N R2E Sect. 2	Tundra Lake	20.0	7.9	17.0	0.3	NONE	No	17.0
	M9922	T10N R2E Sect. 10-11/14-1	Tundra Lake	190.7	5.3	108.6		NONE	No	108.6
	M9923	T10N R2E Sect. 12-13	Tundra Lake	251.7	6.5	175.9	0.0	NONE	Y (elders)	0.0
	M9924	T11N R2E Sect. 36	Tundra Lake	47.9	3.4	17.5		NONE	No	17.5
	M9925	T10N R3E Sect. 6	Tundra Lake	218.0	3.9	91.4		NONE	No	91.4
	M9930	T11N R3E Sect. 18	Tundra Lake	23.4	7.9	19.9	0.3	NONE	No	19.9
	MC7916	T11N R3E Sect. 19	Drainage Lake	418.6	8.0	360.1	6.8	BDWF,LSCS,GRAY	Yes	6.8
	MC7917	T11N R2E Sect. 24	Drainage Lake	293.8	12.6	398.0	26.5	LSCS	Yes	26.5
Fish Ck Confluence										
	L9916	T11N R1E Sect. 34	Perched (FF?)	169.1	14.3	260.0	19.9	LSCS	Yes	19.9
	M9901	T10N R1E Sect. 11-14	Oxbow Lake	66.3	16.9	120.5	10.6	GRAY	Yes	10.6
	M9902	T10N R1E Sect. 12	Tundra Lake	19.9	11.3	24.1		NONE	No	24.1

Table 1. Summary of eastern NPR-A lake data obtained during 1999-2000.

Region	Lake	Township/ Range	Habitat[1]	Estimated Area (acres)	Max. Depth (feet)	Calculated Volume (mil. gals)	15% Winter Volume (mil. gals)	Fish Species Caught[2]	Fish Concern?	Available Water (mil. gals)
	M9903	T10N R1E Sect. 12	Oxbow Lake?	70.2	22.1	166.8	17.1	NONE	Y?	17.1
	M9904	T10N R1E Sect. 1	Perched (FF?)	25.2	9.3	25.2	0.9	NONE	Y?	0.9
	M9905	T10N R2E Sect. 6	Tundra Lake?	24.6	11.3	29.9		NONE	No	29.9
	M9906	T10N R1E Sect. 10	Tundra Lake	202.9	9.7	211.6		NONE	No	211.6
	M9907	T10N R1E Sect. 10-11	Tundra Lake	147.7	9.5	150.9		NONE	No	150.9
	M9908	T11N R2E Sect. 28	Perched (FF?)	17.9	9.4	18.1	0.7	NONE	Y?	0.7
	M9909	T11N R2E Sect. 33	Oxbow Lake	117.6	16.4	207.3	17.8	BDWF,LSCS	Yes	17.8
	M9910	T10N R2E Sect. 6	Perched (FF?)	146.5	9.0	141.8	4.7	GRAY	Yes	4.7
	M9911	T11N R2E Sect. 33	Perched (IF?)	144.2	15.3	237.2	19.3	BDWF,LSCS	Yes	19.3
	M9914	T10N R2E Sect. 9	Tundra Lake	127.4	7.8	106.8	1.6	NONE	Y (elders)	1.6
	M9915	T10N R1E Sect. 24	Tundra Lake	30.6	7.1	23.4	0.0	NONE	No	23.4
	M9916	T10N R2E Sect. 30	Tundra Lake	42.8	3.8	17.5		NONE	No	17.5
	M9917	T10N R1E Sect. 26	Tundra Lake	175.1	9.8	184.5	7.9	GRAY	Yes	7.9
	M9918	T10N R1E Sect. 13	Oxbow Lake	41.5	14.7	65.6	5.2	LSCS,GRAY	Yes	5.2
	M9919	T10N R1E Sect. 9-16	Oxbow Lake	106.8	14.9	171.1	13.6	LSCS	Yes	13.6
	M9920	T10N R1E Sect. 15	Oxbow Lake	96.1	18.0	185.9	17.0	NONE	Yes	17.0
	M9921	T11N R2E Sect. 33	Tundra Lake	108.3	4.4	51.3		NONE	No	51.3
	M9926	T10N R1E Sect. 1	Oxbow Lake	31.6	8.1	27.5	0.6	NONE	Y?	0.6
	M9927	T11N R1E Sect. 35	Perched Lake (?)	14.9	7.4	11.9		NONE	No	11.9
	M9928	T11N R1E Sect. 36	Oxbow Lake	111.8	18.5	222.4	20.7	BDWF,LSCS	Yes	20.7
	M0001	T11N R1E Sect. 31	Oxbow Lake	48.7	10.6	55.5	2.8	NONE	Y?	2.8
	M0002	T11N R1E Sect. 35	Perched (FF?)	20.5	16.0	35.3	3.0	LSCS	Yes	3.0
	M0003	T11N R1E Sect. 26	Perched (FF?)	19.8	16.0	34.0	2.9	NONE	Y?	2.9
	M0005	T11N R1W Sect. 25	Perched (IF?)	122.3	12.1	159.0	10.1	NSSB	N?	159.0
	M0006	T11N R1W Sect. 36	Perched (IF?)	122.4	13.3	175.0	12.4	BKFH	N?	175.0
	M0007	T10N R1E Sect. 18	Tundra Lake	355.5	10.5	401.3		NONE	No	401.3
	M0008	T10N R1W Sect. 13	Tundra Lake	172.4	9.1	168.6		NONE	No	168.6
	M0009	T11N R1E Sect. 26	Tundra Lake	48.7	6.6	34.5		NONE	No	34.5
	M0010	T11N R1E Sect. 26	Tundra Lake	29.7	8.1	25.9		NONE	No	25.9
	M0020	T11N R2E Sect. 30	Oxbow Lake	124.1	16.1	214.8	18.2	LSCS	Yes	18.2
	M0021	T11N R1E Sect. 35	Oxbow Lake	36.3	17.7	69.1	6.3	LSCS	Yes	6.3
	M0022	T10N R2E Sect. 17	Tundra Lake	38.0	6.5	26.5		NONE	No	26.5
	M0023	T10N R2E Sect. 17	Tundra Lake	16.4	3.9	6.9		NONE	No	6.9
	M0024	T10N R2E Sect. 21	Tundra Lake	138.6	7.3	108.8		NONE	No	108.8

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Region	Lake	Township/ Range	Habitat[1]	Estimated Area (acres)	Max. Depth (feet)	Calculated Volume (mil. gals)	15% Winter Volume (mil. gals)	Fish Species Caught[2]	Fish Concern?	Available Water (mil. gals)
	M0025	T11N R1E Sect. 26	Tundra Lake	44.2	8.2	39.0		NONE	No	39.0
	M0028	T11N R1E Sect. 34	Perched (IF?)	36.4	8.7	34.1		NSSB	No	34.1
	M0032	T10N R1E Sect. 16	Oxbow Lake	28.6	11.4	35.0	2.0	NONE	Y?	2.0
Judy Creek										
	L9911	T9N/T10N R1E Sect. 1/36	Tundra Lake	540.2	8.0	464.6		NONE	No	464.6
	M0011	T10N R1E Sect. 29	Oxbow Lake	8.8	14.1	13.3	1.0	NONE	Y?	1.0
	M0012	T9N R1W Sect. 1	Oxbow Lake	42.5	17.9	81.9	7.5	NONE	Y?	7.5
	M0013	T9N R1W Sect. 2	Oxbow Lake	8.7	6.1	5.7		NONE	No	5.7
	M0014	T9N R1W Sect. 23	Tundra Lake	114.3	8.5	104.4		NONE	No	104.4
	M0015	T9N R1W Sect. 26	Tundra Lake	473.4	7.5	381.8		NONE	No	381.8
	M0016	T9N R1E Sect. 4	Tundra Lake	300.2	6.2	200.1		NSSB	No	200.1
	M0017	T9N R1W Sect. 28	Tundra Lake	70.3	3.3	24.9		NONE	No	24.9
	M0029	T9N R1W Sect. 20	Perched (FF?)	44.4	12.6	60.2	4.0	NSSB	Y?	4.0
	M0030	T9N R1W Sect. 20	Oxbow Lake	26.0	8.3	23.2		NONE	No	23.2
	M0031	T9N R1W Sect. 17	Oxbow Lake	33.4	11.4	40.9	2.4	NONE	Y?	2.4

[1] FF = frequent flooding (every 1 to 5 years); IF = infrequent flooding (less than once every 5 years)

[2] BDWF = broad whitefish, LSCS = least cisco, GRAY = arctic grayling, BKFH = Alaska blackfish, NSSB = ninespine stickleback

Table 2. Catches of fish from NPR-A sampling with gill nets, 1999-2000

Region	Lake	Date	Duration (hours)	Broad Whitefish	Least Cisco	Arctic Grayling	Alaska Blackfish	Ninespine Stickleback	Total Catch
Ublutuoch									
	L9817	Jul 17 99	7.5						0
	L9818	Jul 17 99	7.1						0
	L9819	Jul 19 99	7.2						0
	L9822	Jul 16 99	6.5						0
	L9823	Jul 16 99	6.3						0
	L9824	Jul 18 99	6.7						0
	L9825	Jul 18 99	6.8		1	13			14
	L9832	Jul 19 99	3.2						0
	L9914	Aug 4 99	2.6						0
	L9915	Jul 27 99	5.7		3				3
	M9912	Jul 12 99	6.3						0
	M9913	Jul 12 99	5.4						0
	M9922	Jul 15 99	6.4						0
		Aug 1 00	20.5						0
	M9923	Jul 17 99	4.0						0
		Aug 1 00	15.1						0
	M9924	Jul 18 99	2.2						0
	M9925	Jul 18 99	6.4						0
	M9930	Jul 27 99	5.7						0
	MC7917	Aug 4 99	4.0		10				10
	W2.1	Aug 3 99	6.7	2	3				5
	W3.1	Jul 22 99	1.4	1	1				2
	X1.1	Jul 19 99	6.2						0
	X1.2	Jul 19 99	6.1						0
	X2.1	Jul 31 99	7.7						0
	X3.1	Aug 4 99	1.8			1			1
	X4.1	Jul 23 99	0.6	1	4				5
	X4.2	Jul 23 99	1.6	2	7				9
	Y2.1	Jul 31 99	5.0						0
Fish Ck Confluence									
	L9916	Jul 14 00	2.9		9				9
	M9901	Jul 9 99	6.8			29			29
	M9902	Jul 9 99	5.9						0
	M9903	Jul 10 99	3.1						0
		Jul 16 99	6.8						0
	M9904	Jul 10 99	3.4						0
	M9905	Jul 10 99	3.9						0
	M9906	Jul 15 99	7.6						0
	M9907	Jul 15 99	8.2						0
	M9908	Jul 11 99	4.9						0
	M9909	Jul 11 99	5.0	2	6				8
	M9910	Jul 11 99	1.2			4			4
	M9911	Jul 17 99	6.3	14	2				16
	M9914	Jul 12 99	2.3						0
	M9915	Jul 13 99	5.5						0
	M9916	Jul 13 99	6.3						0
	M9917	Jul 13 99	8.7			3			3
	M9918	Jul 14 99	6.3		1	1			2
	M9919	Jul 14 99	4.9		1				1
	M9920	Jul 14 99	2.8						0

Table 2. Catches of fish from NPR-A sampling with gill nets, 1999-2000

Region	Lake	Date	Duration (hours)	Broad Whitefish	Least Cisco	Arctic Grayling	Alaska Blackfish	Ninespine Stickleback	Total Catch
	M9921	Jul 15 99	4.3						0
	M9926	Jul 20 99	5.1						0
	M9927	Jul 20 99	5.2						0
	M9928	Jul 20 99	1.6	3	13				16
	M0001	Jul 12 00	5.1						0
	M0002	Jul 13 00	4.7						0
		Jul 14 00	1.8		1				1
	M0003	Jul 13 00	4.4						0
		Jul 14 00	1.5						0
	M0005	Jul 15 00	6.0					3	3
	M0006	Jul 15 00	6.8				1		1
	M0007	Jul 16 00	8.7						0
	M0008	Jul 16 00	5.2						0
	M0009	Jul 17 00	6.8						0
	M0010	Jul 17 00	8.0						0
	M0020	Jul 27 00	1.8		7				7
	M0021	Jul 27 00	2.7		7				7
	M0022	Jul 29 00	8.8						0
	M0023	Jul 29 00	0.9						0
	M0024	Jul 29 00	10.3						0
	M0025	Jul 31 00	8.0						0
	M0028	Aug 2 00	8.0						0
	M0032	Aug 4 00	8.5						0
Judy Creek									
	L9911	Jul 25 99	4.1						0
	M0011	Jul 19 00	10.8						0
	M0012	Jul 20 00	10.2						0
	M0013	Jul 20 00	10.0						0
	M0014	Jul 21 00	14.3						0
	M0015	Jul 21 00	12.2						0
	M0016	Jul 22 00	12.7						0
	M0017	Jul 24 00	2.2						0
	M0029	Aug 3 00	10.9						0
	M0030	Aug 3 00	11.0						0
	M0031	Aug 3 00	11.1						0

Table 3. Catches of fish from NPR-A sampling with minnow traps, 2000.

Minnow Traps (2 per lake)

NPR-A Region	Lake	Date	Trap Effort (hours)	Ninespine Stickleback	Total Catch
Ublutuoch					
	M9922	8/1/00	21.35	seen	1
	M9923	8/1/00	0.00		0
Fish Ck Confluence					
	M0020	7/27/00	1.92		0
	M0021	7/27/00	4.00		0
	M0022	7/29/00	10.00		0
	M0023	7/29/00	3.00		0
	M0024	7/29/00	11.17		0
	M0025	7/31/00	9.50		0
	M0028	8/2/00	11.17	1	1
	M0032	8/4/00	31.83		0
Judy Creek					
	M0011	7/19/00	9.83	19	19
	M0012	7/20/00	8.50		0
	M0013	7/20/00	8.50		0
	M0014	7/21/00	15.33		0
	M0015	7/21/00	10.50		0
	M0016	7/22/00	14.00	1	1
	M0017	7/24/00	5.67		0
	M0029	8/3/00	12.00	3	3
	M0030	8/3/00	12.00		0
	M0031	8/3/00	11.50		0

Table 4. Water chemistry parameters measured in conjunction with NPR-A Area lake sampling, 1999-2000.

NPR-A Region	Lake	Date	Water Temp. (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen Percent Saturation	Specific Conductance (mS/cm)	pH	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Hardness (mg/l)	TDS (mg/l)
Ublutuoch													
	L9817	7/17/99	14.9	9.23	92.6	325.2	7.98						
	L9818	7/17/99	13.8	9.10	87.9	256.4	7.92						
	L9819	7/19/99	12.3	9.11	85.3	176.9	8.00						
	L9822	7/16/99	15.1	9.77	96.6	107.9	7.89	12.1	2.6	8.6	2.2	30.6	44
	L9823	7/16/99	15.1	9.57	94.9	214.5	7.76	44.4	8.9	22.4	6.5	82.6	168
	L9824	7/18/99	13.5	9.14	88.1	55.7	7.84	5.3	1.7	5.2	1.4	19.0	MDL=35
	L9825	7/18/99	12.6	9.01	82.4	46.8	7.86	4.5	1.4	4.4	1.2	15.9	MDL=35
	L9832	7/19/99	10.9	10.27	93.0	203.4	7.98						
	L9914	8/4/99	12.5	11.28	107.8	405.9	8.42						
	L9915	7/27/99	7.4	11.50	95.3	190.9	8.29	20.8	9.5	25.4	3.7	78.9	124
	M9912	7/12/99	14.3	9.94	95.7	88.2	7.38	13.9	4.4	8.6	2.2	31.4	59
	M9913	7/12/99	13.9	9.82	97.0	85.9	7.37	11.9	3.9	9.2	2.1	32.0	55
	M9922	8/1/00	10.5			134.5	7.79	19.9	5.2	14.5	3.3	49.8	88
		7/15/99	14.3	10.00	95.4	136.4	7.77	23.8	6.2	16.5	4.1	58.0	92
	M9923	8/1/00	9.7			225.1	8.20	18.8	5.4	33.0	4.9	103.0	128
		7/17/99	14.4	9.71	95.8	253.2	8.23	24.1	6.8	38.4	6.3	122.0	140
	M9924	7/18/99	11.7			186.1	7.58	22.7	10.5	24.8	4.4	77.3	136
	M9925	7/18/99	12.2			275.5	8.12	37.8	11.1	40.2	6.2	122.0	194
	M9930	7/27/99	7.9	11.98	102.3	178.5	8.26	17.8	7.3	25.2	3.6	77.8	88
	MC7917	8/4/99	11.9	10.50	97.2	175.2	8.02	14.2	5.8	25.4	3.3	76.7	104
	W2.1	1993						25.0	13.0	6.0	2.3	24.0	110
		1998						21.1	9.5	7.3	3.1	31.1	68
		8/3/99	12.6	11.25	105.3	144.6	7.97	22.1	13.7	8.6	4.0	38.0	70
	W3.1	7/22/99	9.0	11.31	97.8	167.2	7.88	15.0	6.8	7.5	2.8	30.0	67
	X1.1	7/19/99	11.1	10.05	91.7	172.2	8.18						
	X1.2	7/19/99	10.7	9.83	89.3	179.6	8.13						
	X2.1	7/31/99	9.0	11.27	97.8	229.5	8.03						
	X3.1	8/4/99	12.9	11.33	107.7	153.0	8.20						
	X4.1	7/23/99	10.1	11.23	99.8	170.8	7.95	20.7	11.7	12.4	6.5	57.6	88
	X4.2	7/23/99	9.2	11.04	96.2	311.5	8.16	49.1	22.5	19.8	12.6	101.0	154
	Y2.1	7/31/99	9.0	11.36	98.4	160.7	7.93	12.9	4.4	20.1	3.7	65.5	96

Table 4. Water chemistry parameters measured in conjunction with NPR-A Area lake sampling, 1999-2000.

NPR-A Region	Lake	Date	Water Temp. (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen Percent Saturation	Specific Conductance (mS/cm)	pH	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Hardness (mg/l)	TDS (mg/l)
Fish Ck Confluence													
	L9916	7/14/00	7.0	11.1	92.7	210.4	8.07	14.5	6.9	27.3	5.2	89.5	106
	M9901	7/9/99	14.7	9.91	97.9	179.6	7.66	23.8	4.6	24.7	3.7	79.8	110
	M9902	7/9/99	14.9	9.57	95.0	293.7	8.10	18.5	8.6	39.3	7.8	135.0	164
	M9903	7/10/99	15.2	9.55	95.2	87.3	8.11	7.9	2.8	9.7	1.9	33.2	55
		7/16/99	15.3	9.98	100.0	85.4	7.86						
	M9904	7/10/99	14.8	9.62	95.3	209.8	8.04	8.3	3.4	32.0	4.4	98.6	126
	M9905	7/10/99	15.0	9.41	93.6	85.2	7.97	7.4	2.6	9.9	1.9	33.0	61
	M9906	7/15/99	13.0	9.90	94.6	199.7	8.25	13.8	5.0	26.9	4.0	85.6	112
	M9907	7/15/99	13.2	9.88	95.5	199.3	8.30	13.3	5.4	25.4	4.3	84.0	116
	M9908	7/11/99	14.2	9.90	96.3	317.8	8.35	28.6	9.0	40.9	7.6	136.0	188
	M9909	7/11/99	13.7	9.92	95.0	173.3	8.11	20.5	5.0	18.8	3.8	65.1	98
	M9910	7/11/99	13.7	10.50	101.1	126.6	8.10	8.7	3.1	17.2	3.0	54.9	78
	M9911	7/11/99	14.3	10.26	100.6	146.0	8.03	9.4	3.6	21.5	2.9	65.7	84
	M9914	7/12/99	14.2	9.84	95.8	99.3	7.45	12.1	4.5	10.1	2.4	35.9	74
	M9915	7/13/99	14.7	9.76	95.7	88.7	7.58	14.1	4.1	9.0	2.3	32.8	61
	M9916	7/13/99	13.5	10.15	97.3	146.5	9.00	17.5	8.0	15.4	3.8	55.0	120
	M9917	7/13/99	14.6	9.72	95.5	208.1	8.26	19.3	6.4	27.7	4.3	88.6	138
	M9918	7/14/99	14.5	9.68	94.9	75.1	8.04	7.0	2.8	8.5	1.8	29.8	44
	M9919	7/14/99	14.3	10.11	98.8	106.2	7.80	10.4	3.7	12.8	2.5	43.2	138
	M9920	7/14/99	15.3	9.84	98.3	174.4	8.27	7.7	3.4	25.5	4.0	81.6	114
	M9921	7/15/99	13.9	10.38	103.0	196.7	8.02	27.4	8.6	28.3	5.1	91.6	130
	M9926	7/20/99	12.3	9.67	90.5	166.9	8.37	9.0	4.5	23.8	5.0	132.0	84
	M9927	7/20/99	9.6	10.19	82.8	237.1	8.60	19.8	9.7	29.0	8.8	102.0	136
	M9928	7/20/99	12.0	9.90	92.0	121.0	8.04	8.4	4.0	16.4	2.7	52.2	62
	M0001	7/12/00					7.73	10.3	4.6	16.5	3.0	53.3	90
	M0002	7/13/00	8.7	11.1	95.9	83.5	7.25	9.7	3.9	8.5	2.0	29.3	<35
	M0003	7/13/00	8.7	11.0	94.2	130.3	7.58	13.5	5.7	15.2	3.0	50.3	84
	M0005	7/15/00	9.1	10.7	93.5	281.9	8.06	29.4	12.3	31.4	6.4	105.0	148
	M0006	7/15/00	9.9	10.6	92.6	223.4	7.97	21.2	9.7	27.4	5.1	89.4	134
	M0007	7/16/00	11.4	11.2	105.7	294.9	8.15	32.0	11.9	35.5	5.5	111.0	164
	M0008	7/16/00	12.6	10.8	101.3	124.7	7.83	13.5	5.9	14.1	2.7	46.3	76
	M0009	7/17/00	12.9	10.5	99.3	69.4	7.60	7.7	3.1	7.6	1.5	25.0	<35
	M0010	7/17/00	12.2	10.5	97.9	150.4	8.00	14.2	6.2	17.2	3.7	58.2	88

Table 4. Water chemistry parameters measured in conjunction with NPR-A Area lake sampling, 1999-2000.

NPR-A Region	Lake	Date	Water Temp. (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen Percent Saturation	Specific Conductance (mS/cm)	pH	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Hardness (mg/l)	TDS (mg/l)
	M0020	7/27/00	10.1	10.5	95.4	141.6	7.91	11.1	4.9	18.4	3.2	59.1	122
	M0021	7/27/00	11.2			117.0	7.86	7.6	3.2	16.6	2.6	52.1	102
	M0022	7/29/00	10.4			96.2	7.97	11.5	5.1	10.0	2.4	34.8	84
	M0023	7/29/00	10.3			191.8	7.88	22.6	9.9	19.0	4.6	66.5	128
	M0024	7/29/00	10.6	10.9	98.0	107.2	7.93	14.3	4.8	11.2	2.9	39.9	70
	M0025	7/31/00	9.9			99.7		10.7	4.9	10.5	2.6	36.8	66
	M0028	8/2/00	11.7			119.4	8.15	10.4	5.0	13.7	3.4	48.2	74
	M0032	8/4/00	13.6			204.9	8.22	21.3	8.2	24.6	4.5	79.7	114
Judy Creek													
	L9911	7/25/99	9.2	11.04	95.9	178.9	8.22	11.9	5.0	27.5	3.8	84.2	118
	M0011	7/19/00	11.4	10.7	98.2	135.0	7.96	10.9	5.6	16.5	3.2	54.3	66
	M0012	7/20/00	11.5	10.7	99.1	208.0	8.29	19.7	9.9	24.7	4.1	78.6	140
	M0013	7/20/00	11.1	11.2	103.8	192.2	8.58	8.2	7.2	28.9	3.5	86.5	136
	M0014	7/22/00	12.3	10.6	97.5	197.0	7.79	24.7	9.8	21.8	4.2	71.5	166
	M0015	7/22/00	14.8	9.8	98.5	203.5	7.80	23.5	10.1	21.2	3.9	69.0	156
	M0016	7/22/00	13.2	10.3	96.7	123.9	7.77	14.8	5.2	14.4	2.8	47.6	72
	M0017	7/24/00	11.6	7.8	73.0	265.5	7.61	16.3	8.9	34.2	6.8	133.0	162
	M0029	8/3/00	13.4			468.3	8.50	45.9	29.3	39.2	10.6	142.0	254
	M0030	8/3/00	13.0			198.1	8.26	20.1	10.0	22.6	4.4	74.5	66
	M0031	8/3/00	14.0	10.1	97.8	120.1	7.96	6.9	4.4	16.9	2.3	51.6	56

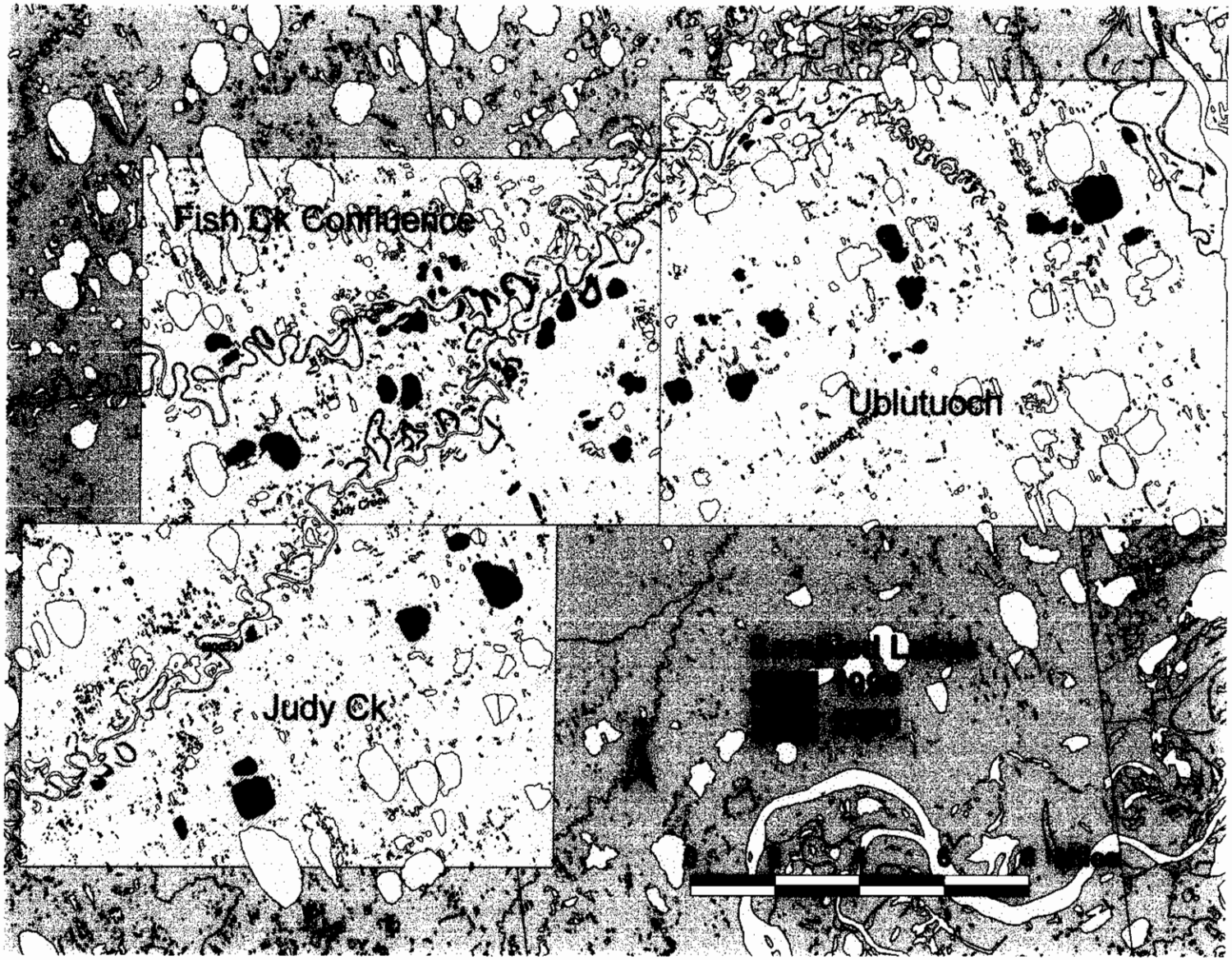


Figure 1. Regions of eastern NPRA sampled for fish during 1999-2000 summer field seasons.

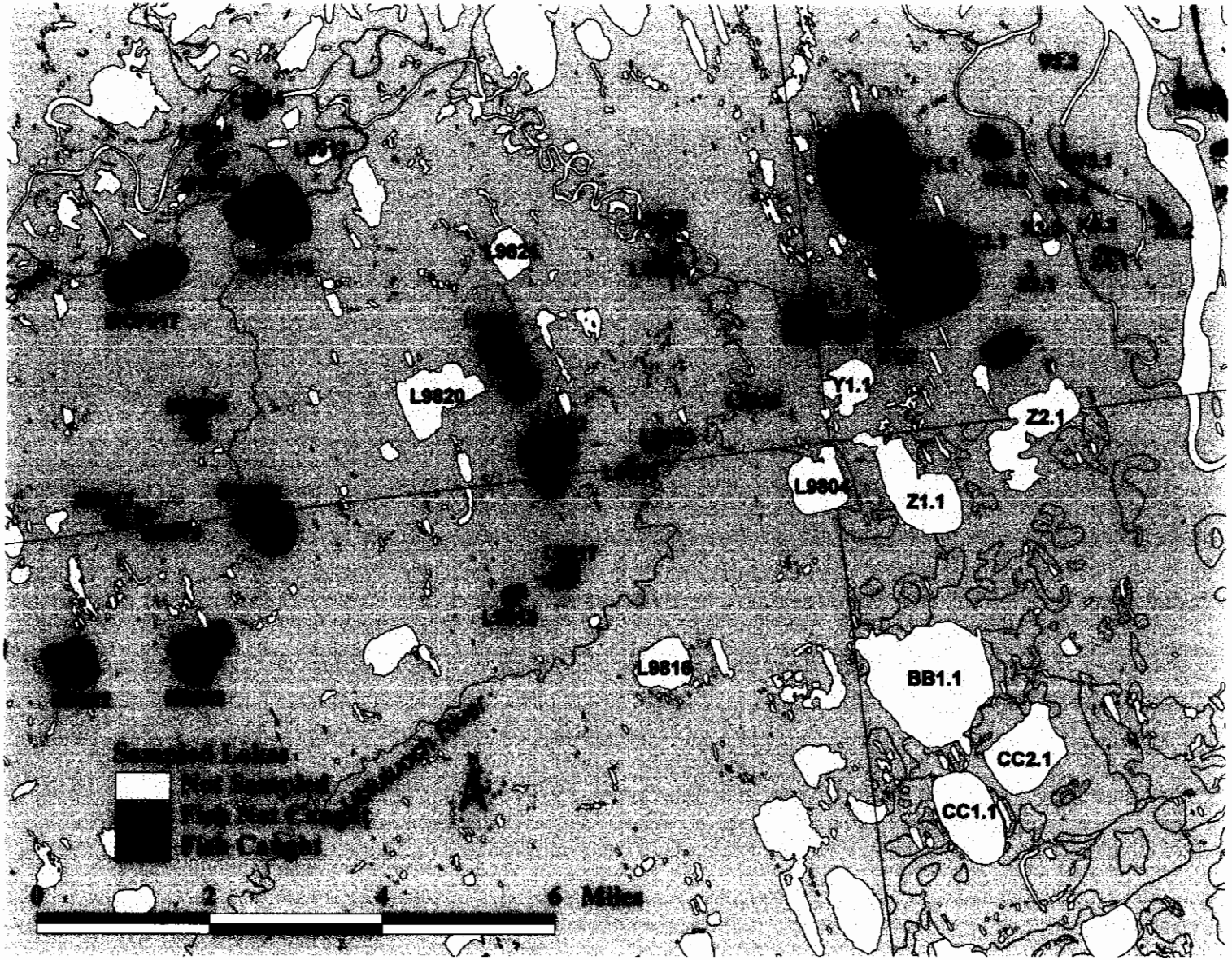


Figure 2. Lakes sampled for fish in the Ublutuoch region during 1999-2000 (lakes in red were confirmed to contain fish other than sticklebacks).

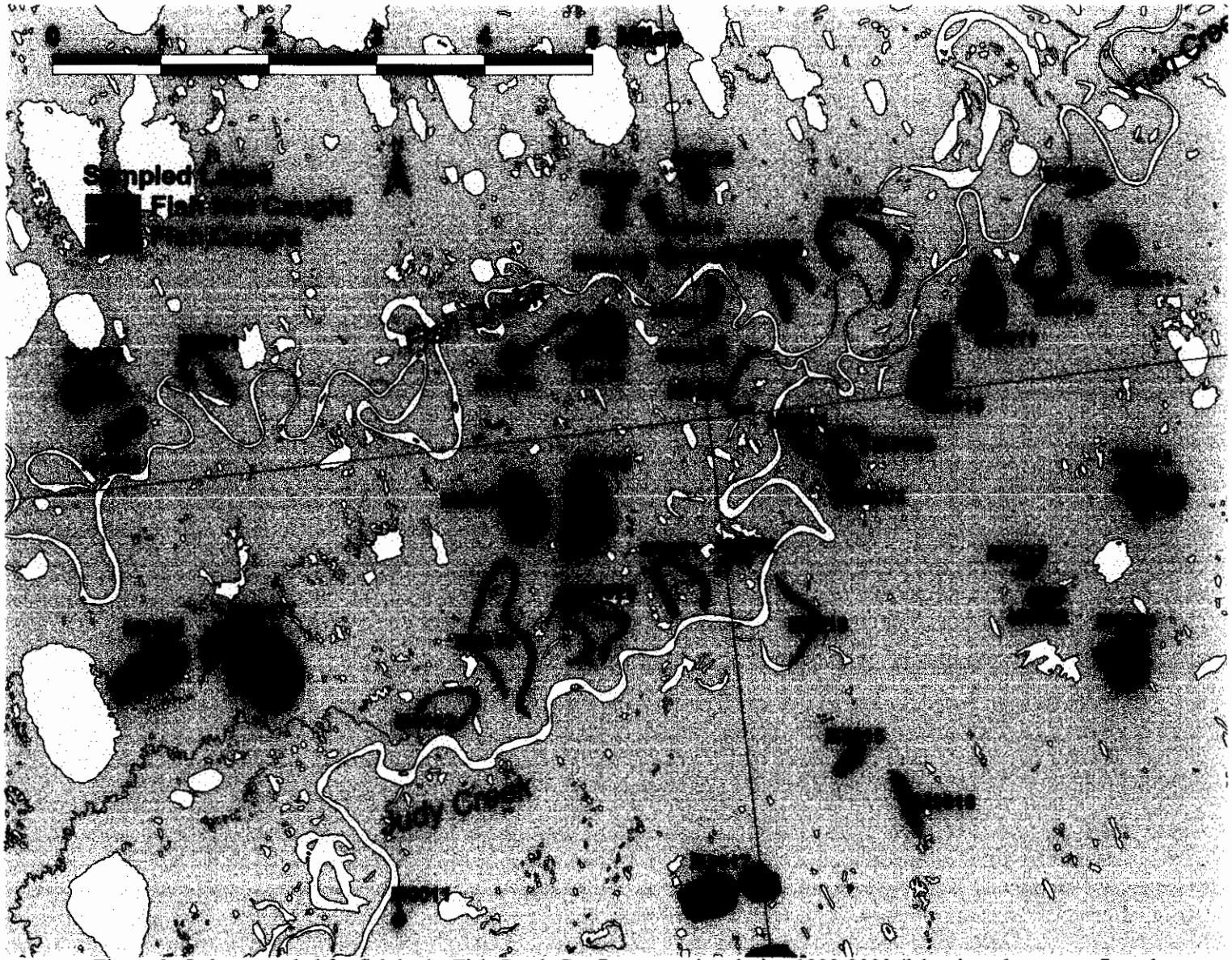


Figure 3. Lakes sampled for fish in the Fish Creek Confluence region during 1999-2000 (lakes in red were confirmed to contain fish other than sticklebacks).

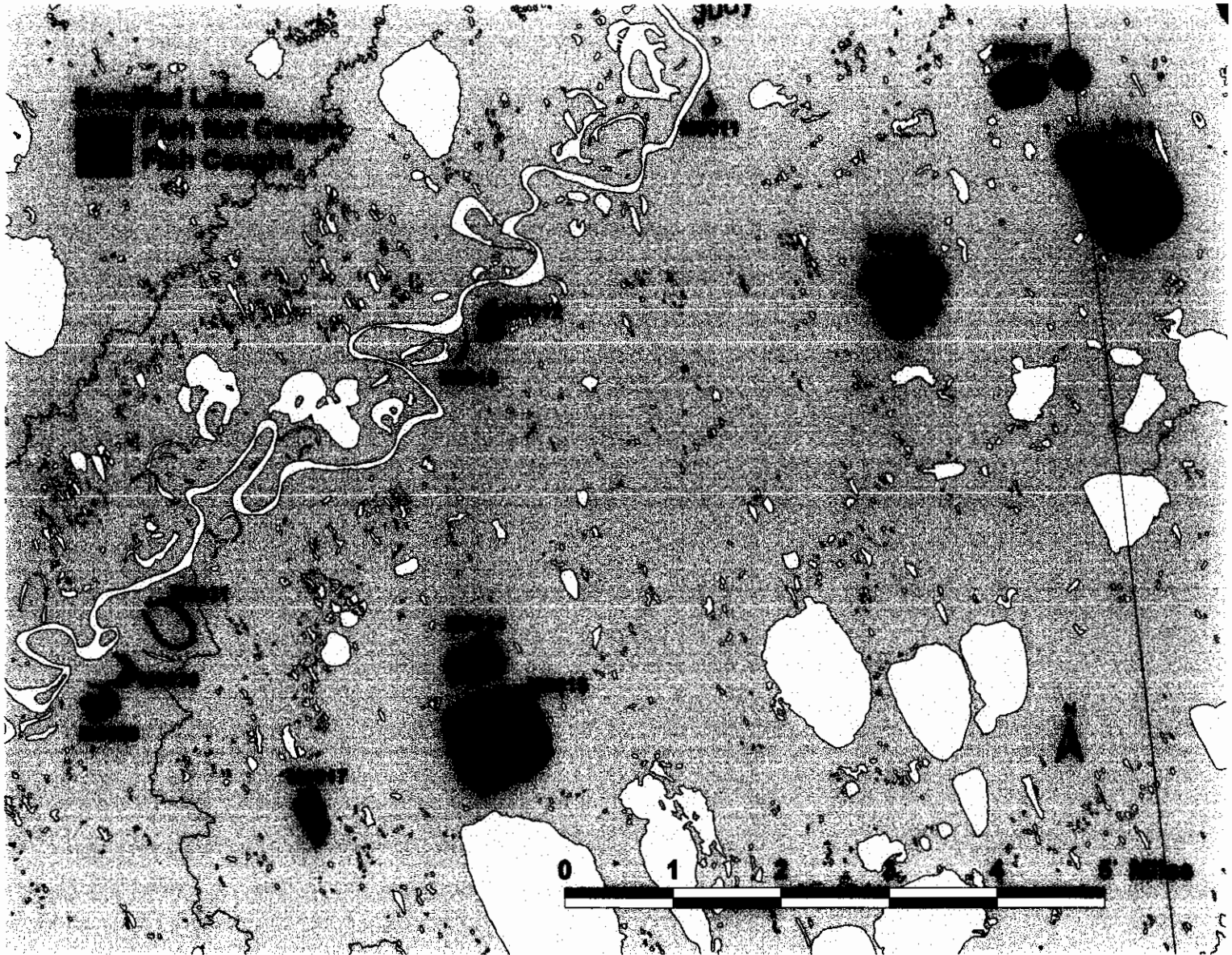


Figure 4. Lakes sampled for fish in the Judy Creek region during 1999-2000 (lakes in red were confirmed to contain fish other than sticklebacks).

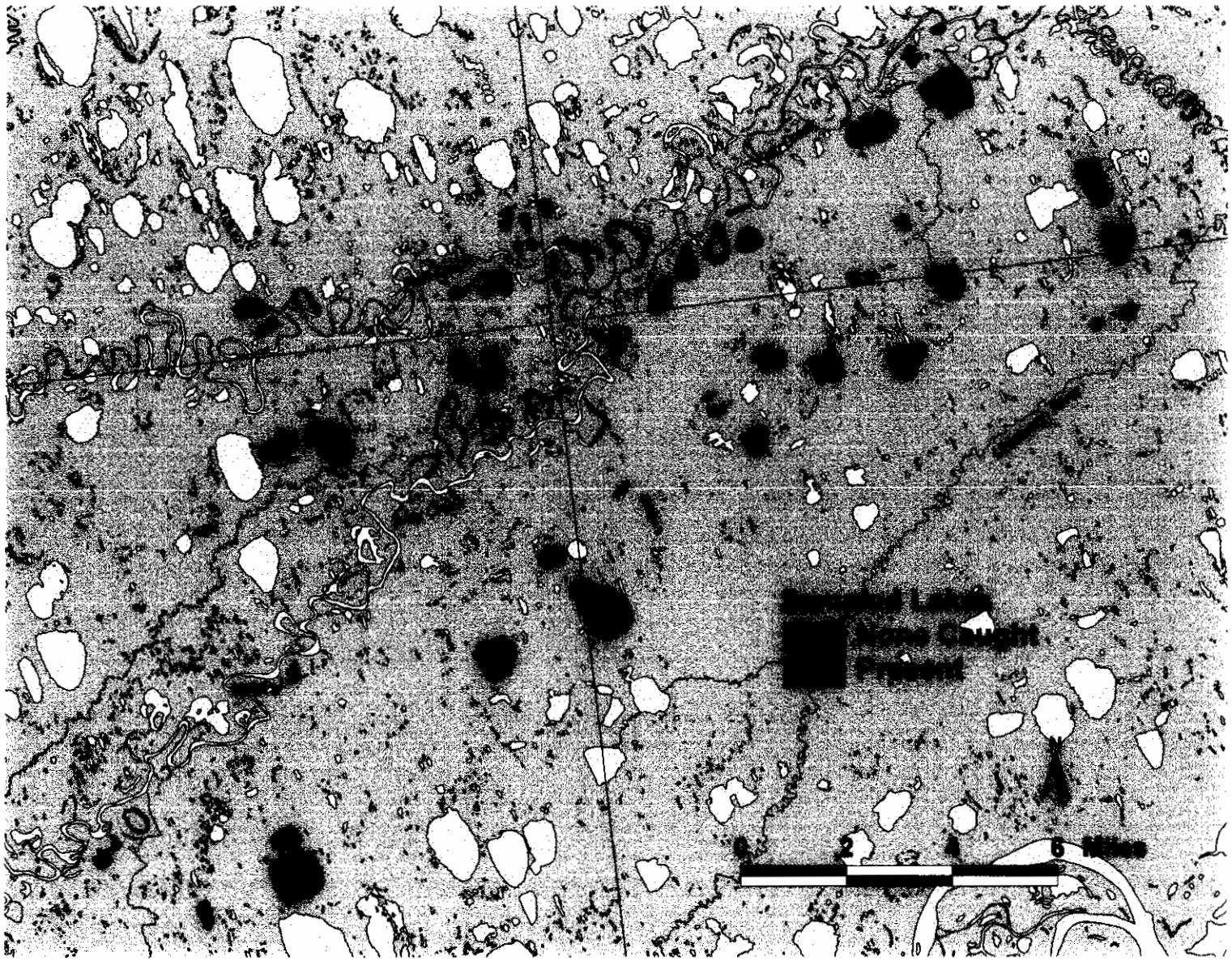


Figure 5. Distribution of least cisco in lakes sampled west of the Ublutuoch River during 1999-2000 summer field seasons.

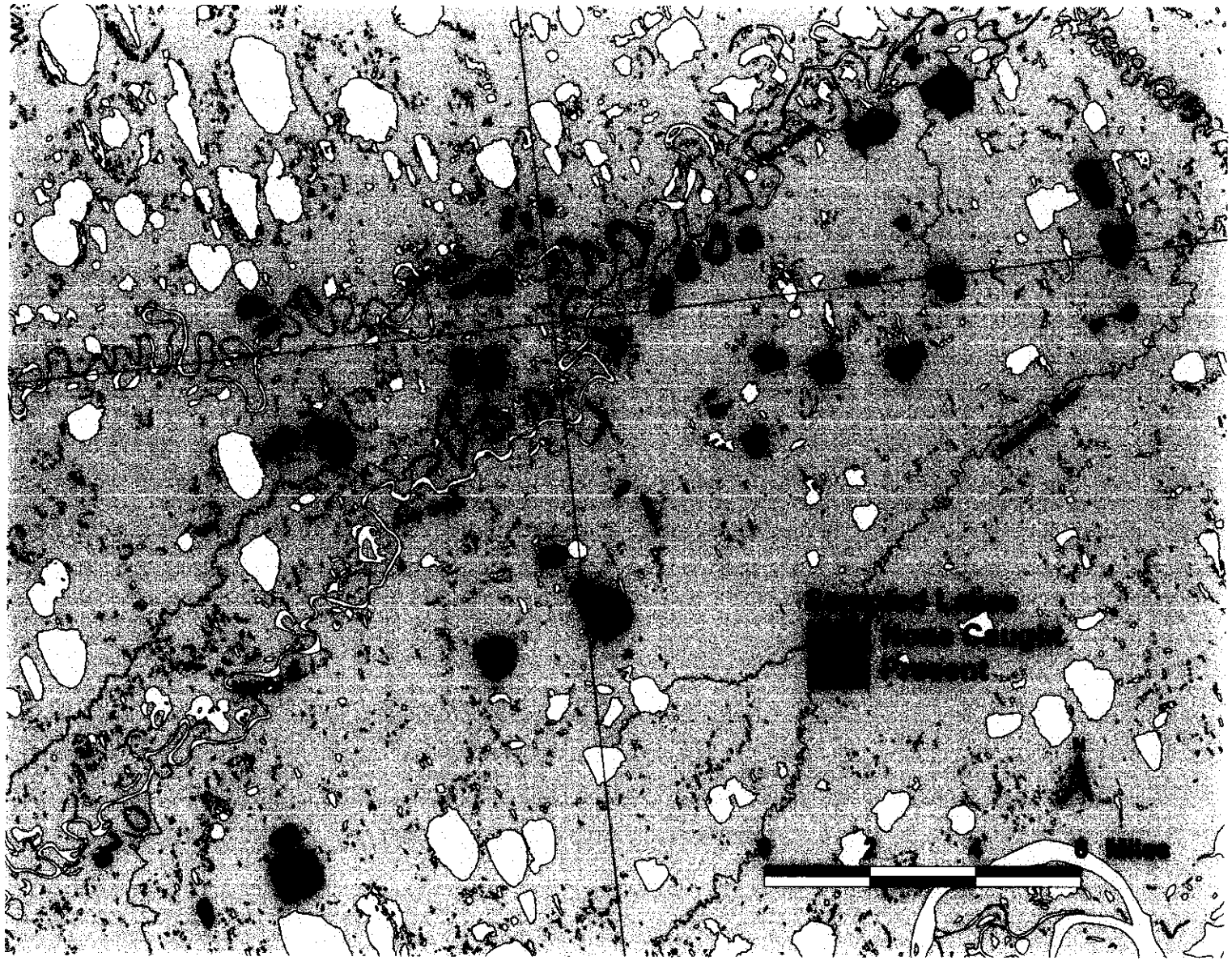


Figure 6. Distribution of broad whitefish in lakes sampled west of the Ublutuoch River during 1999-2000 summer field seasons.

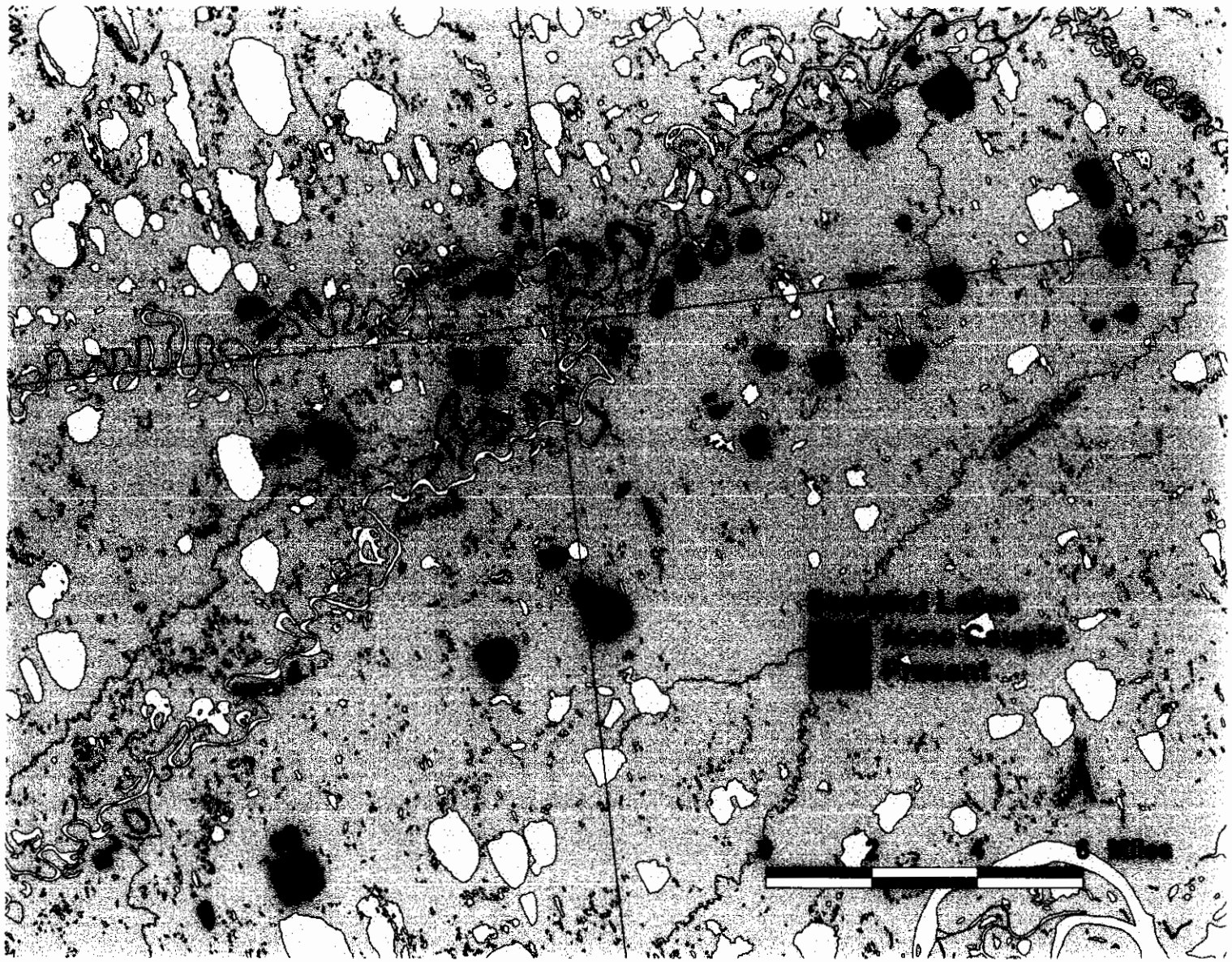
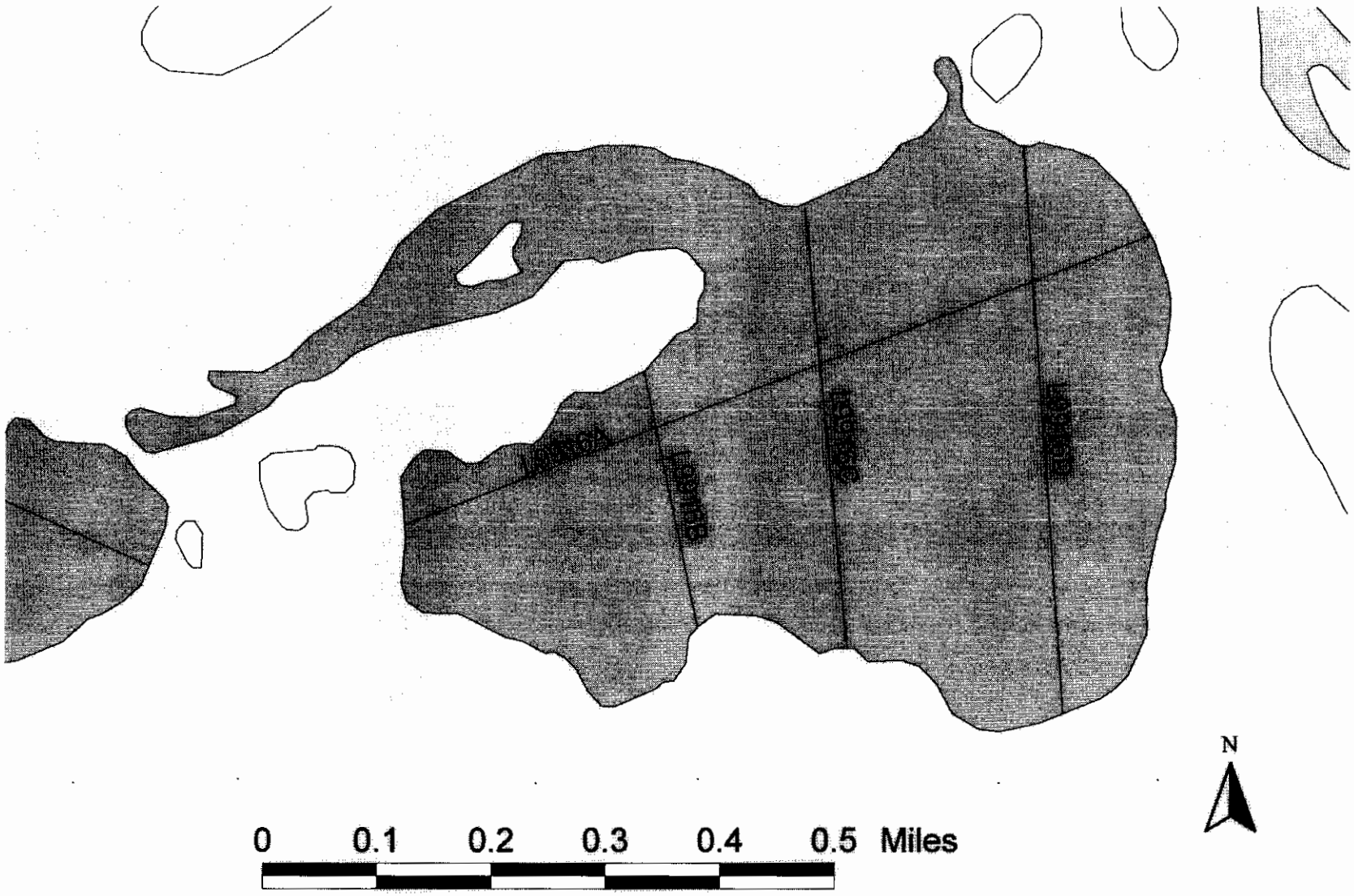


Figure 7. Distribution of arctic grayling in lakes sampled west of the Ublutuoch River during 1999-2000 summer field seasons.

LAKE SUMMARIES

L9916



Lake L9916

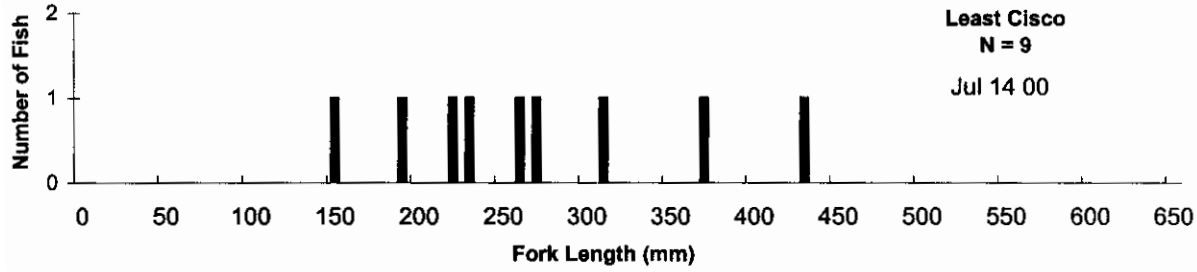
Other Names: M0004
Location: 70°15.80N 151°50.50W
USGS Quad Sheet: Harrison Bay B-4: Section 34 T11N R1E
Habitat:
Area: 169 acres
Maximum Depth: 14.3 feet
Active Outlet:
Spec. Conductance: 210 µS/cm
pH: 8.1
Calculated Volume: 260.0 million gallons
Permittable Volume: 19.9 million gallons

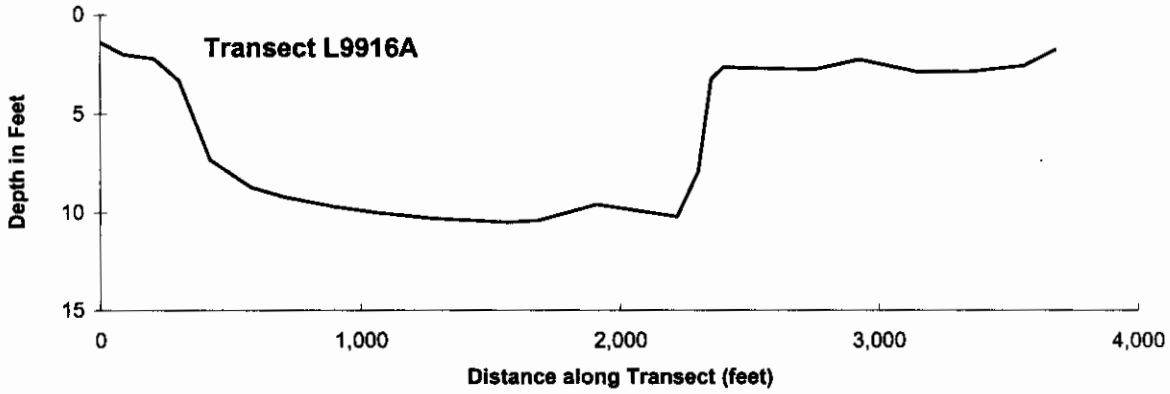
Water Quality:

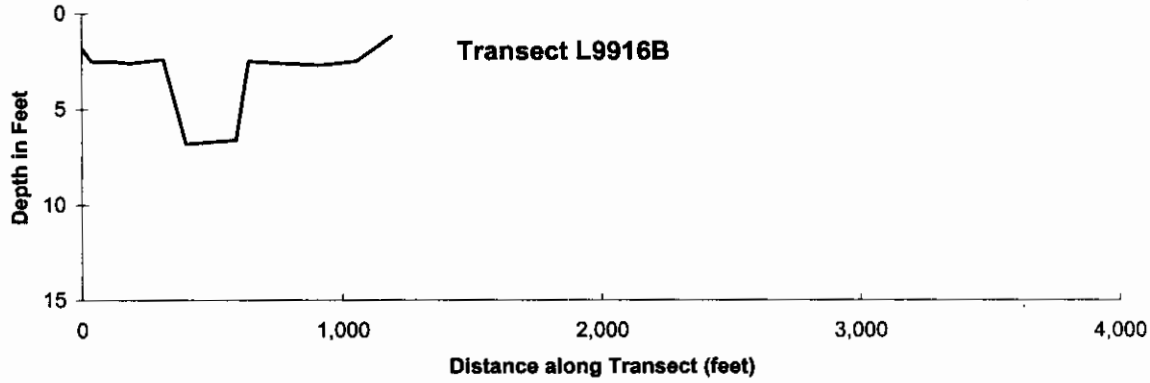
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	14.5	6.9	27.3	5.2	90	106	this study

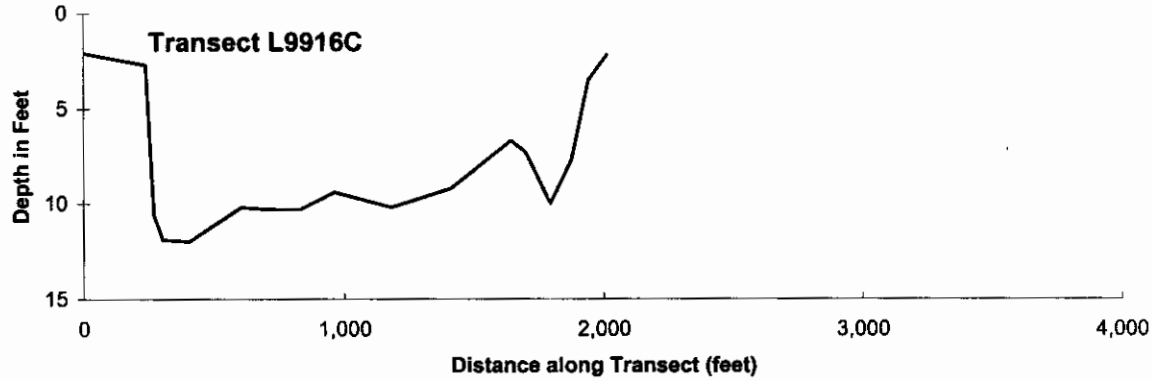
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 14 00	2.9	Least cisco	9	191-433




Transect L9916A
Depth in Feet
0
5
10
15
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)


Transect L9916B
Depth in Feet
0
5
10
15
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)


Transect L9916C
Depth in Feet
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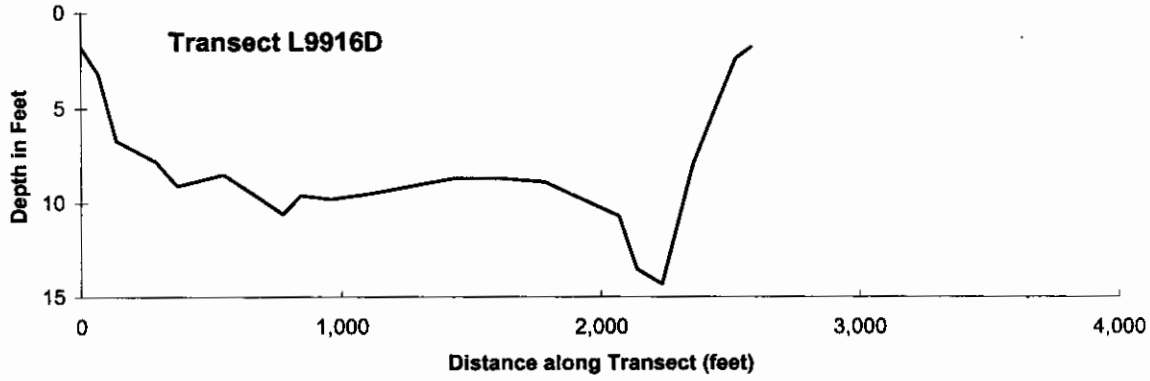
5
10
15
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)


Transect L9916D
Depth in Feet
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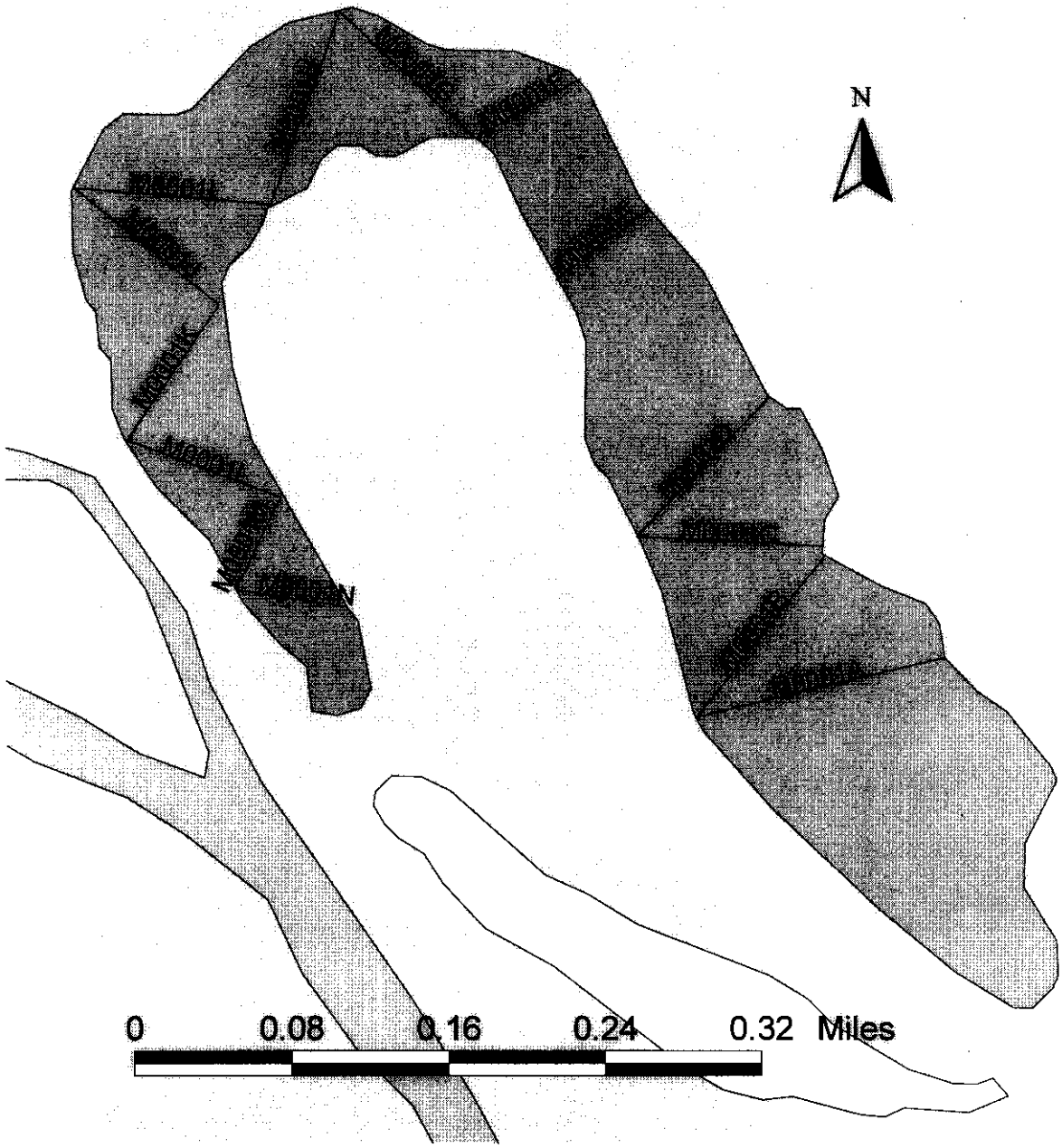
5
10
15
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)

M0001



Lake M0001

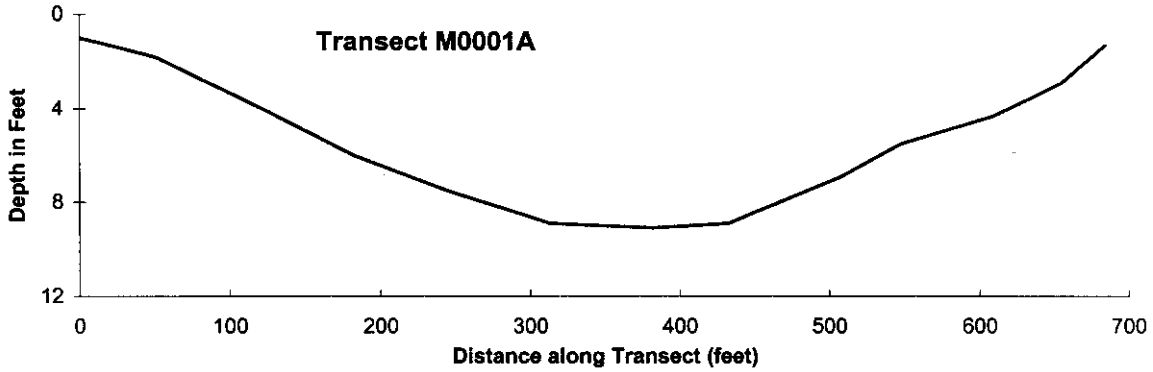
Other Names:
Location: 70°15.98N 152°00.25W
USGS Quad Sheet: Harrison Bay B-4: Section 31 T11N R1E
Habitat:
Area: 49 acres
Maximum Depth: 10.6 feet
Active Outlet:
Spec. Conductance: µS/cm
pH: 7.7
Calculated Volume: 55.5 million gallons
Permittable Volume: 2.8 million gallons

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
2000	10.3	4.6	16.5	3.0	53	90	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 12 00	5.1	None	0


Transect M0001A
Depth in Feet
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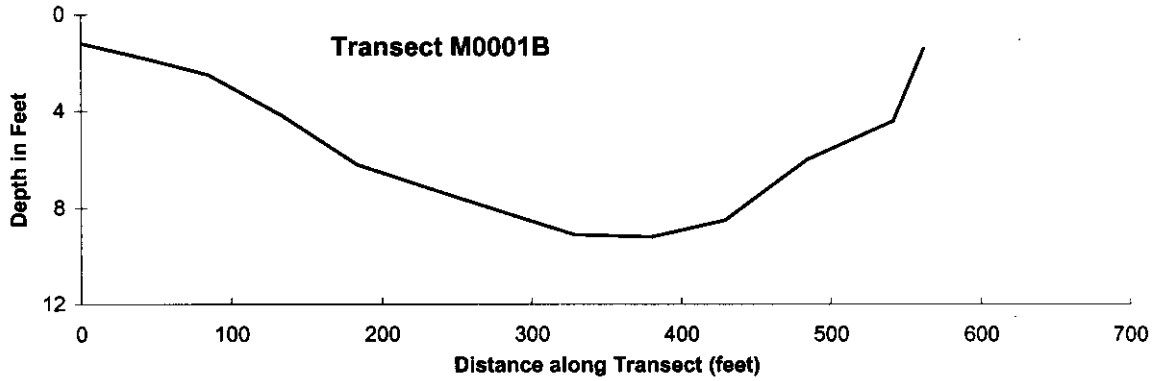
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001B
Depth in Feet
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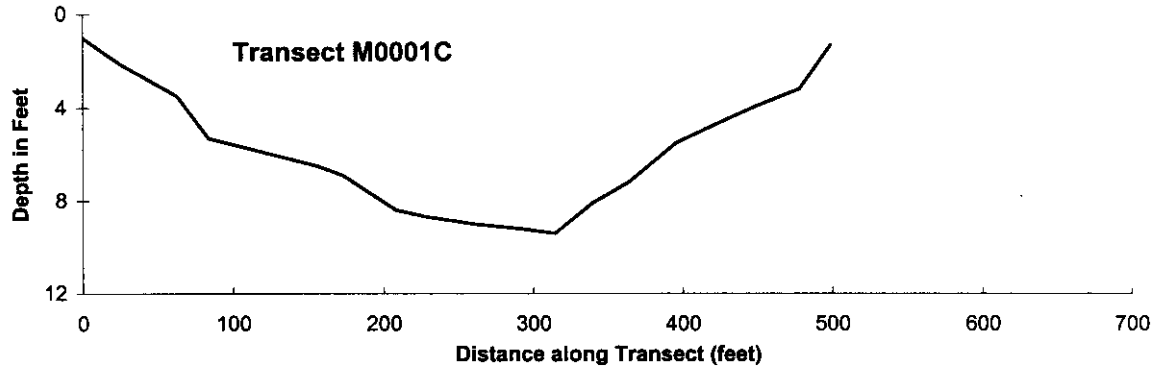
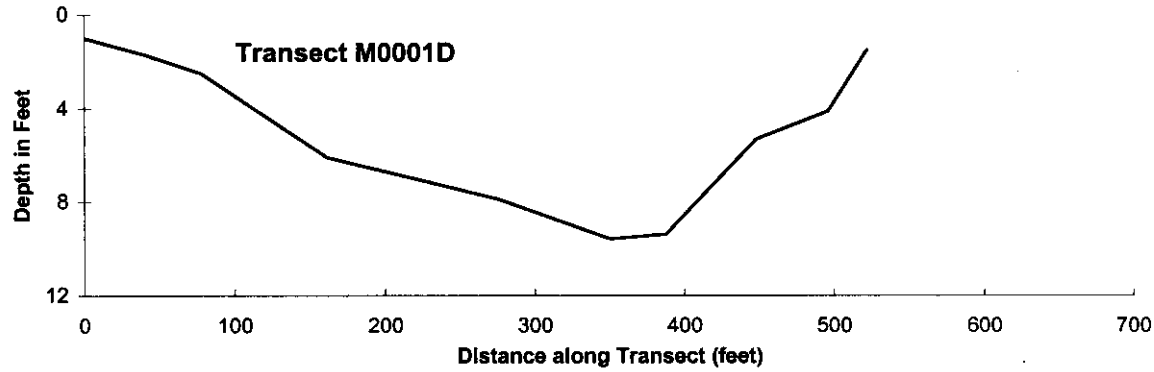
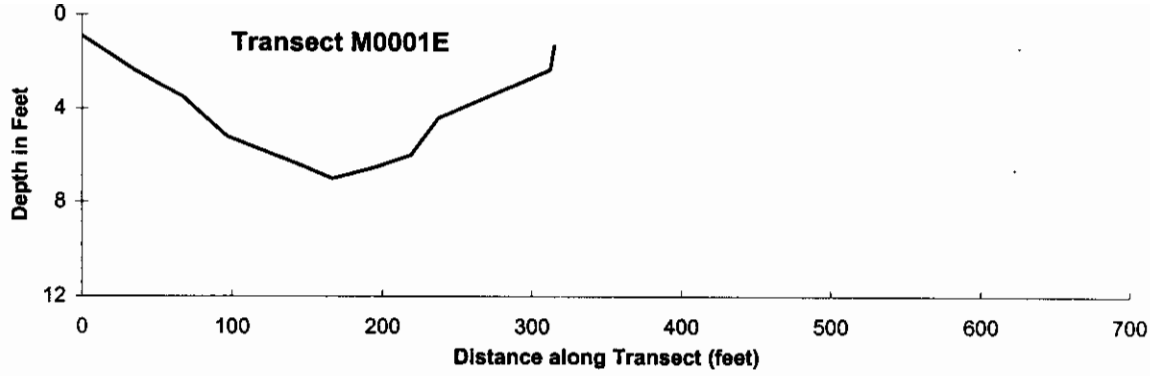
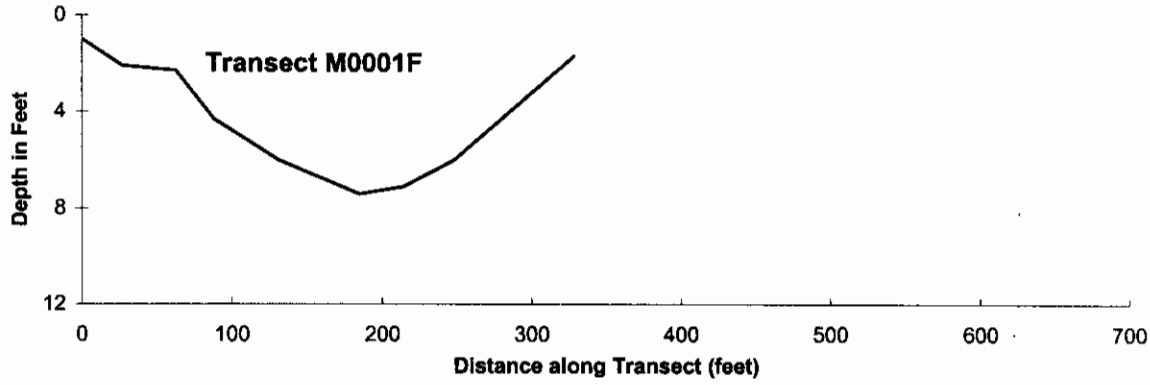
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001C
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001D
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001E
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001F
Depth in Feet
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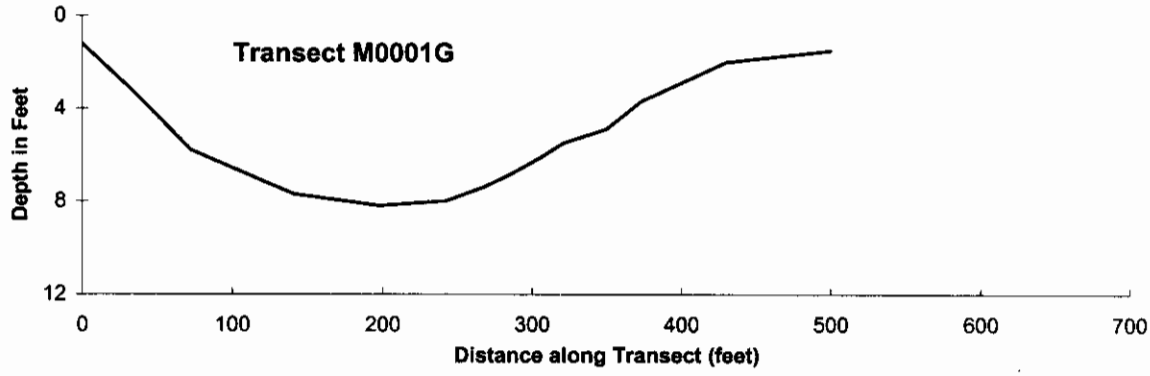
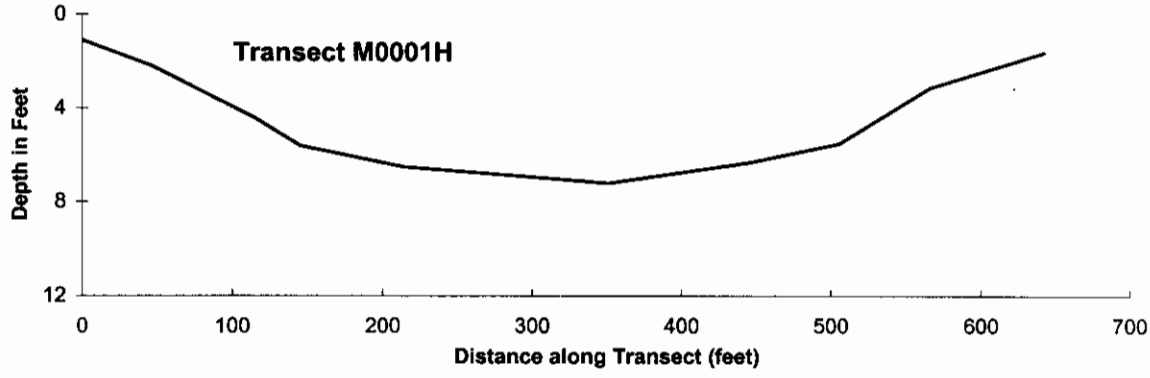
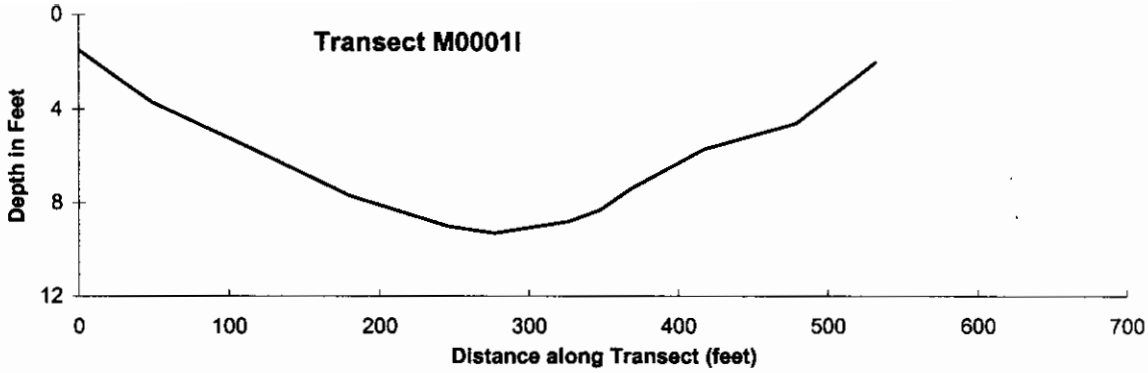
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001G
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001H
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001I
Depth in Feet
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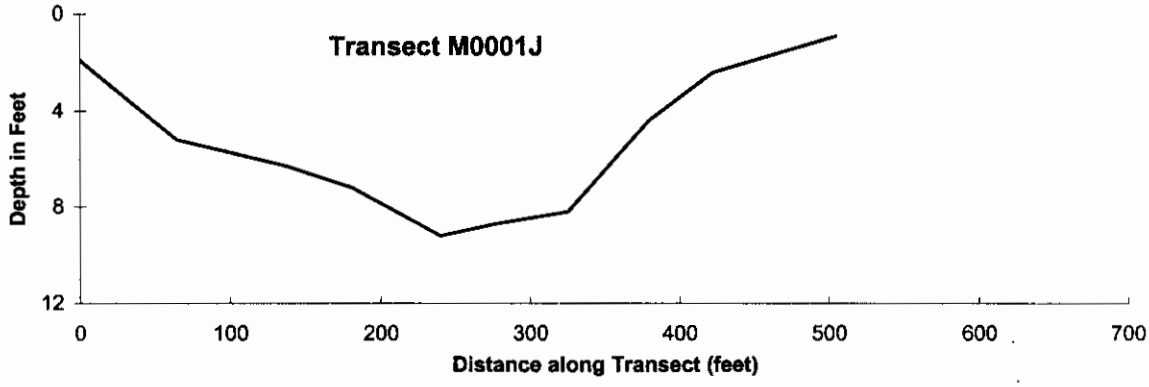
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001J
Depth in Feet
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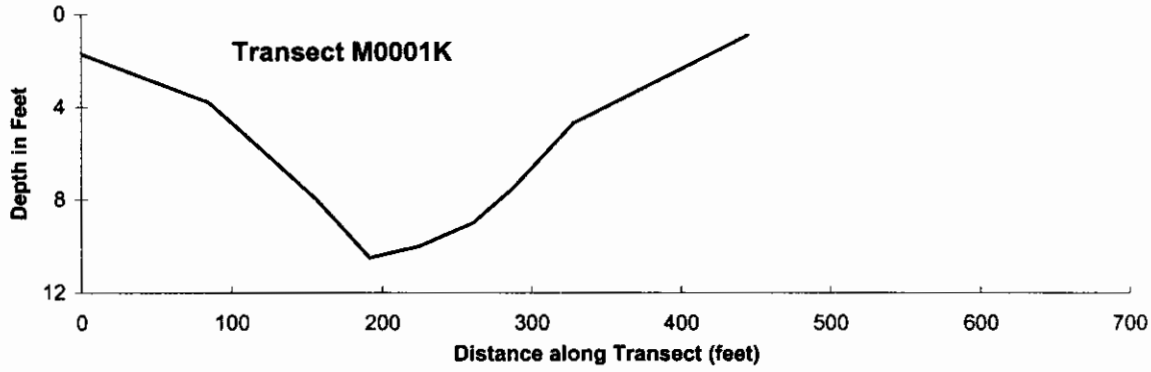
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001K
Depth in Feet
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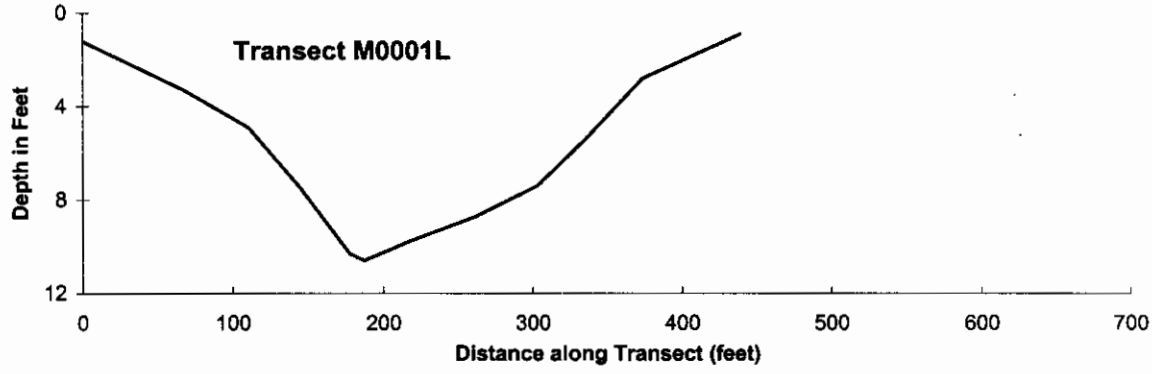
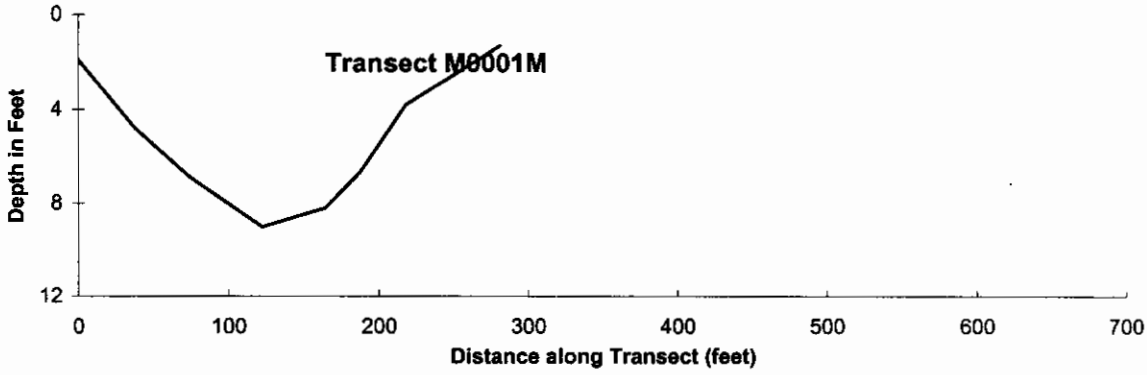
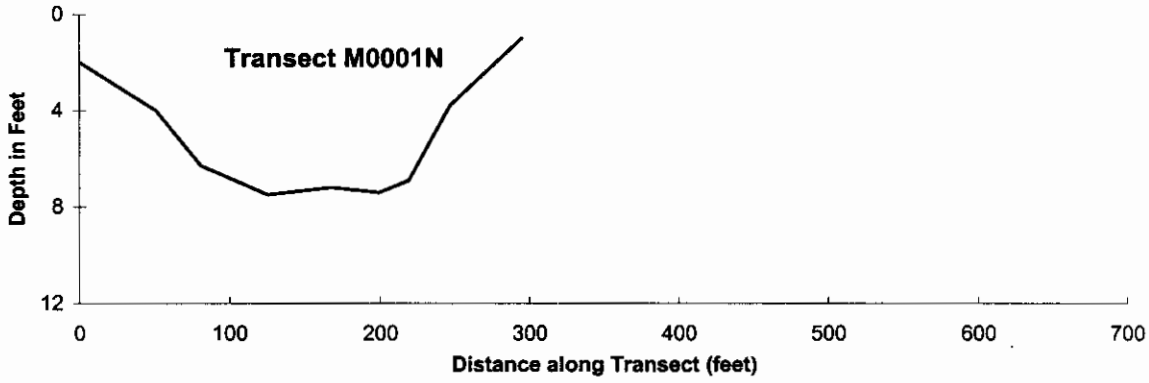
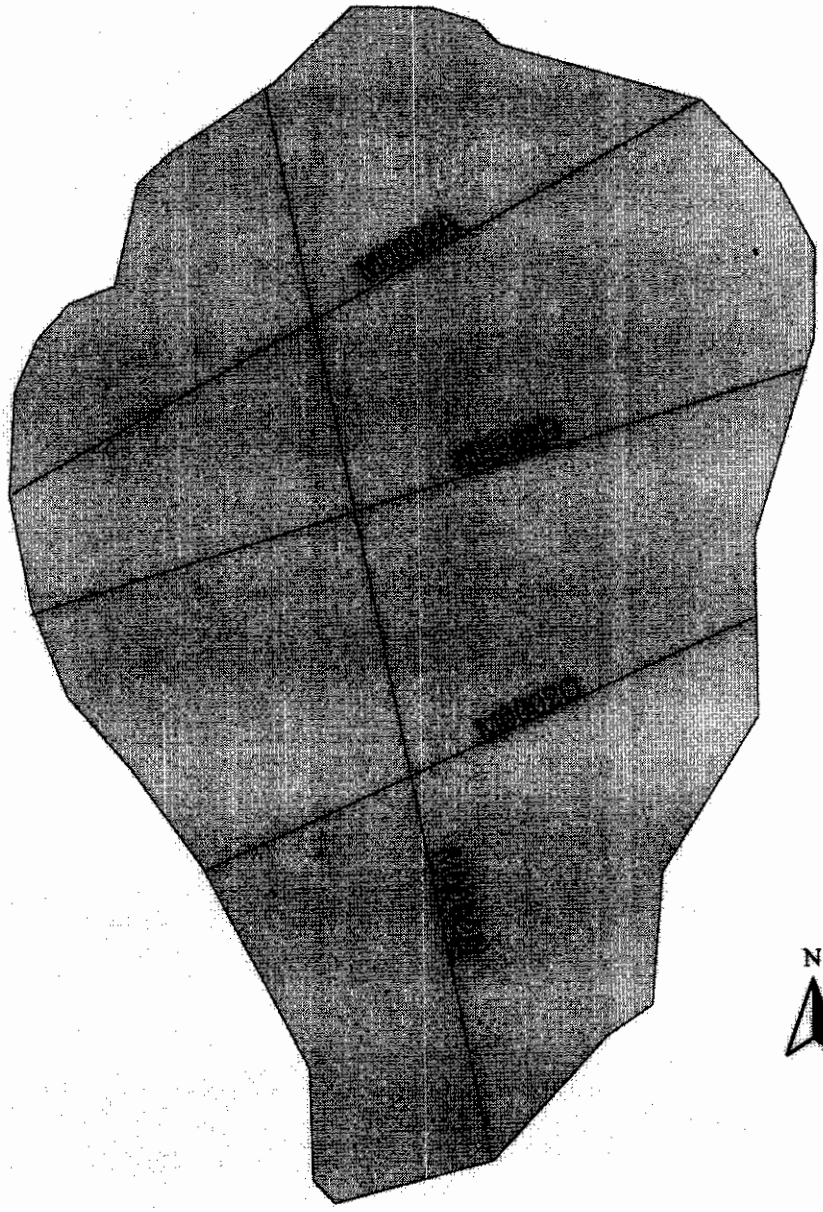
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001L
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001M
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0001N
Depth in Feet
0
4
8
12
0
100
200
300
400
500
600
700
Distance along Transect (feet)

M0002



Lake M0002

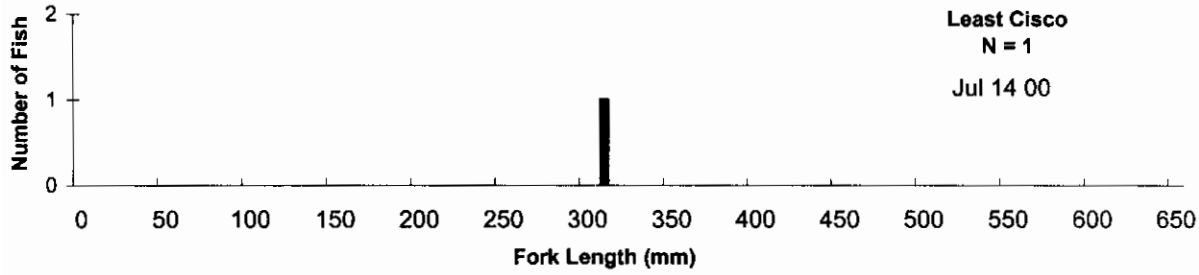
Other Names:
Location: 70°16.24N 151°49.44W
USGS Quad Sheet: Harrison Bay B-4: Sections 26/35 T11N R1E
Habitat:
Area: 21 acres
Maximum Depth: 16.1 feet
Active Outlet:
Spec. Conductance: 84 µS/cm
pH: 7.25
Calculated Volume: 35.3 million gallons
Permittable Volume: 3.0 million gallons

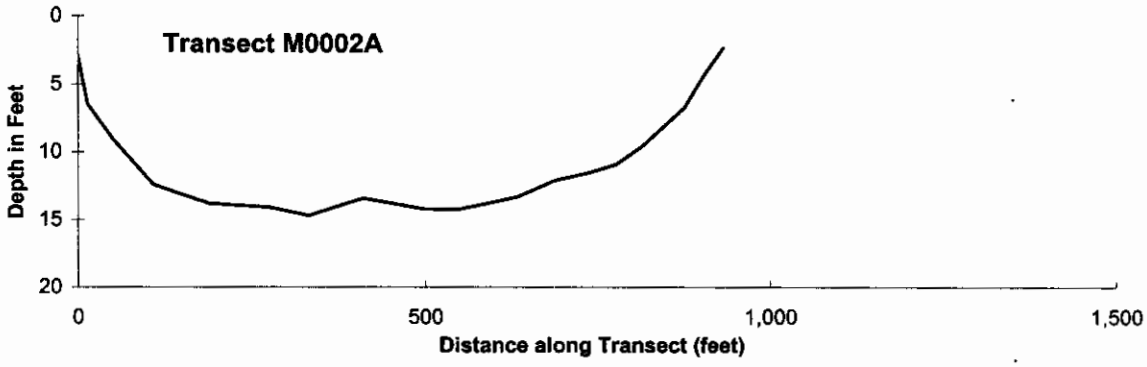
Water Quality:

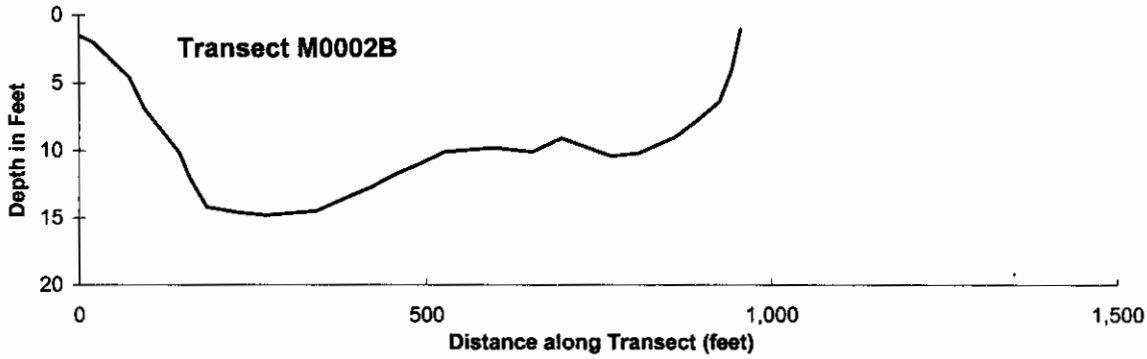
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	9.7	3.9	8.5	2.0	29	<35	this study

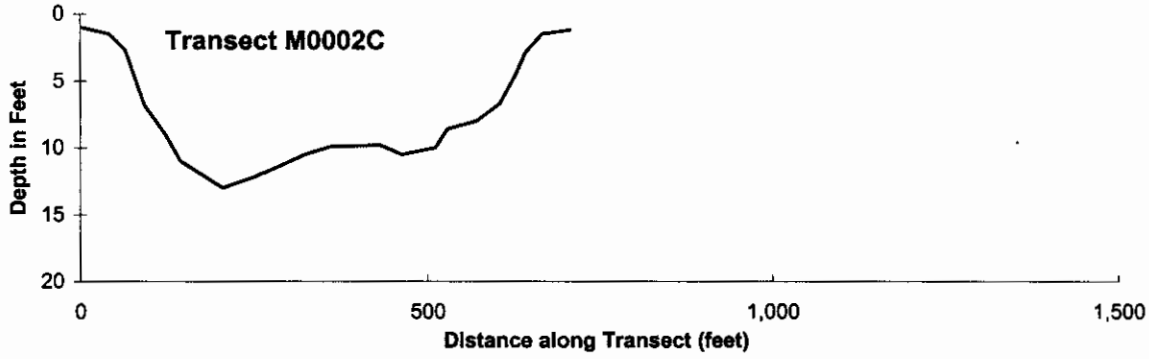
Catch Record:

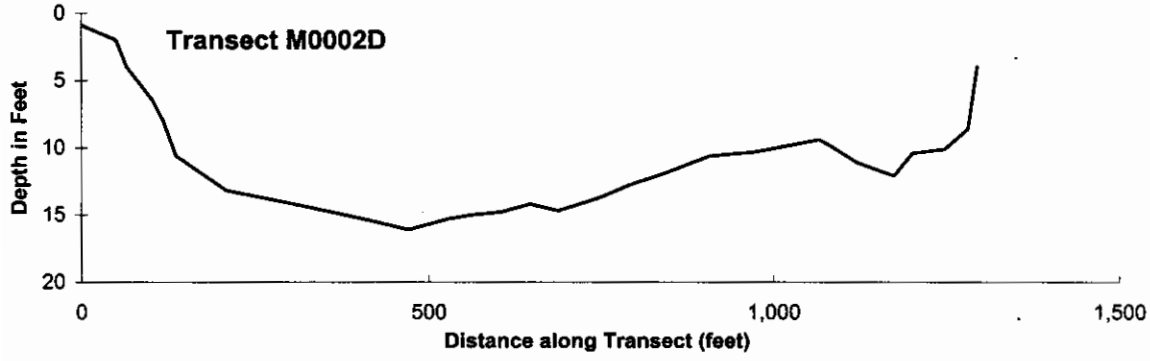
Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 13 00	4.7	None	0	
	Jul 14 00	1.8	Least cisco	1	310



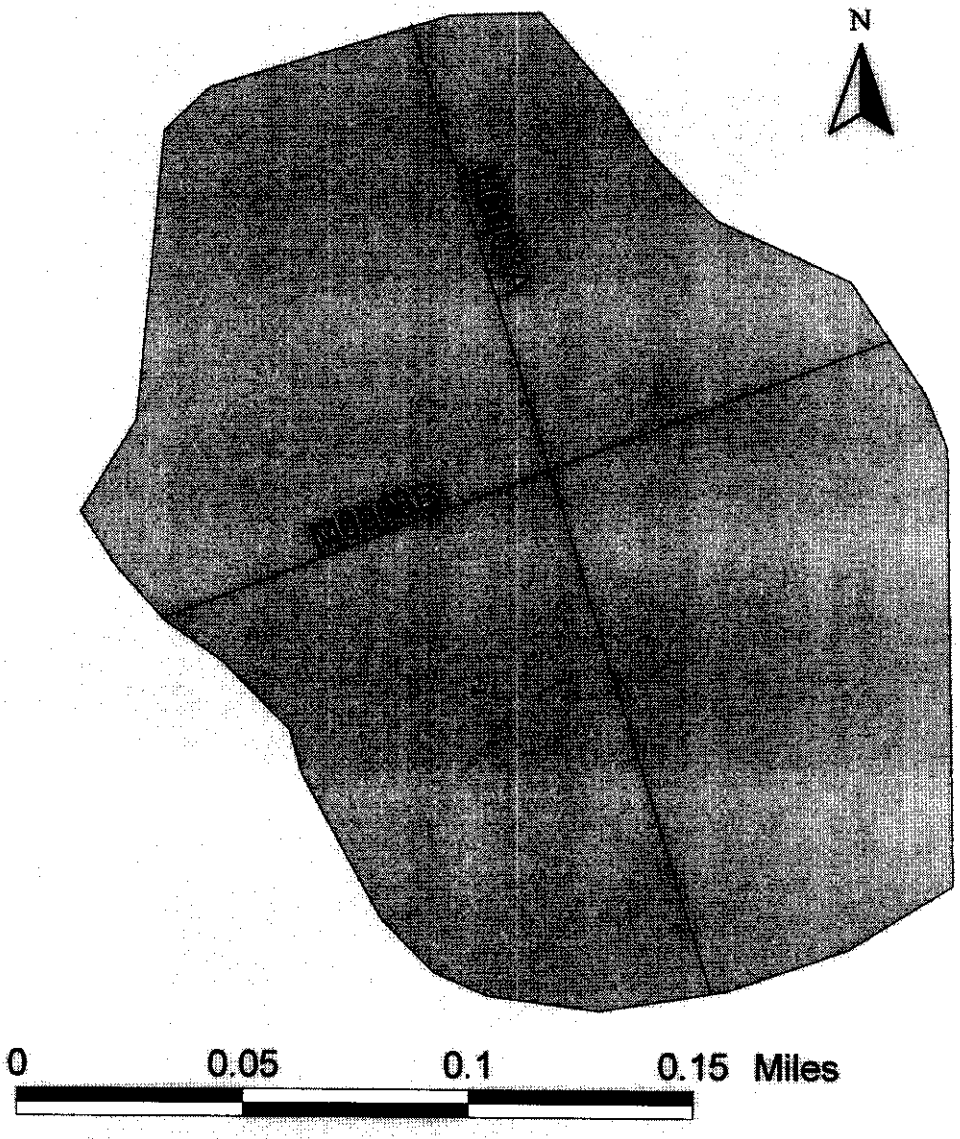

Transect M0002A
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0002B
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0002C
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0002D
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)

M0003



Lake M0003

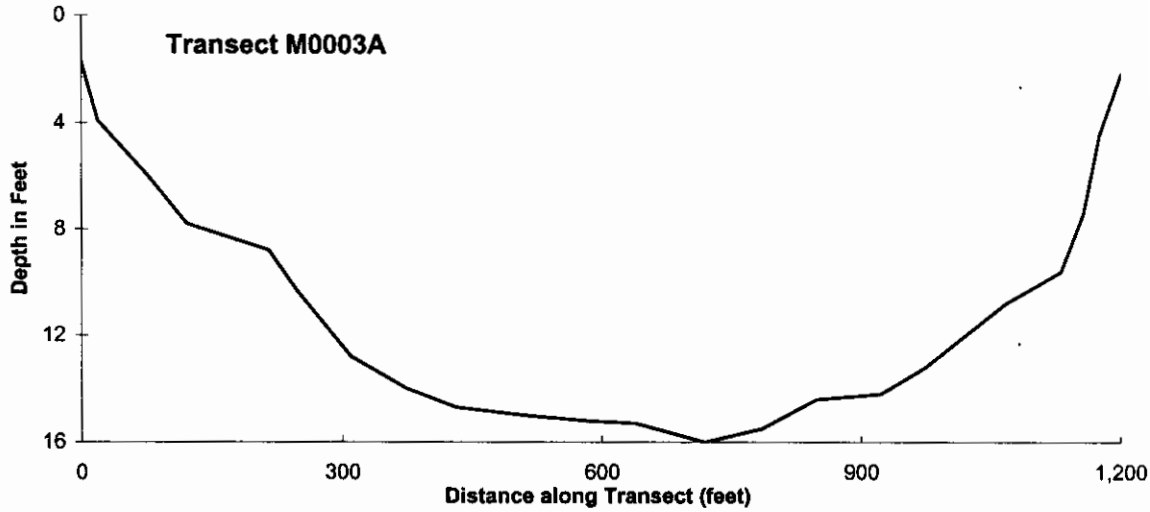
Other Names:
Location: 70°16.32N 151°48.62W
USGS Quad Sheet: Harrison Bay B-4: Sections 26/35 T11N R1E
Habitat:
Area: 20 acres
Maximum Depth: 16.0 feet
Active Outlet:
Spec. Conductance: 130 µS/cm
pH: 7.6
Calculated Volume: 34.0 million gallons
Permittable Volume: 2.9 million gallons

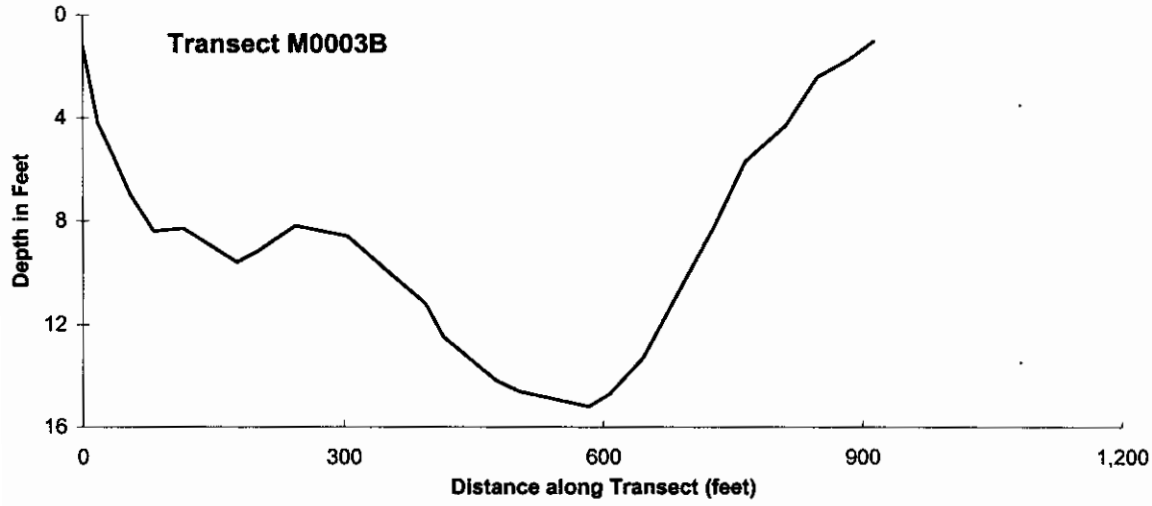
Water Quality:

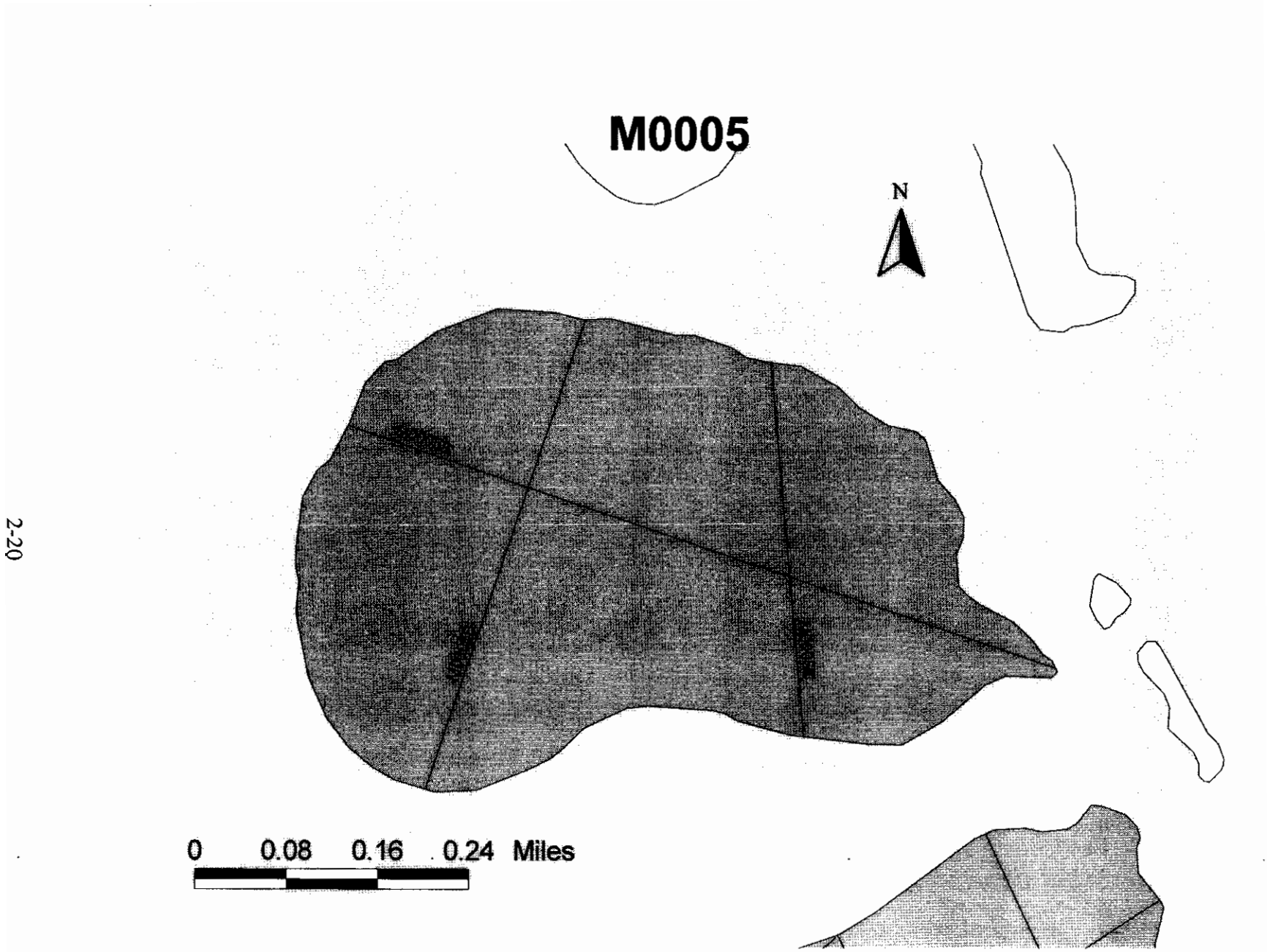
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	13.5	5.7	15.2	3.0	50	84	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 13 00	4.4	None	0
	Jul 14 00	1.5	None	0


Transect M0003A
Depth in Feet
0
4
8
12
16
0
300
600
900
1,200
Distance along Transect (feet)


Transect M0003B
Depth in Feet
0
4
8
12
16
0
300
600
900
1,200
Distance along Transect (feet)


M0005
N
0
0.08
0.16
0.24
Miles

Lake M0005

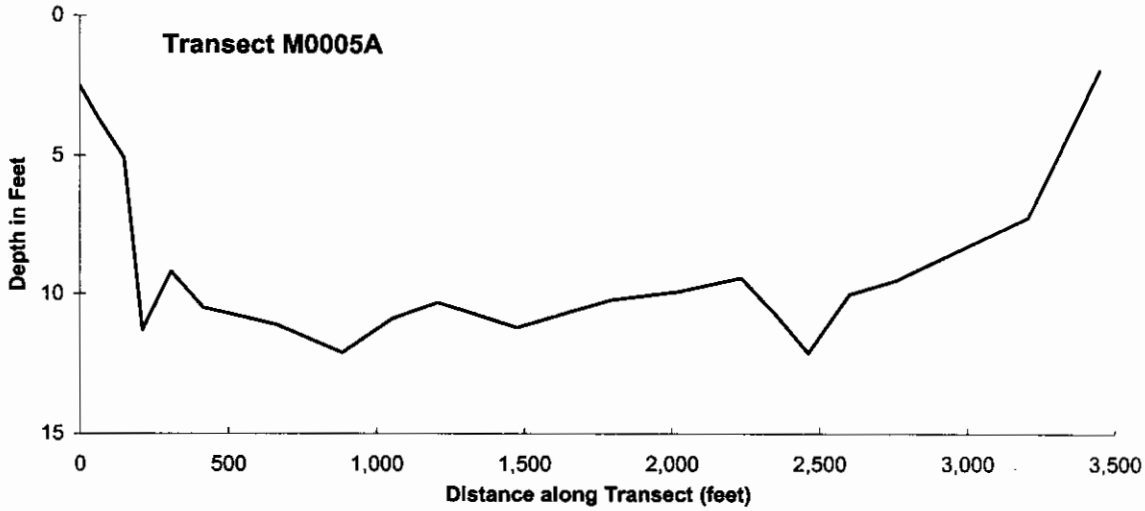
Other Names:
Location: 70°15.75N 152°02.00W
USGS Quad Sheet: Harrison Bay B-4: Section 35/36 T11N R1W
Habitat:
Area: 122 acres
Maximum Depth: 12.1 feet
Active Outlet:
Spec. Conductance: 282 µS/cm
pH: 8.1
Calculated Volume: 159.0 million gallons
Permittable Volume: 10.1 million gallons

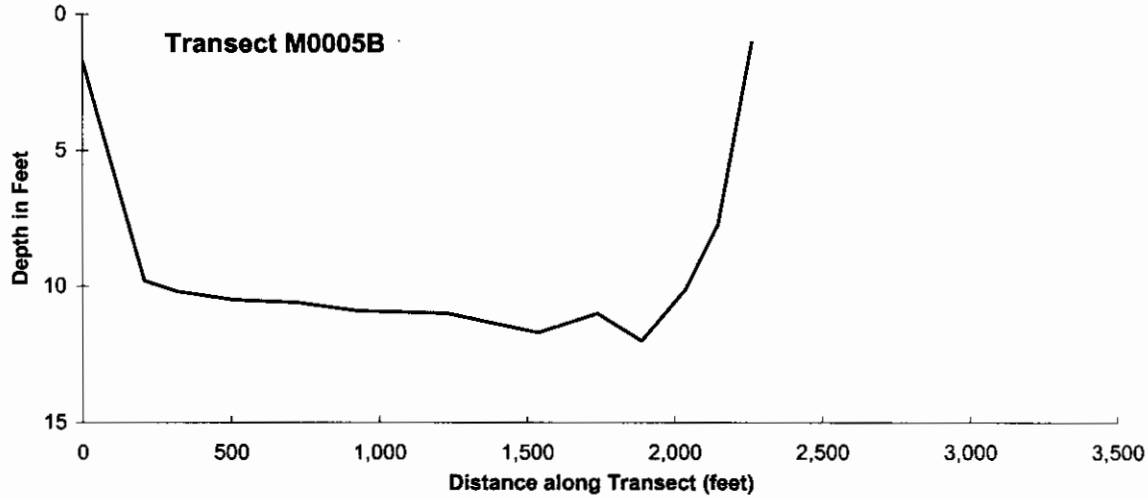
Water Quality:

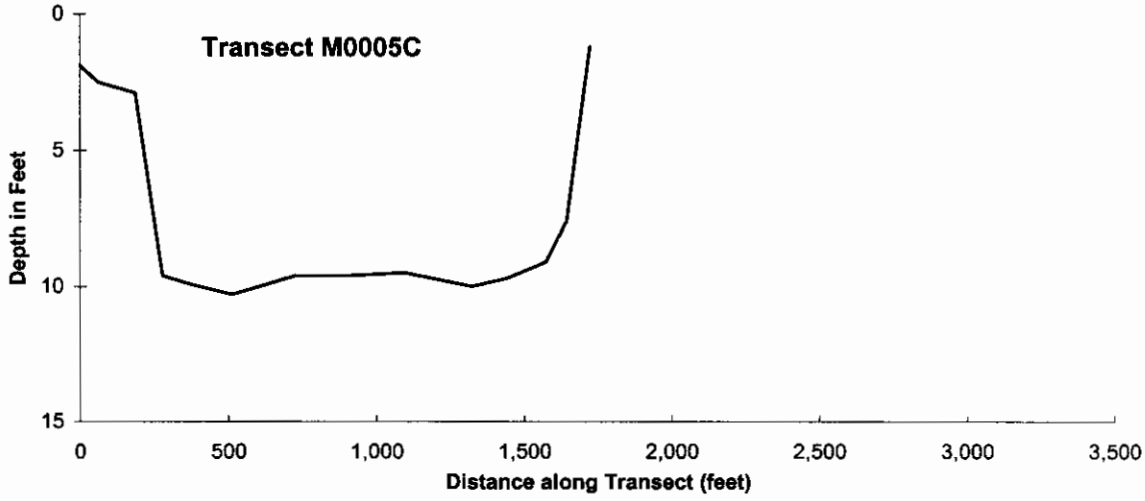
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	29.4	12.3	31.4	6.4	105	148	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 15 00	6.0	Ninespine stickleback	3	44-53


Transect M0005A
Depth in Feet
0
5
10
15
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)


Transect M0005B
Depth in Feet
0
5
10
15
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)


Transect M0005C
Depth in Feet
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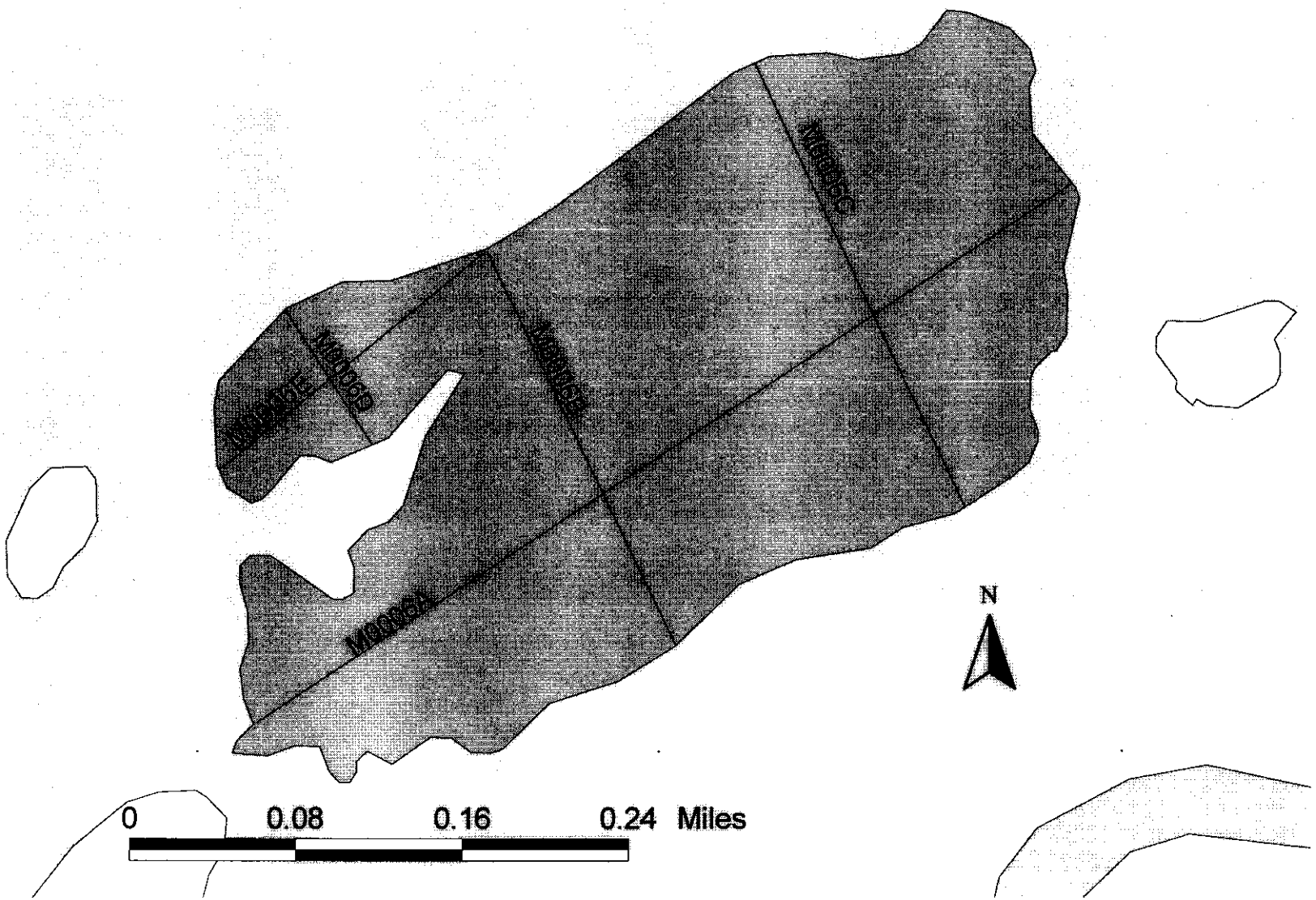
5
10
15
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)

M0006



Lake M0006

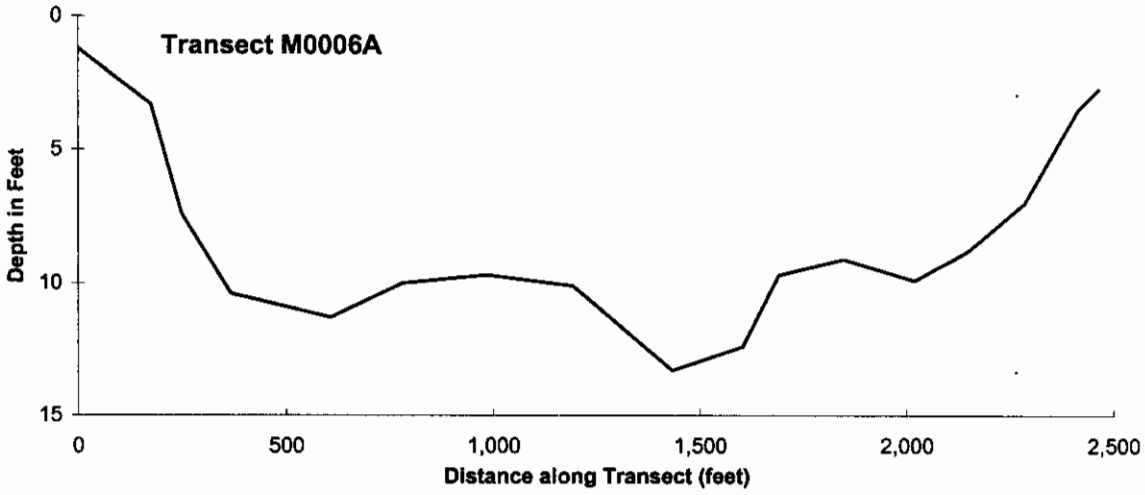
Other Names:
Location: 70°15.46N 152°01.85W
USGS Quad Sheet: Harrison Bay B-4: Section 36 T11N R1W
Habitat:
Area: 122 acres
Maximum Depth: 13.3 feet
Active Outlet:
Spec. Conductance: 223 µS/cm
pH: 8.0
Calculated Volume: 175.0 million gallons
Permittable Volume: 12.4 million gallons

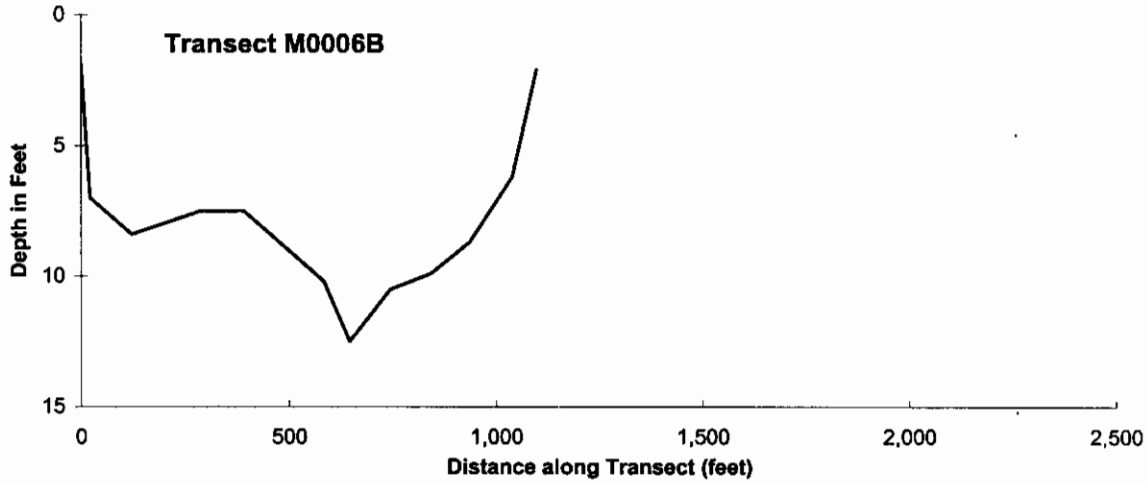
Water Quality:

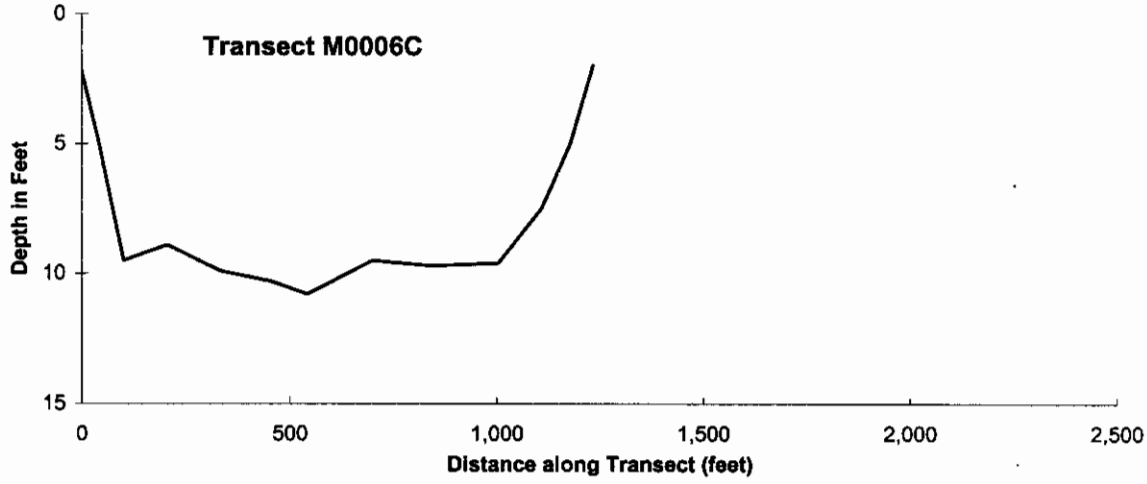
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	21.2	9.7	27.4	5.1	89	134	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 15 00	6.8	Alaska blackfish	1	111


Transect M0006A
Depth in Feet
0
5
10
15
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)


Transect M0006B
Depth in Feet
0
5
10
15
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)


Transect M0006C
Depth in Feet
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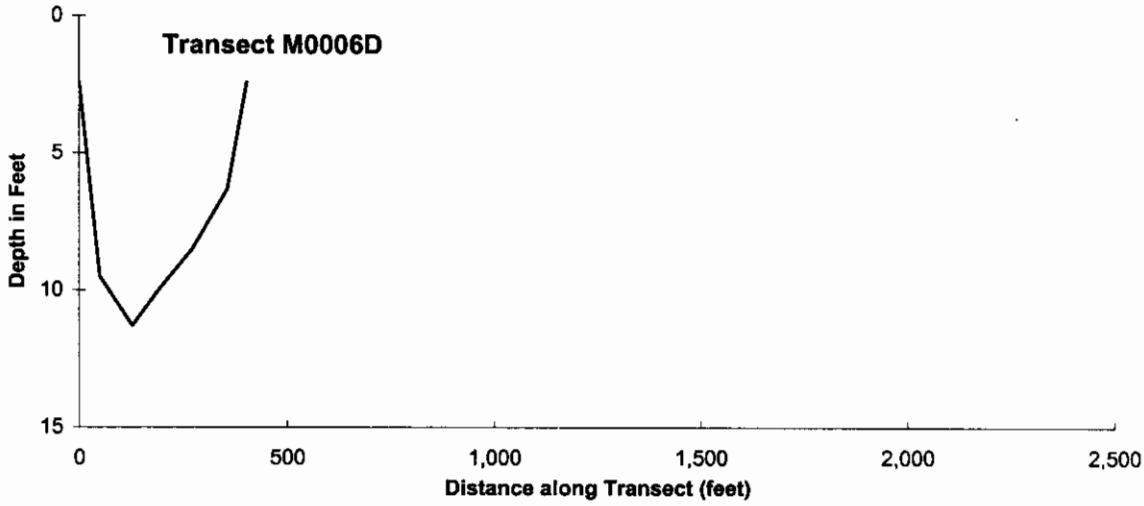
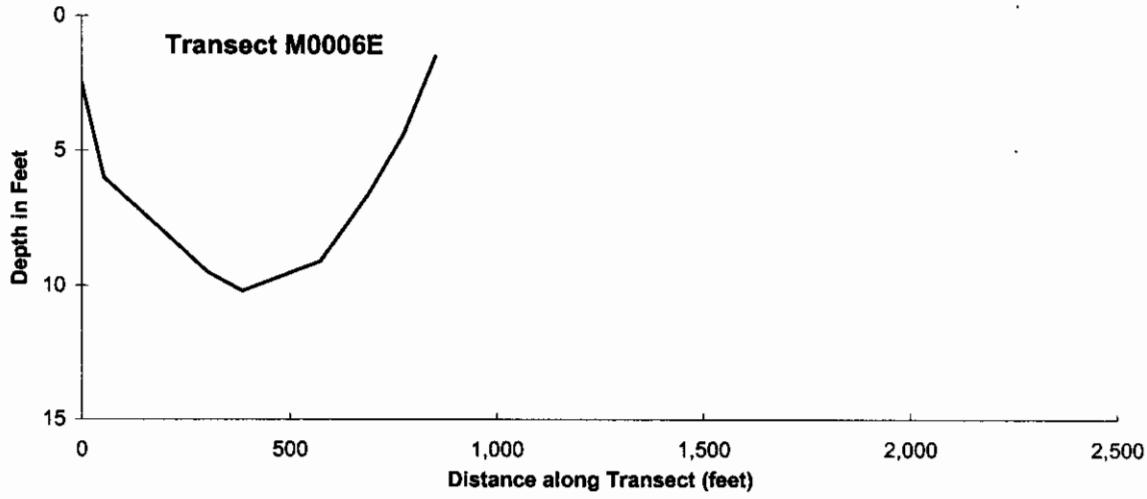
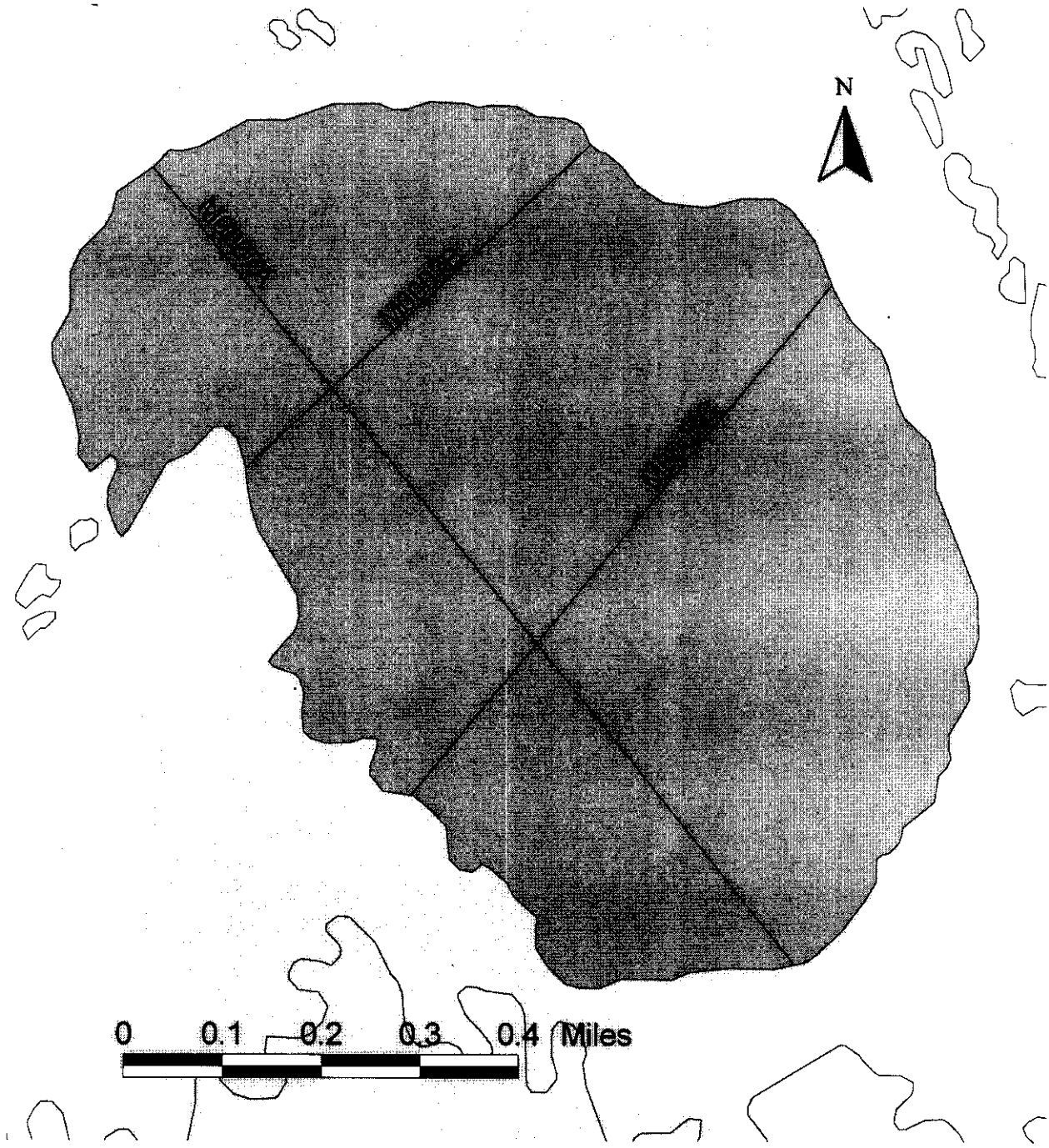
5
10
15
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)


Transect M0006D
Depth in Feet
0
5
10
15
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)


Transect M0006E
Depth in Feet
0
5
10
15
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)

M0007



Lake M0007

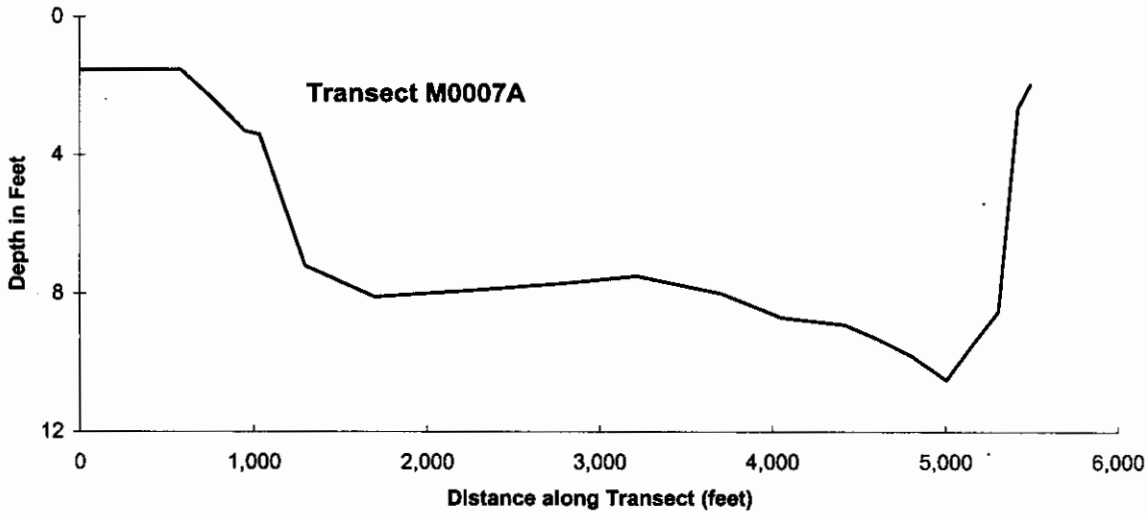
Other Names:
Location: 70°13.30'N 151°59.50'W
USGS Quad Sheet: Harrison Bay A-4: Section 18 T10N R1E
Habitat:
Area: 356 acres
Maximum Depth: 10.5 feet
Active Outlet:
Spec. Conductance: 295 µS/cm
pH: 8.15
Calculated Volume: 401.3 million gallons
Permittable Volume: No fish concern

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
2000	32.0	11.9	35.5	5.5	111	164	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 16 00	8.7	None	0


Transect M0007A
Depth in Feet
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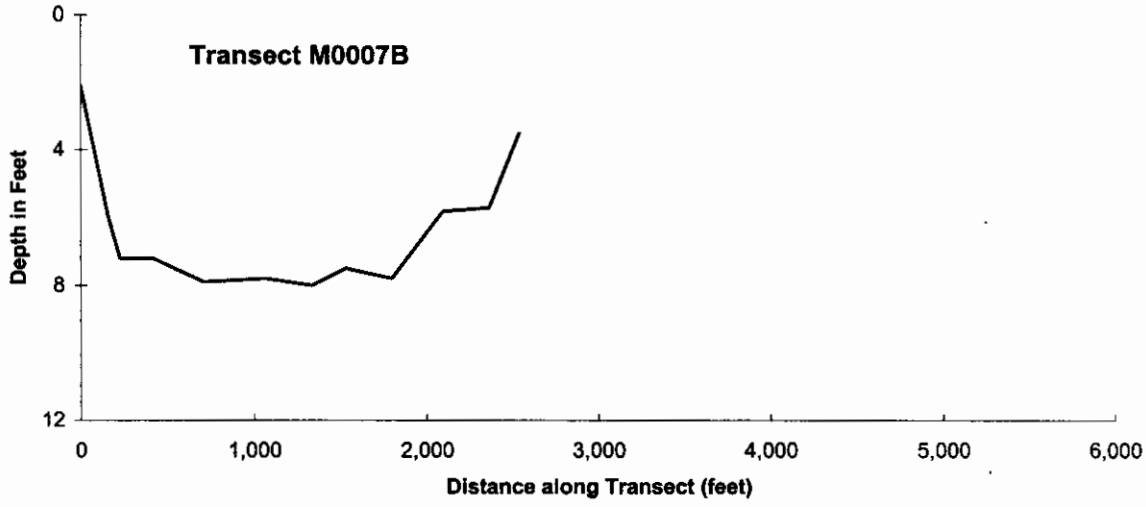
8
12
0
1,000
2,000
3,000
4,000
5,000
6,000
Distance along Transect (feet)


Transect M0007B
Depth in Feet
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8
12
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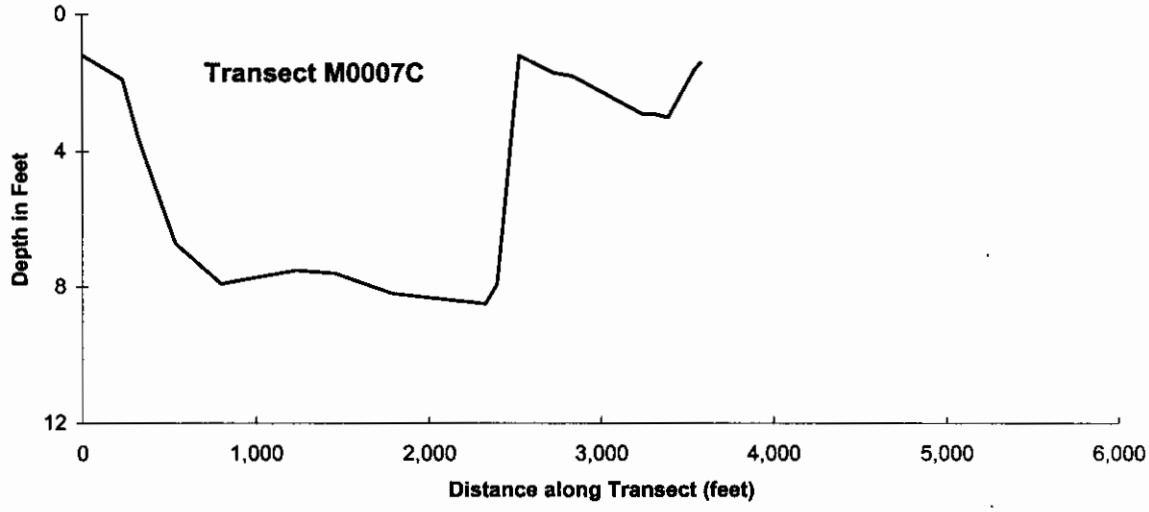
1,000
2,000
3,000
4,000
5,000
6,000
Distance along Transect (feet)


Transect M0007C
Depth in Feet
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4
8
12
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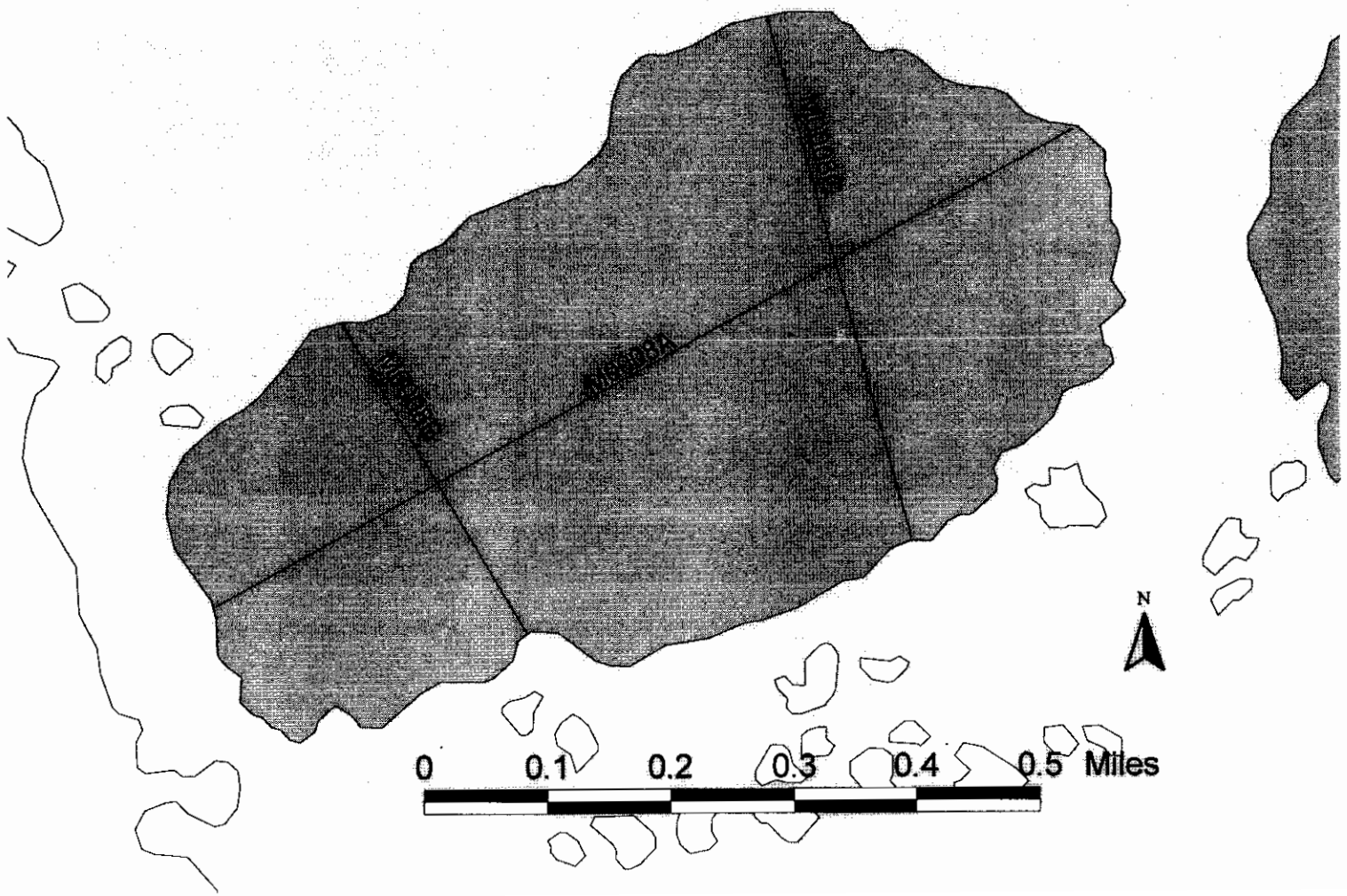
1,000
2,000
3,000
4,000
5,000
6,000
Distance along Transect (feet)

M0008



Lake M0008

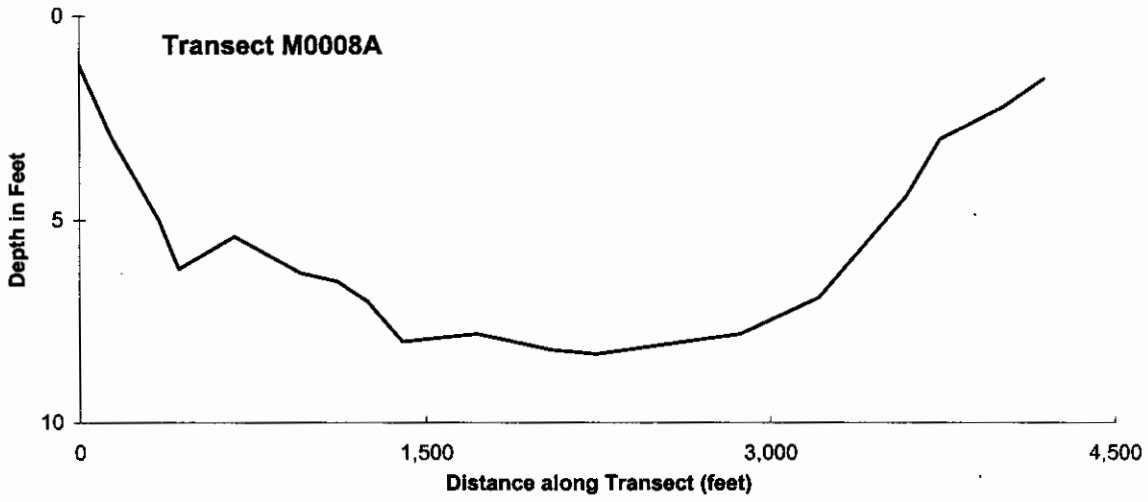
Other Names:
Location: 70°13.40'N 152°02.20'W
USGS Quad Sheet: Harrison Bay A-4: Section 13 T10N R1W
Habitat:
Area: 172 acres
Maximum Depth: 9.1 feet
Active Outlet:
Spec. Conductance: 125 µS/cm
pH: 7.8
Calculated Volume: 168.6 million gallons
Permittable Volume: No fish concern

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
2000	13.5	5.9	14.1	2.7	46	76	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 16 00	5.2	None	0


Transect M0008A
Depth in Feet
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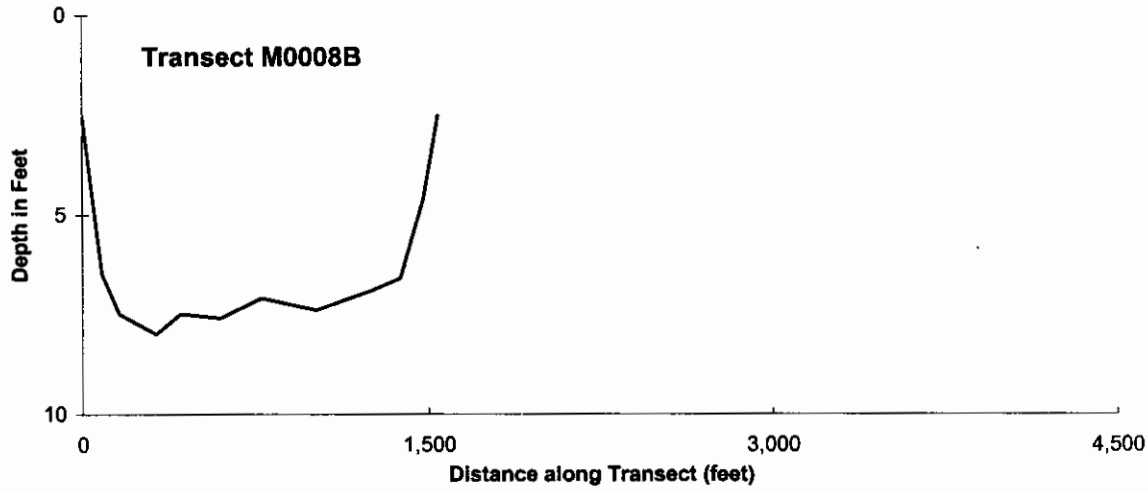
5
10
0
1,500
3,000
4,500
Distance along Transect (feet)


Transect M0008B
Depth in Feet
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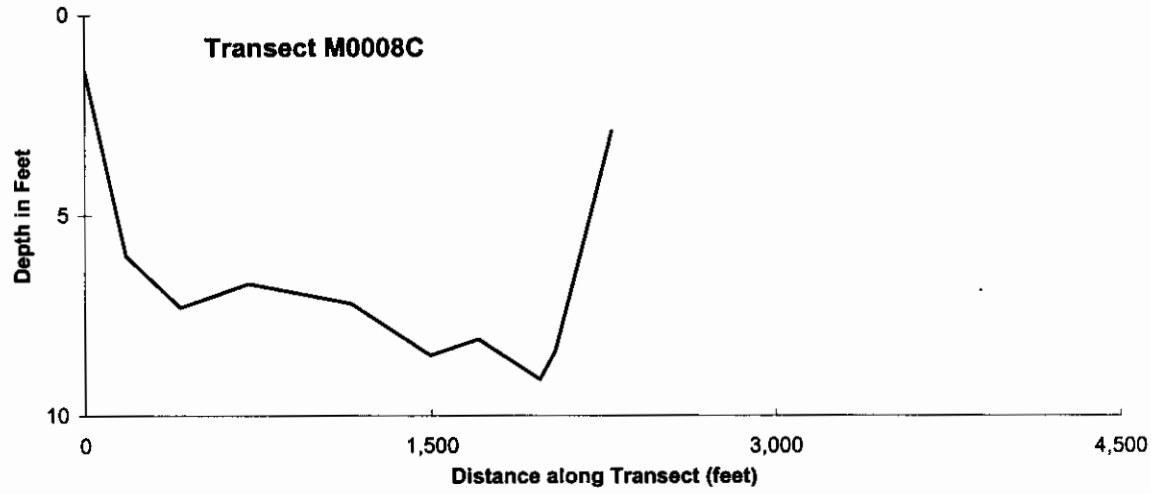
5
10
0
1,500
3,000
4,500
Distance along Transect (feet)


Transect M0008C
Depth in Feet
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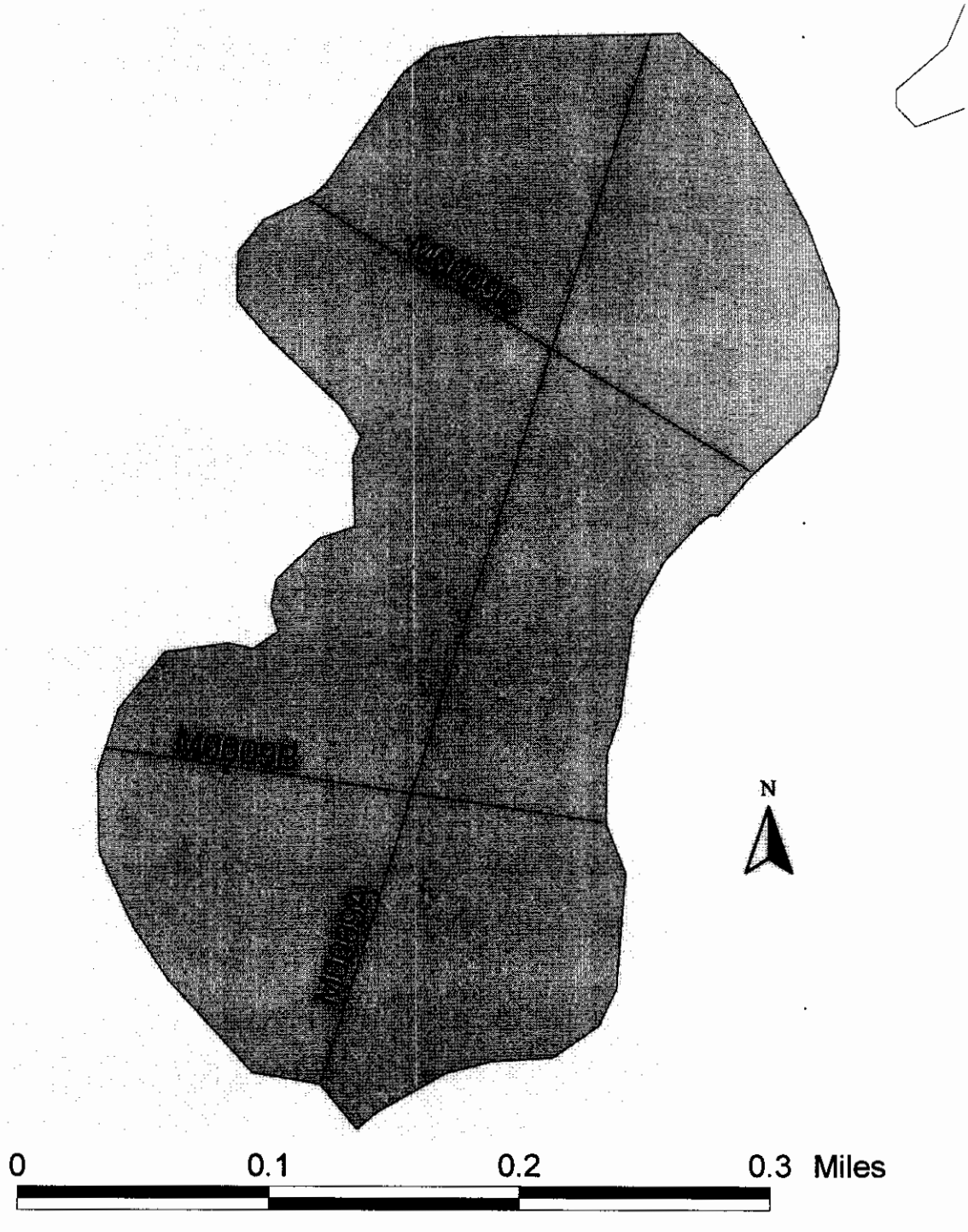
5
10
0
1,500
3,000
4,500
Distance along Transect (feet)

M0009



Lake M0009

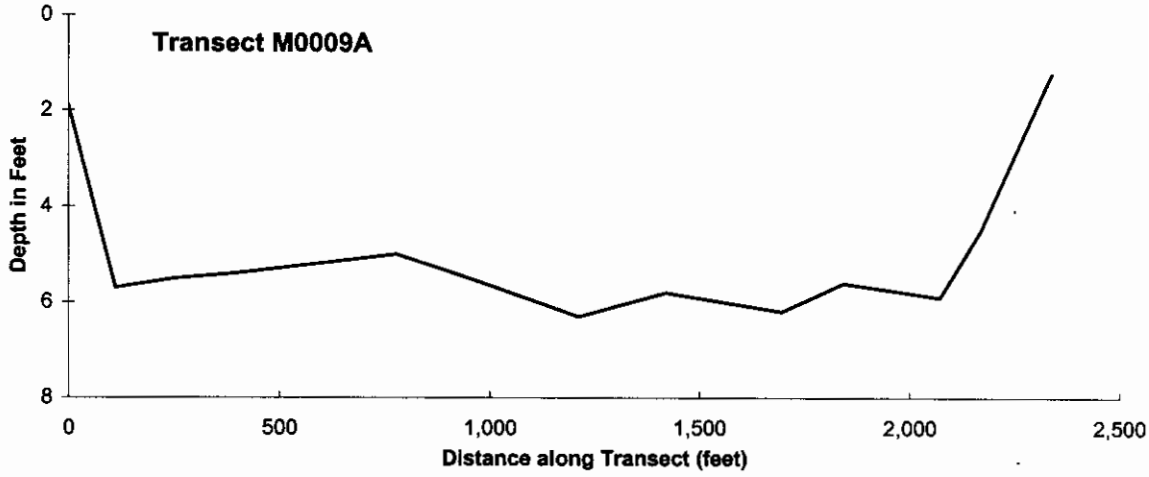
Other Names:
Location: 70°16.70N 151°49.80W
USGS Quad Sheet: Harrison Bay B-4: Section 26 T11N R1E
Habitat:
Area: 49 acres
Maximum Depth: 6.6 feet
Active Outlet:
Spec. Conductance: 69 µS/cm
pH: 7.6
Calculated Volume: 34.5 million gallons
Permittable Volume: No fish concern

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
2000	7.7	3.1	7.6	1.5	25	<35	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 17 00	6.8	None	0


Transect M0009A
Depth in Feet
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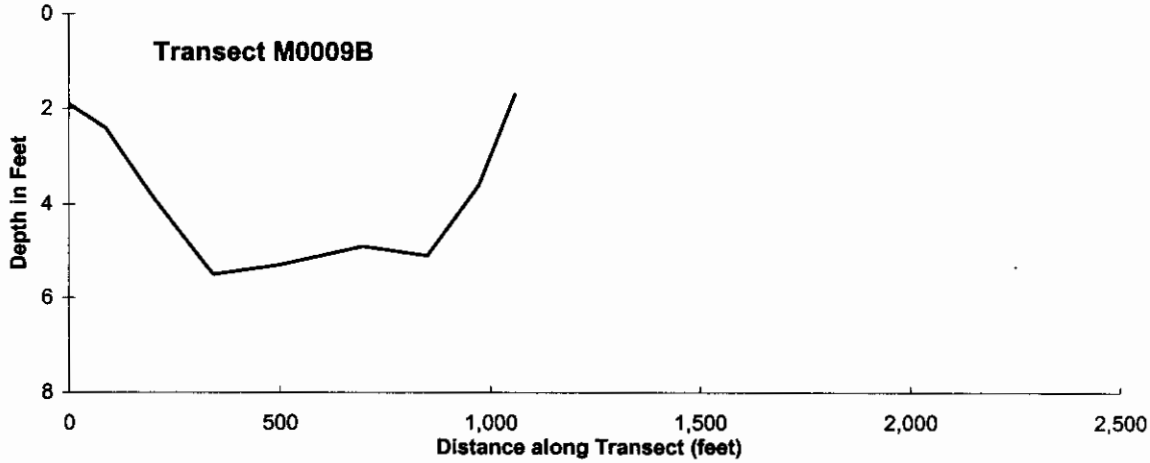
2
4
6
8
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)


Transect M0009B
Depth in Feet
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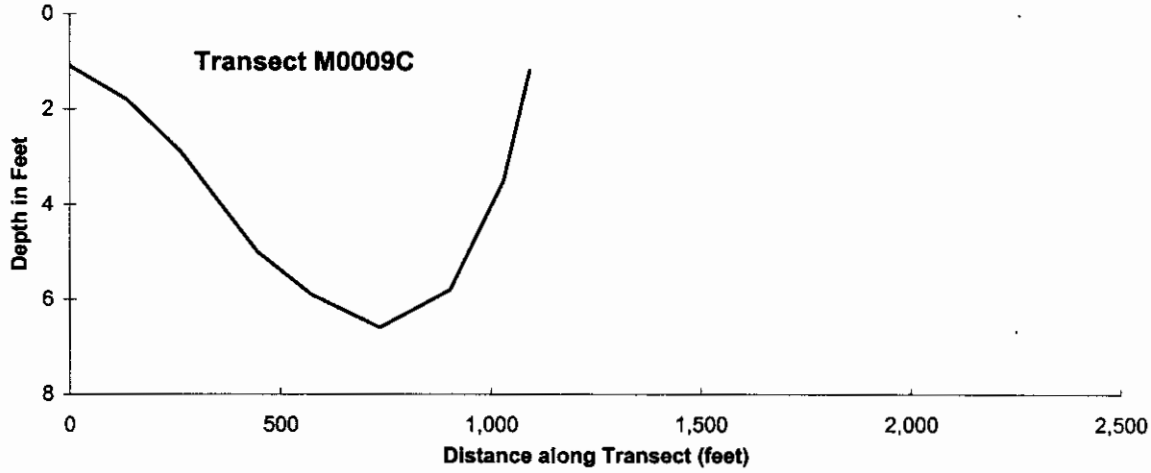
2
4
6
8
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)


Transect M0009C
Depth in Feet
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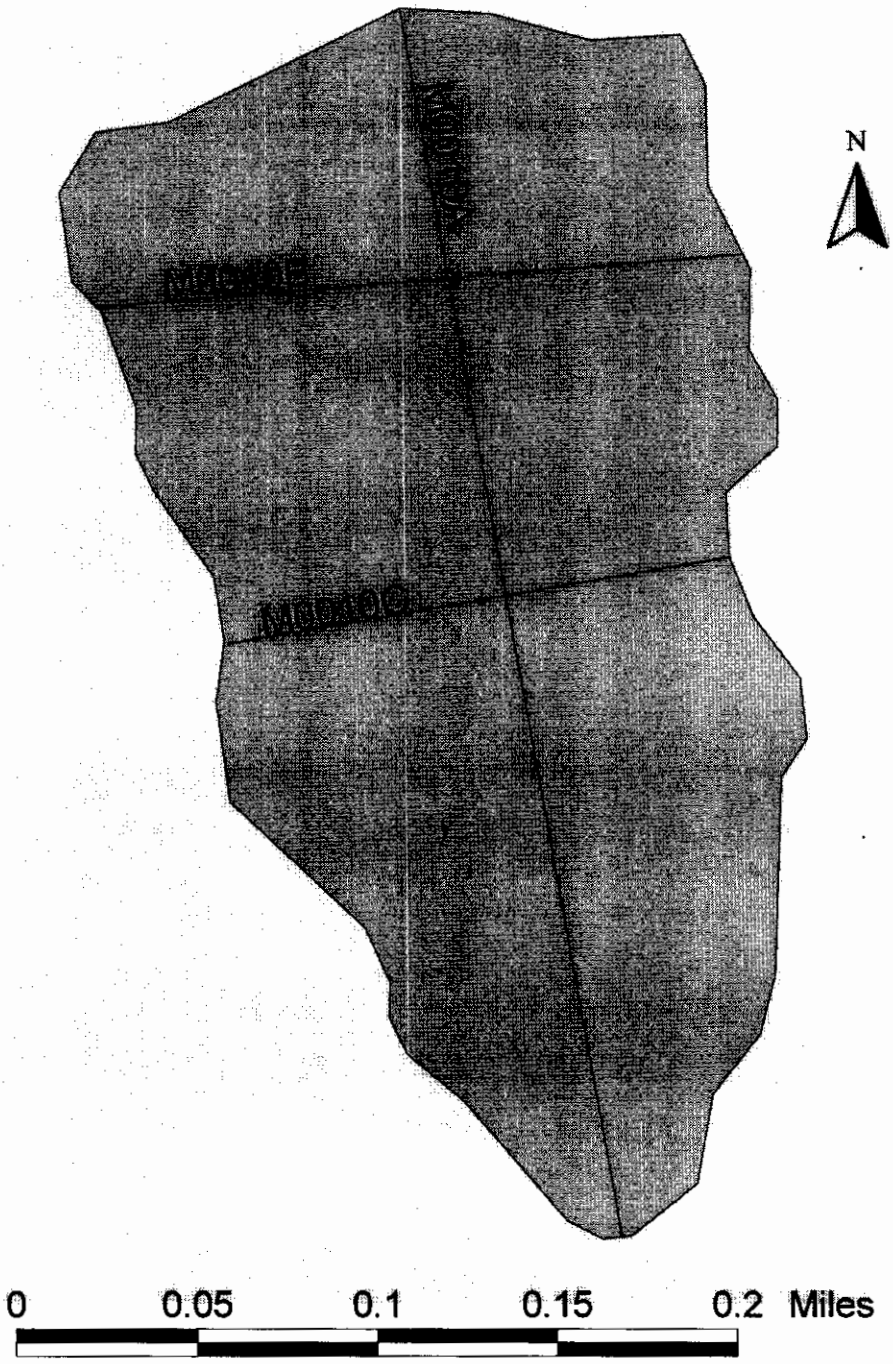
2
4
6
8
0
500
1,000
1,500
2,000
2,500
Distance along Transect (feet)

M0010



Lake M0010

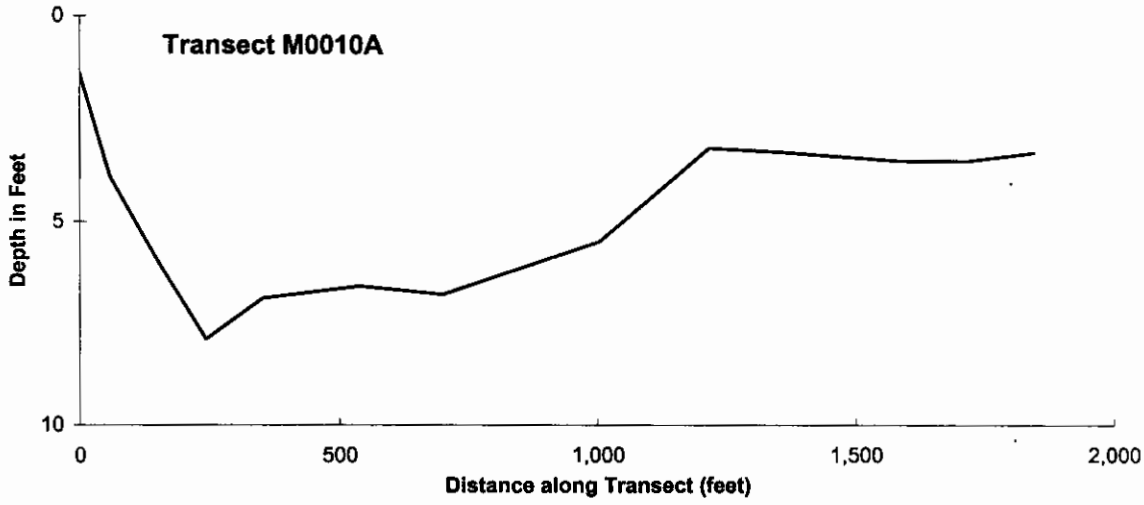
Other Names:
Location: 70°16.60N 151°48.85W
USGS Quad Sheet: Harrison Bay B-4: Section 26 T11N R1E
Habitat:
Area: 30 acres
Maximum Depth: 8.1 feet
Active Outlet:
Spec. Conductance: 150 µS/cm
pH: 8
Calculated Volume: 25.9 million gallons
Permittable Volume: No fish concern

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
2000	14.2	6.2	17.2	3.7	58	88	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 17 00	8.0	None	0


Transect M0010A
Depth in Feet
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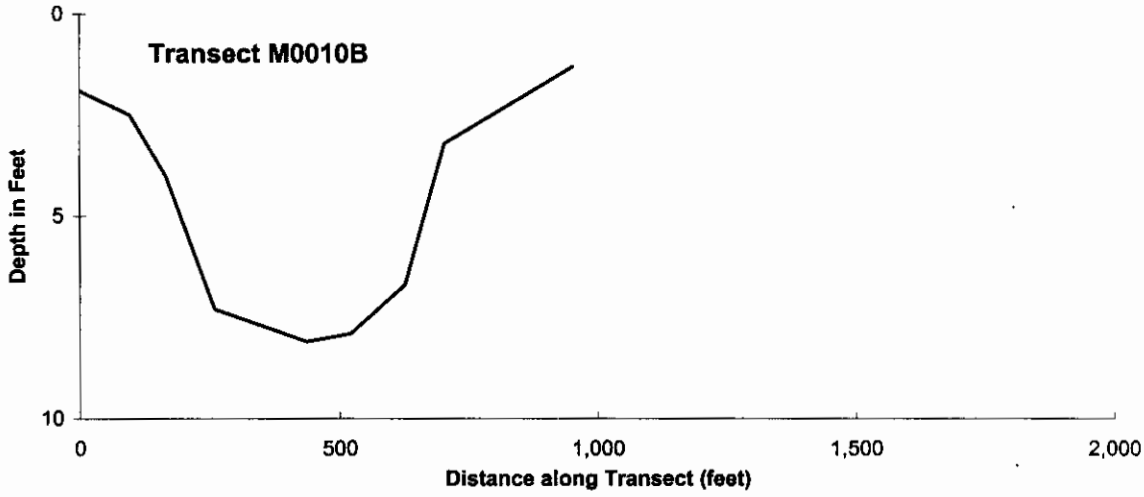
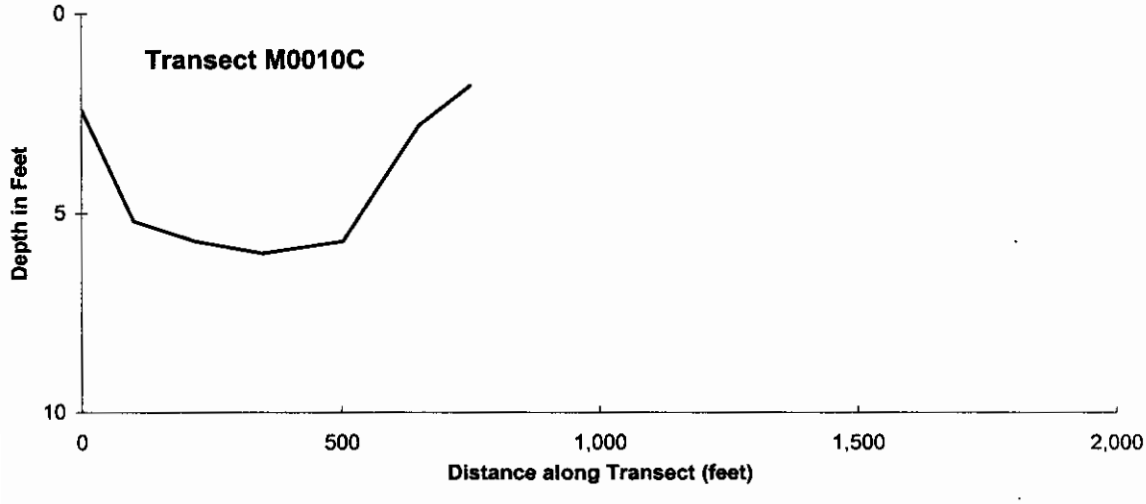
5
10
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0010B
Depth in Feet
0
5
10
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0010C
Depth in Feet
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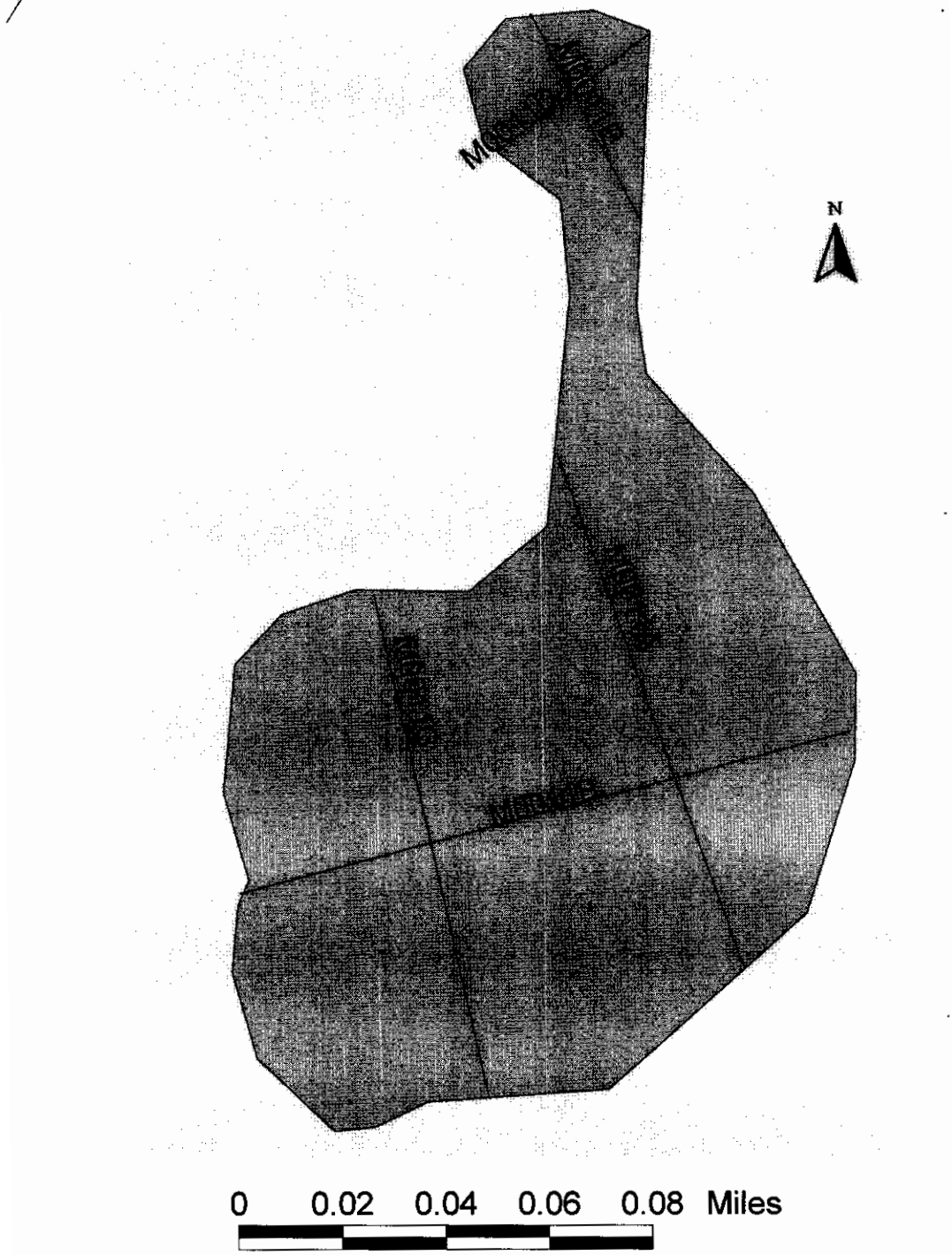
5
10
0
500
1,000
1,500
2,000
Distance along Transect (feet)

M0011



Lake M0011

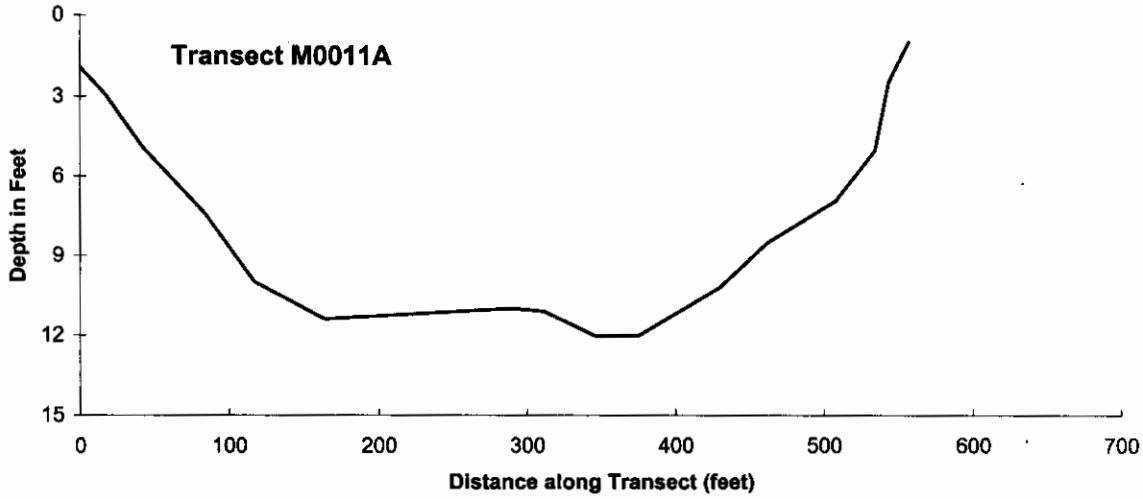
Other Names:
Location: 70°11.31N 151°56.70W
USGS Quad Sheet: Harrison Bay A-4: Section 29 T10N R1E
Habitat:
Area: 9 acres
Maximum Depth: 14.1 feet
Active Outlet:
Spec. Conductance: 135 µS/cm
pH: 8.0
Calculated Volume: 13.3 million gallons
Permittable Volume: No fish concern

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
2000	10.9	5.6	16.5	3.2	54	66	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 19 00	10.8	None	0
Minnow Traps	Jul 19 00	9.8	Ninespine stickleback	19


Transect M0011A
Depth in Feet
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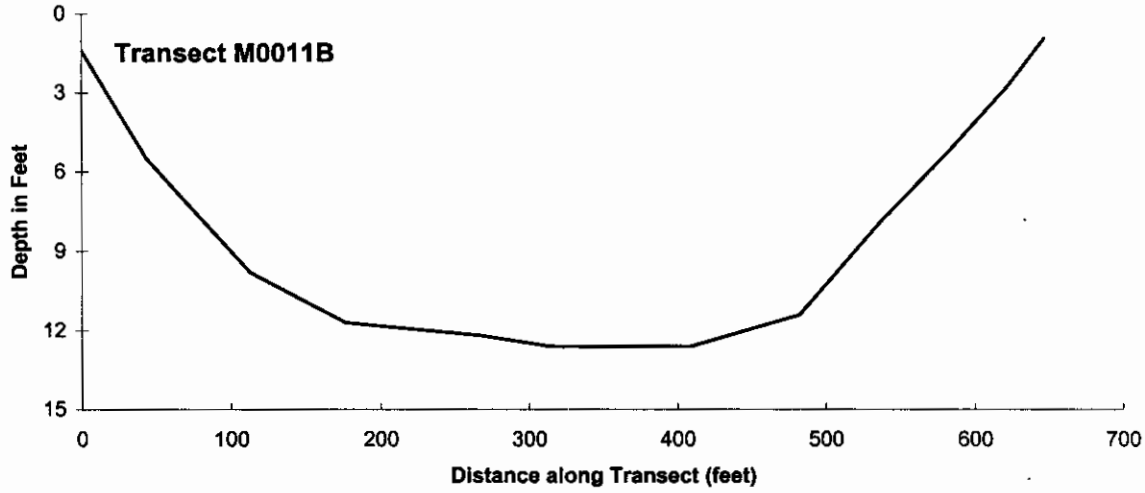
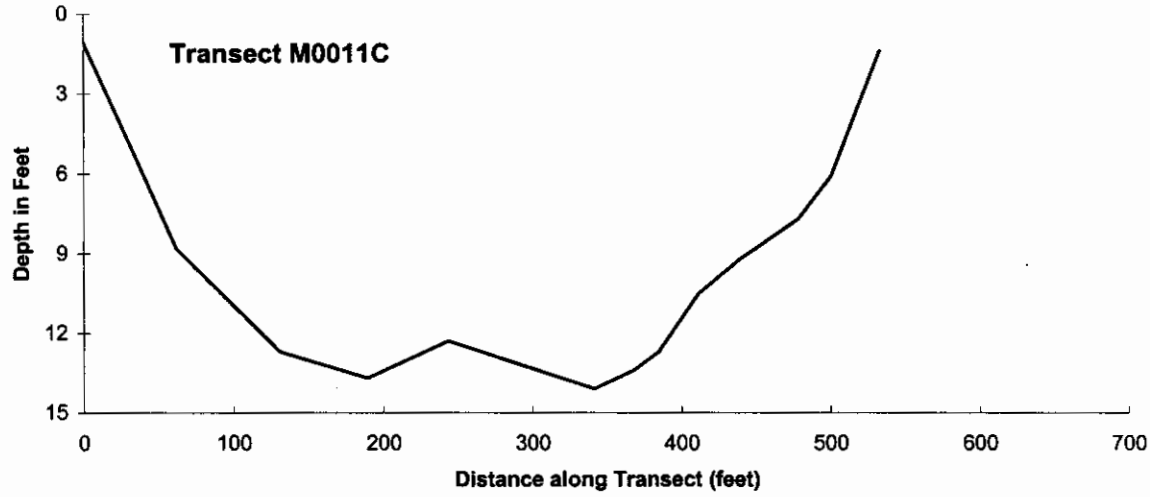
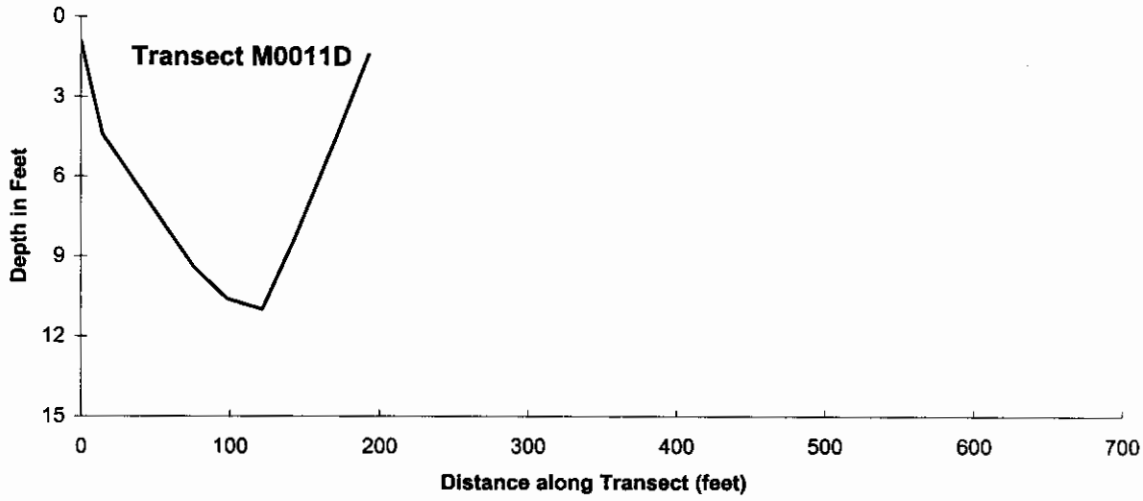
3
6
9
12
15
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0011B
Depth in Feet
0
3
6
9
12
15
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0011C
Depth in Feet
0
3
6
9
12
15
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0011D
Depth in Feet
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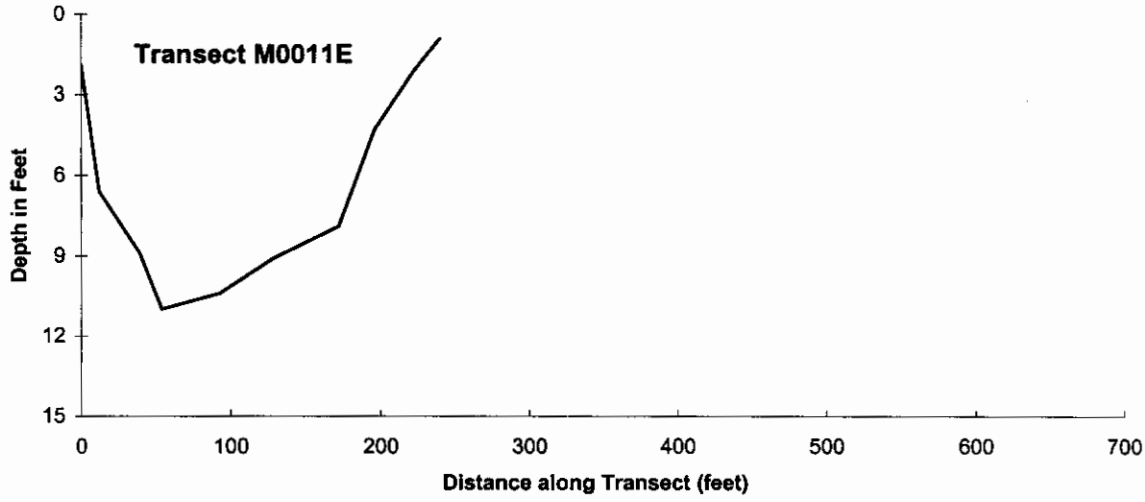
3
6
9
12
15
0
100
200
300
400
500
600
700
Distance along Transect (feet)


Transect M0011E
Depth in Feet
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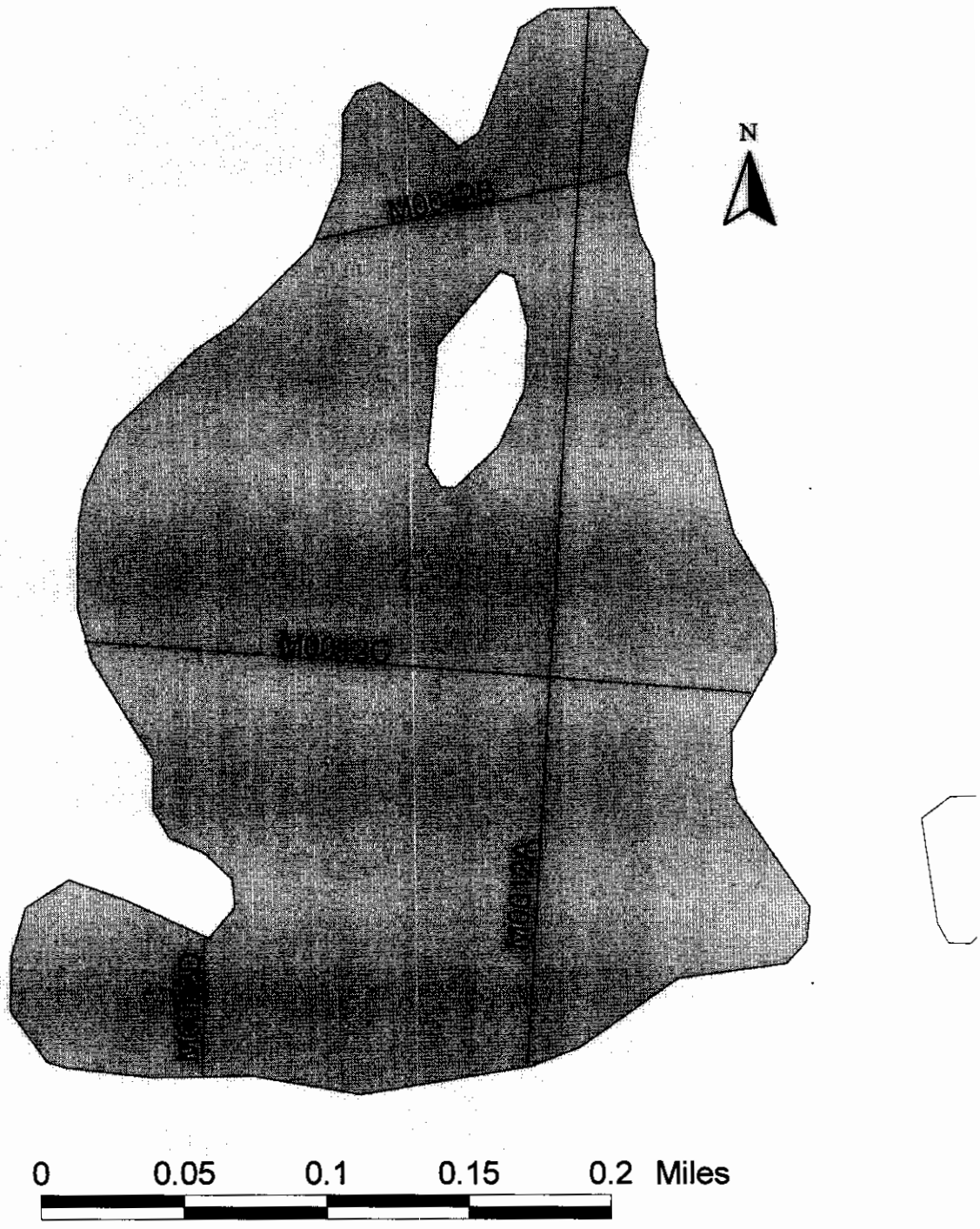
3
6
9
12
15
0
100
200
300
400
500
600
700
Distance along Transect (feet)

M0012



Lake M0012

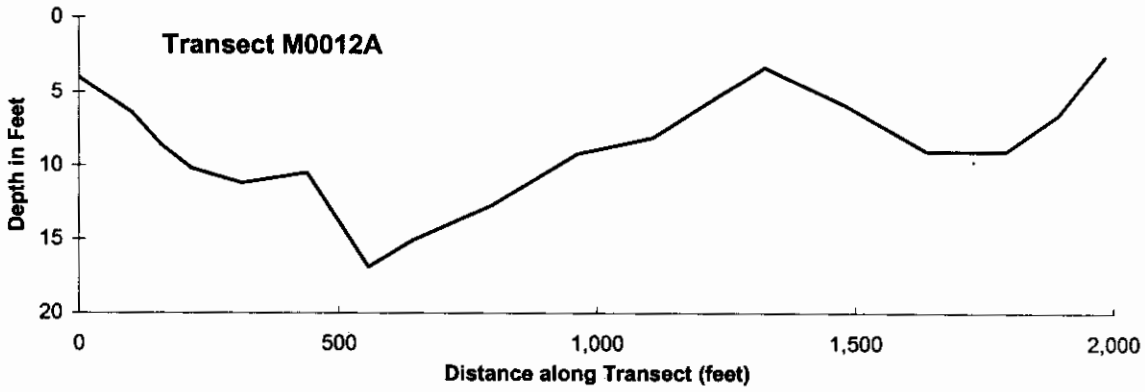
Other Names:
Location: 70°09.80N 152°02.49W
USGS Quad Sheet: Harrison Bay A-4: Section 1 of T9N R1W
Habitat:
Area: 43 acres
Maximum Depth: 17.9 feet
Active Outlet:
Spec. Conductance: 208 µS/cm
pH: 8.3
Calculated Volume: 81.9 million gallons
Permittable Volume: No fish concern

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
2000	19.7	9.9	24.7	4.1	79	140	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 20 00	10.2	None	0
Minnow Traps	Jul 20 00	8.5	None	0


Transect M0012A
Depth in Feet
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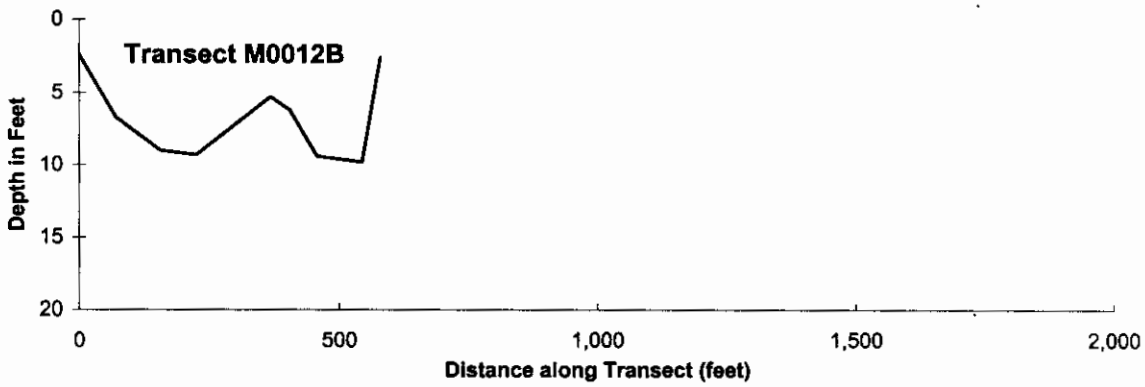
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0012B
Depth in Feet
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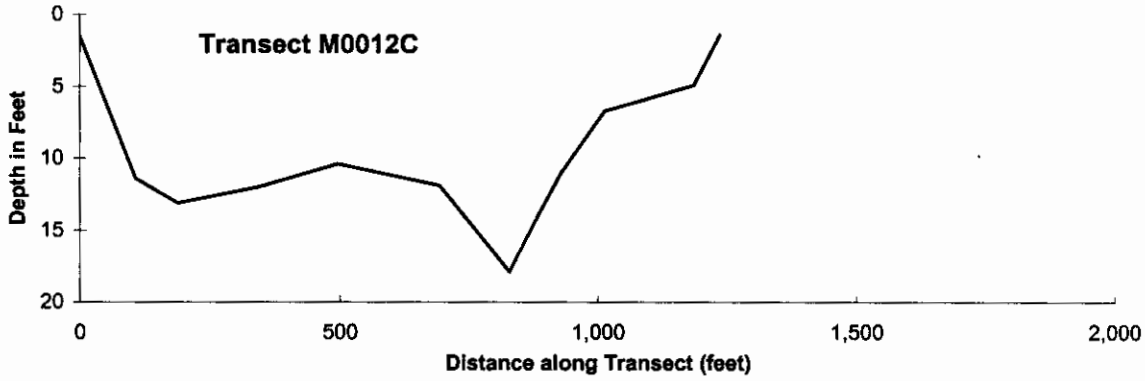
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0012C
Depth in Feet
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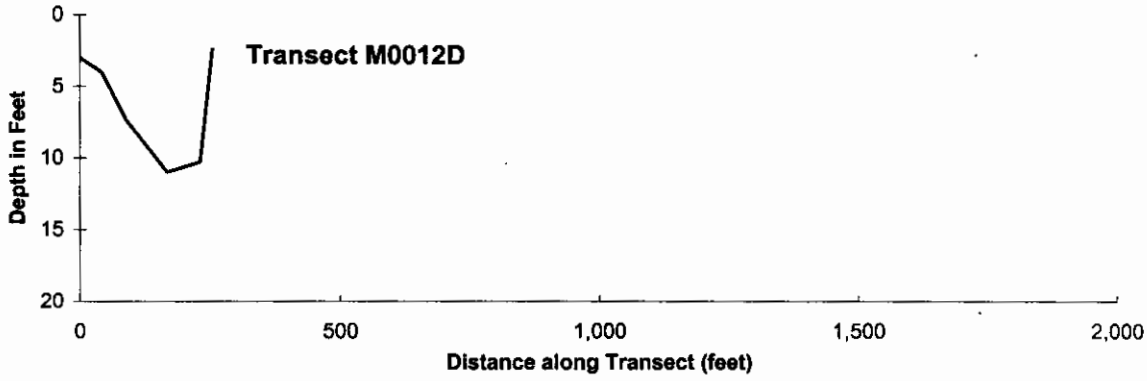
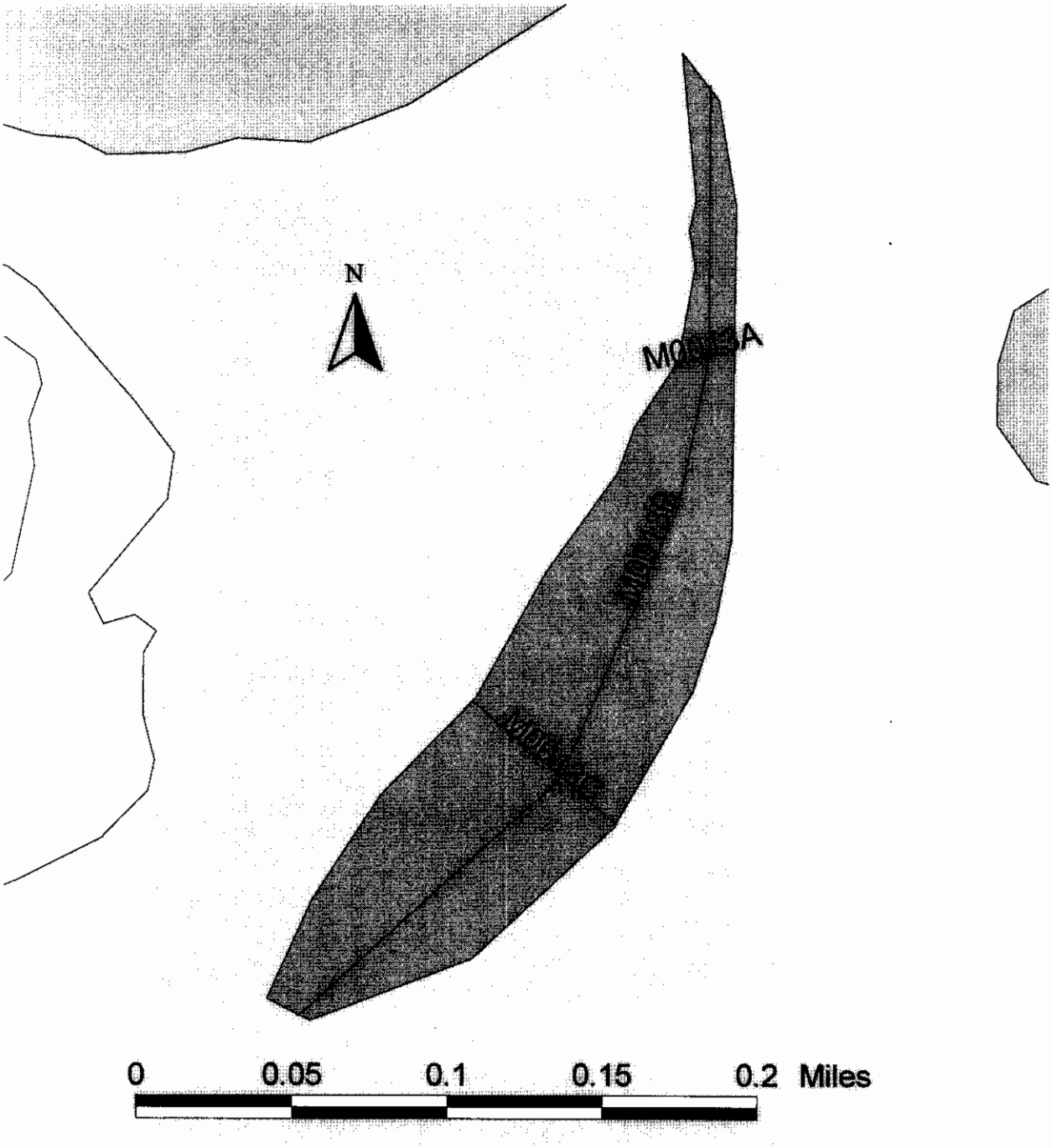
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0012D
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)

M0013



Lake M0013

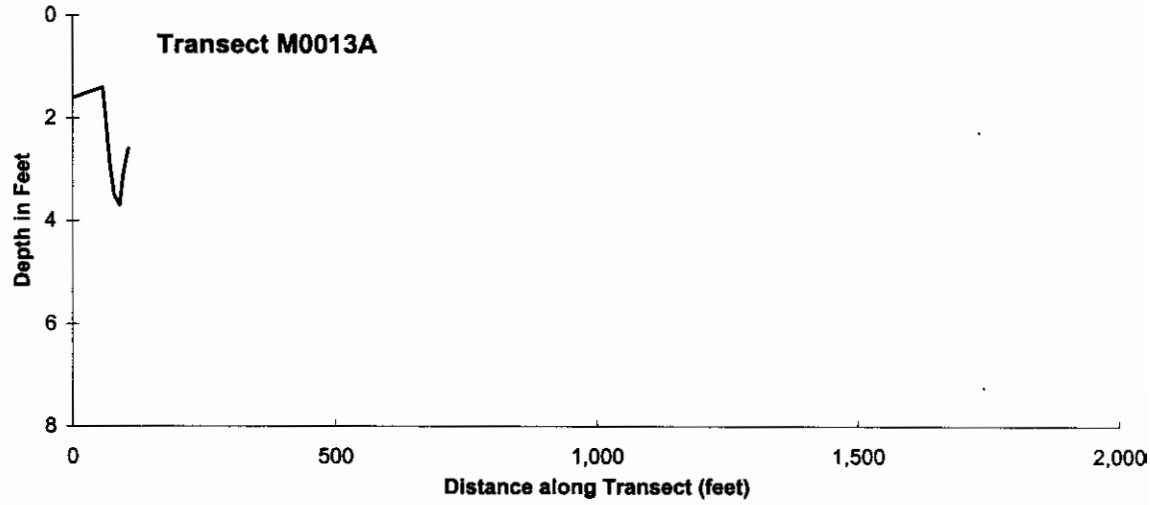
Other Names:
Location: 70°09.60N 152°03.18W
USGS Quad Sheet: Harrison Bay A-4: Section 2 of T9N R1W
Habitat:
Area: 9 acres
Maximum Depth: 6.1 feet
Active Outlet:
Spec. Conductance: 192 µS/cm
pH: 8.6
Calculated Volume: 5.7 million gallons
Permittable Volume: No fish concern

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
2000	8.2	7.2	28.9	3.5	87	136	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 20 00	10.0	None	0
Minnow Traps	Jul 20 00	8.5	None	0


Transect M0013A
Depth in Feet
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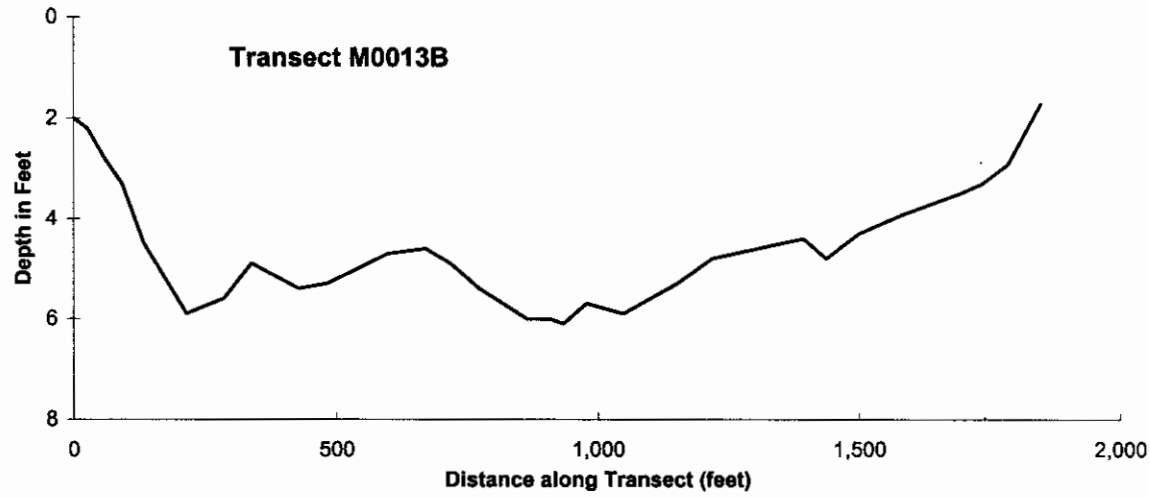
2
4
6
8
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0013B
Depth in Feet
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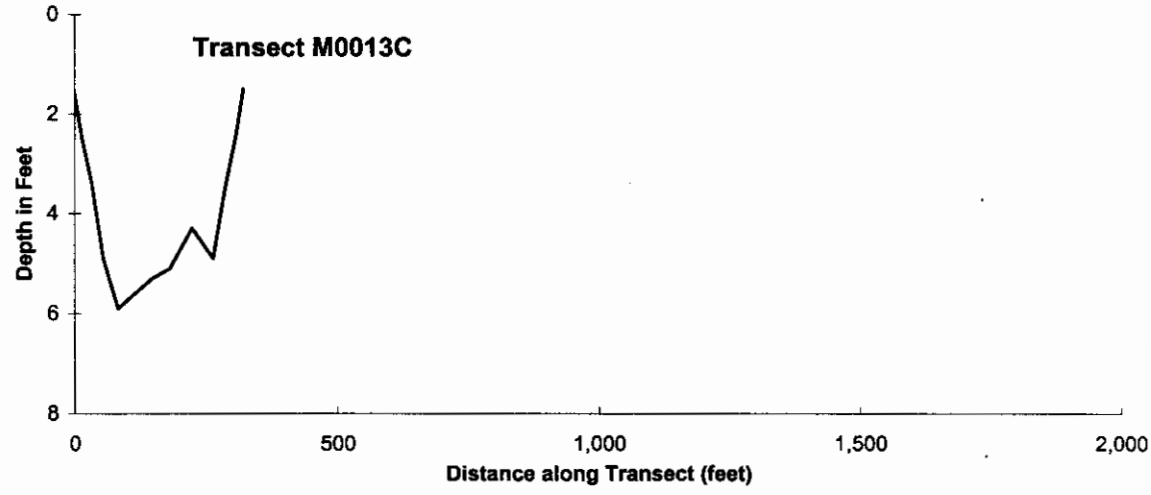
2
4
6
8
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0013C
Depth in Feet
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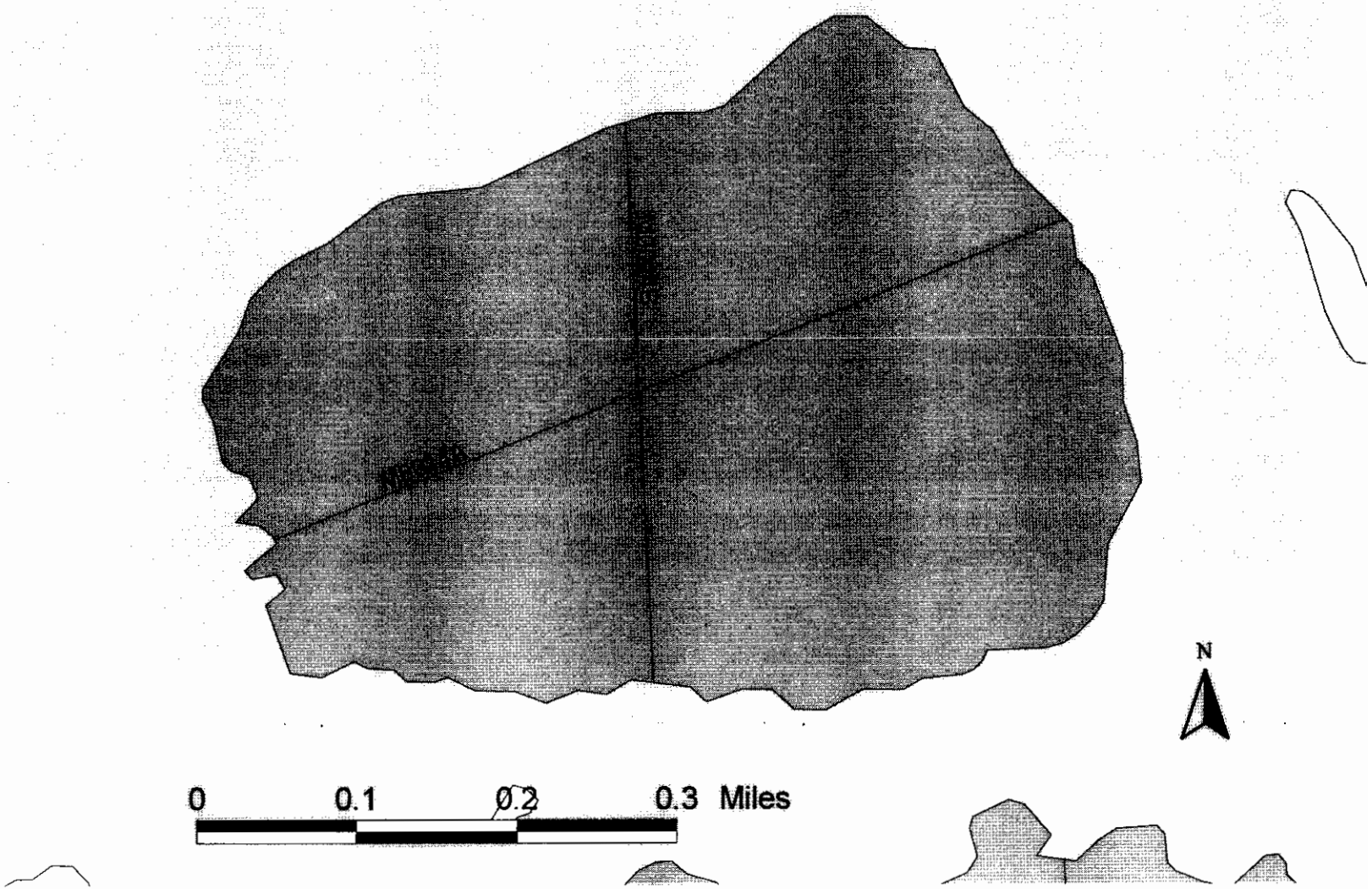
2
4
6
8
0
500
1,000
1,500
2,000
Distance along Transect (feet)

M0014



Lake M0014

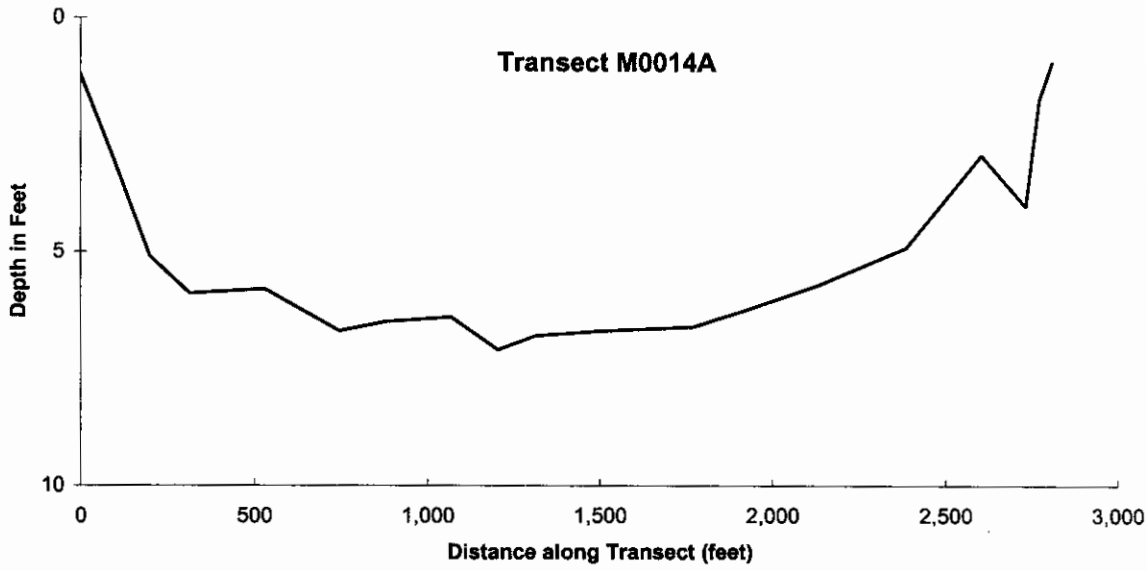
Other Names:
Location: 70°07.15N 152°03.90W
USGS Quad Sheet: Harrison Bay A-4: Section 23 of T9N R1W
Habitat:
Area: 114 acres
Maximum Depth: 8.5 feet
Active Outlet:
Spec. Conductance: 197 µS/cm
pH: 7.8
Calculated Volume: 104.4 million gallons
Permittable Volume: No fish concern

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
2000	24.7	9.8	21.8	4.2	72	166	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 21 00	14.3	None	0
Minnow Traps	Jul 21 00	15.3	None	0


Transect M0014A
Depth in Feet
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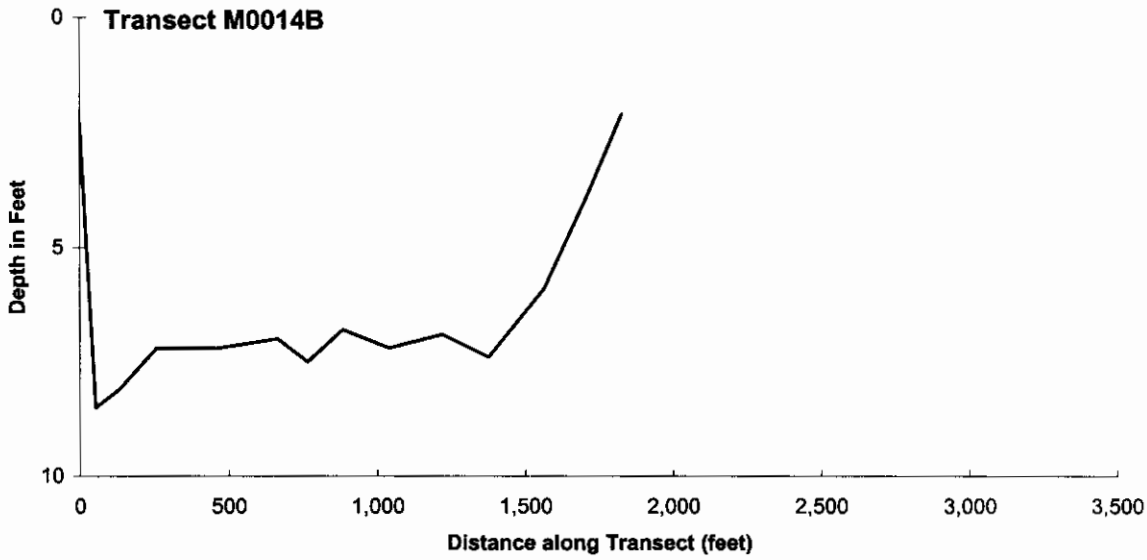
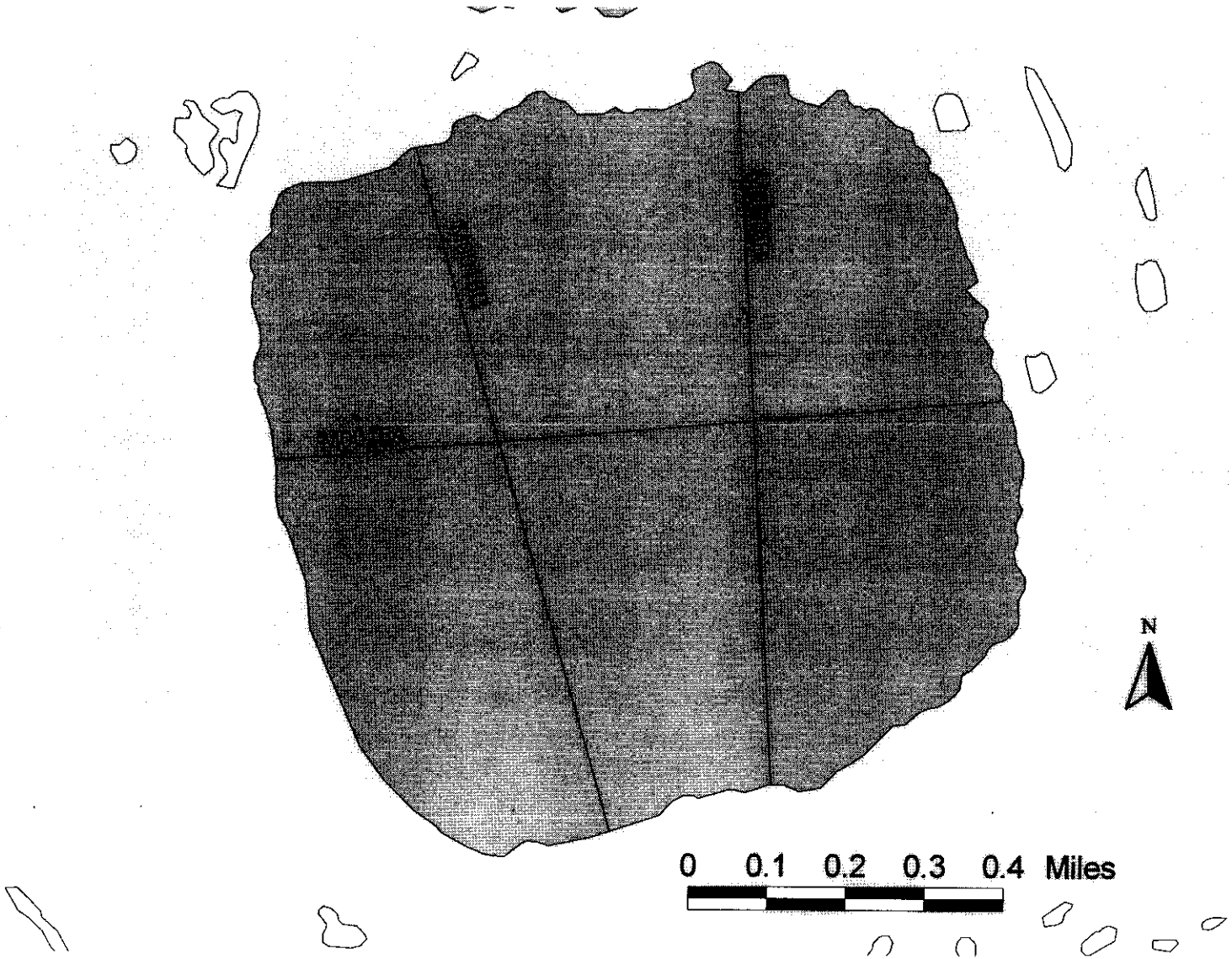
5
10
0
500
1,000
1,500
2,000
2,500
3,000
Distance along Transect (feet)


Transect M0014B
Depth in Feet
0
5
10
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)

M0015



Lake M0015

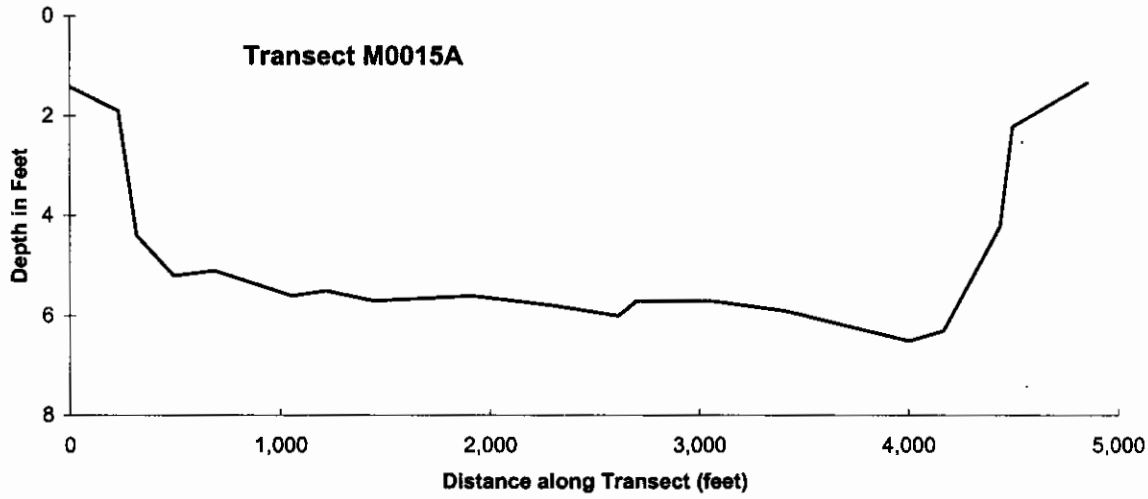
Other Names:
Location: 70°06.55N 152°03.55W
USGS Quad Sheet: Harrison Bay A-4: Section 26 of T9N R1W
Habitat:
Area: 473 acres
Maximum Depth: 7.5 feet
Active Outlet:
Spec. Conductance: 204 µS/cm
pH: 7.8
Calculated Volume: 381.8 million gallons
Permittable Volume: No fish concern

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
2000	23.5	10.1	21.2	3.9	69	156	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 21 00	12.2	None	0
Minnow Traps	Jul 21 00	10.5	None	0


Transect M0015A
Depth in Feet
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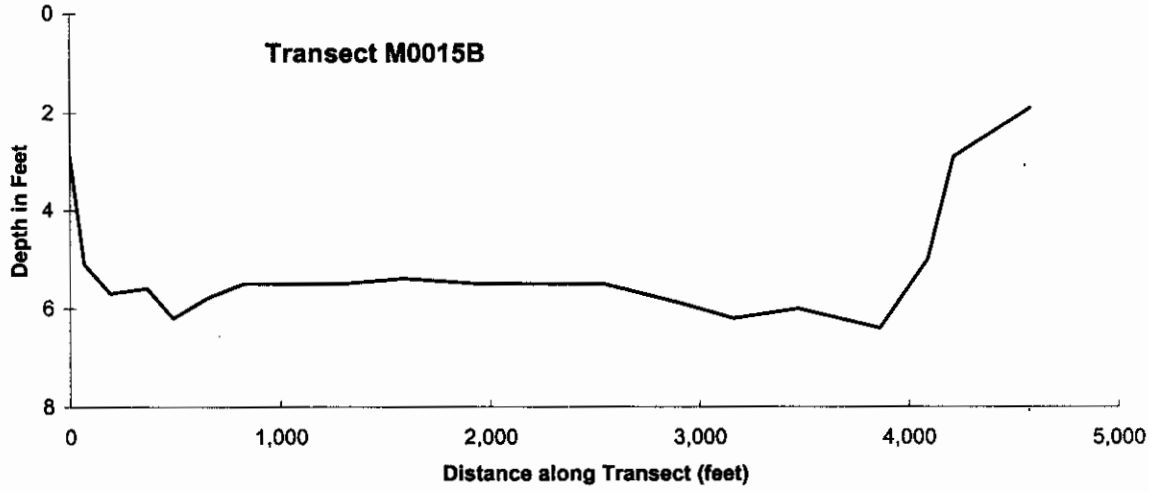
2
4
6
8
0
1,000
2,000
3,000
4,000
5,000
Distance along Transect (feet)


Transect M0015B
Depth in Feet
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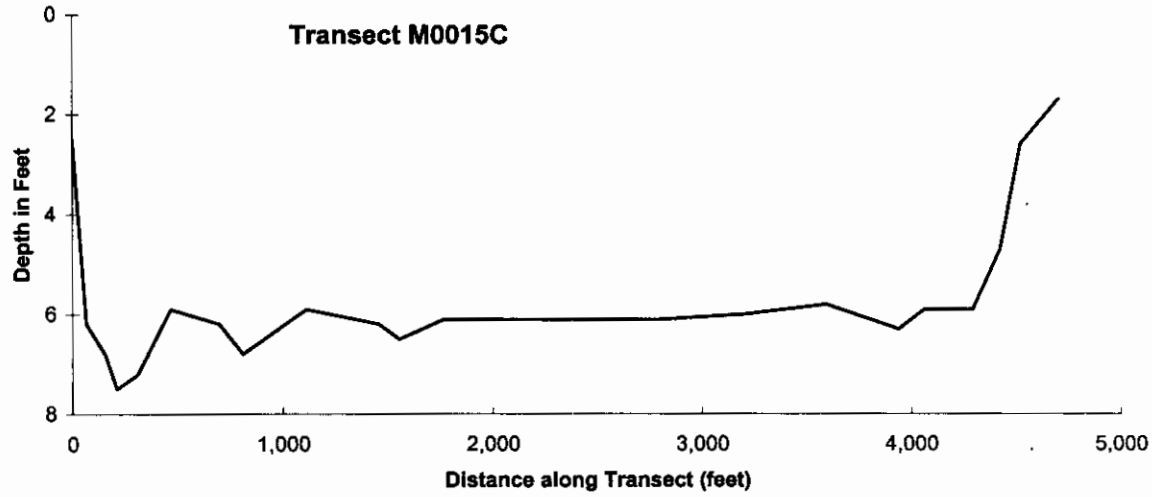
1,000
2,000
3,000
4,000
5,000
Distance along Transect (feet)


Transect M0015C
Depth in Feet
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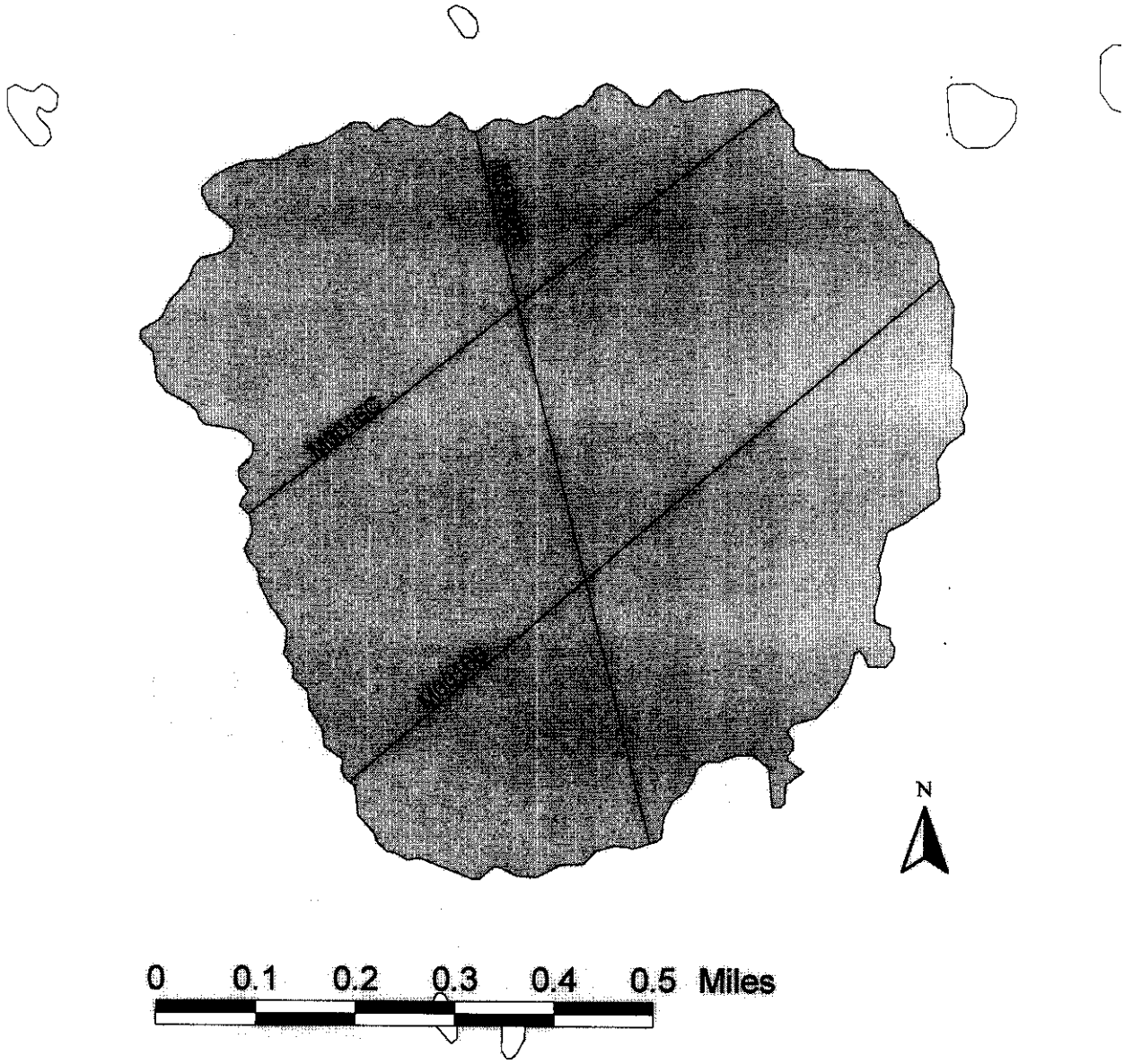
2
4
6
8
0
1,000
2,000
3,000
4,000
5,000
Distance along Transect (feet)

M0016



Lake M0016

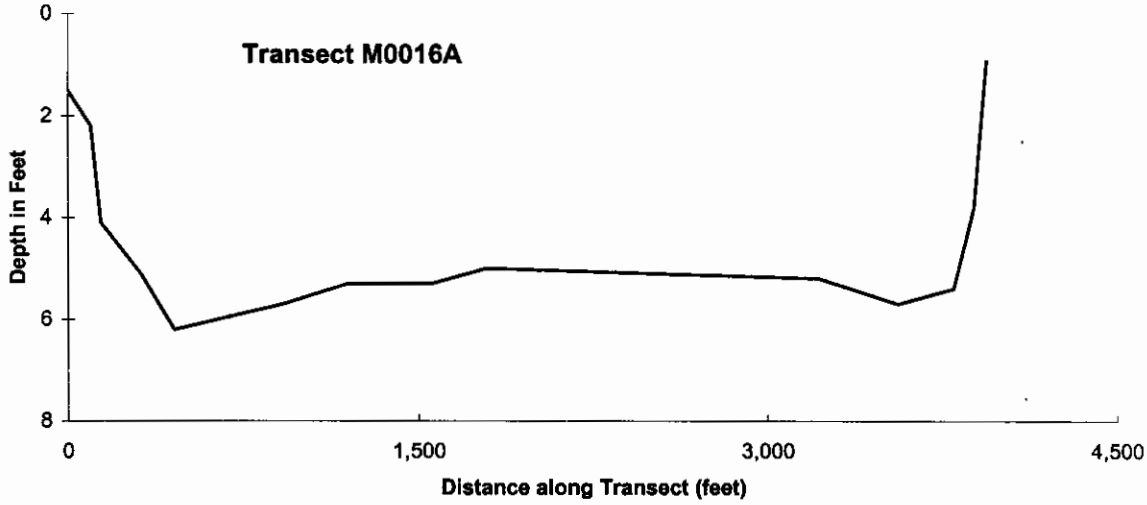
Other Names:
Location: 70°09.80N 151°52.80W
USGS Quad Sheet: Harrison Bay A-4: Section 3/4 of T9N R1E
Habitat:
Area: 300 acres
Maximum Depth: 6.2 feet
Active Outlet:
Spec. Conductance: 124 µS/cm
pH: 7.8
Calculated Volume: 200.1 million gallons
Permittable Volume: No fish concern

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
2000	14.8	5.2	14.4	2.8	48	72	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 22 00	12.7	None	0	
Minnow Traps	Jul 22 00	14.0	Ninespine stickleback	1	59


Transect M0016A
Depth in Feet
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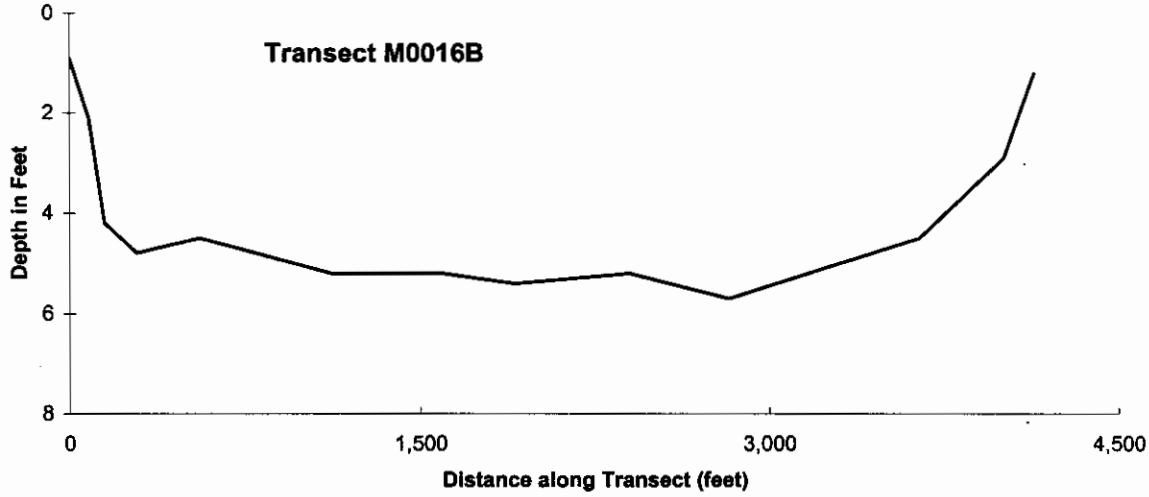
2
4
6
8
0
1,500
3,000
4,500
Distance along Transect (feet)


Transect M0016B
Depth in Feet
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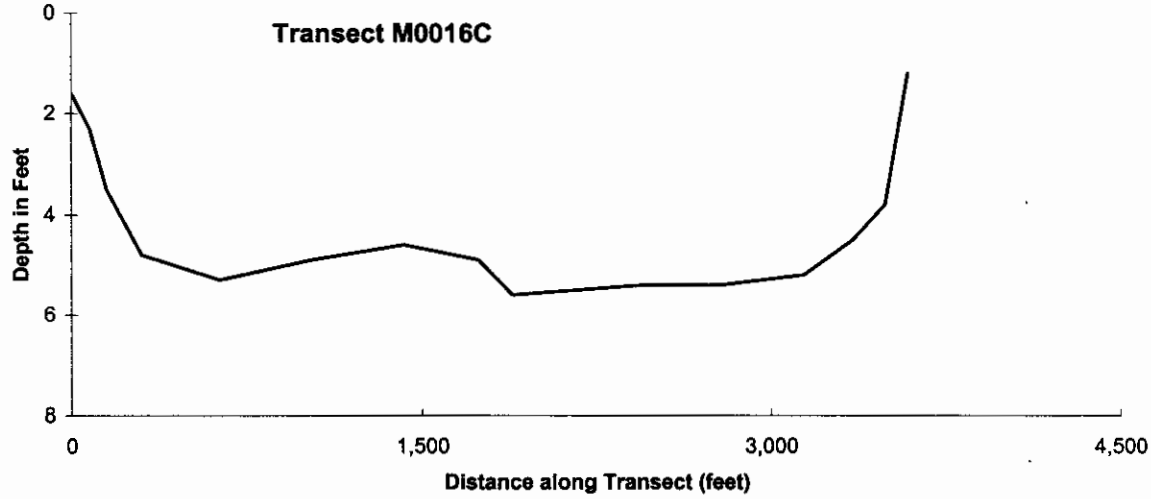
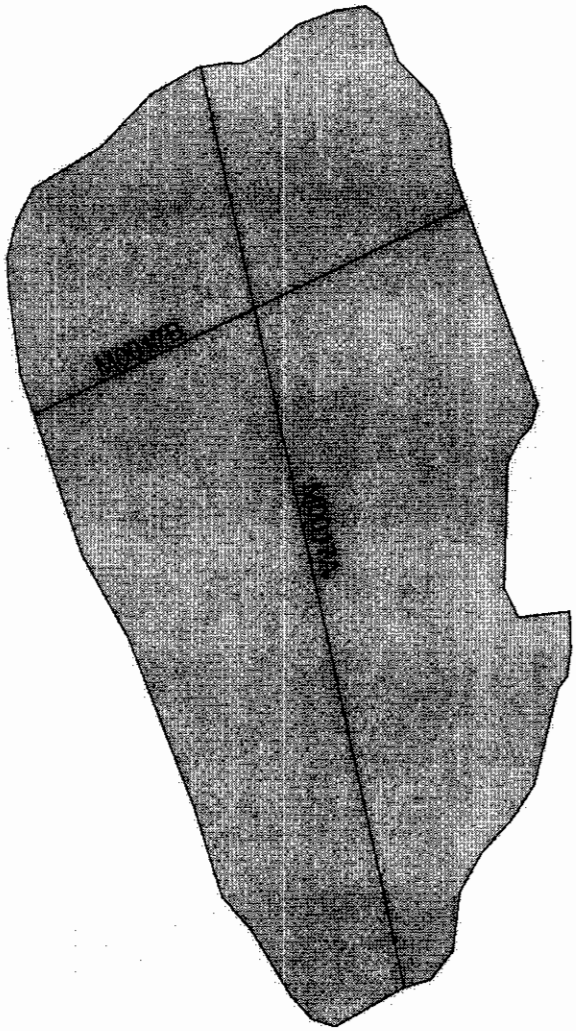
2
4
6
8
0
1,500
3,000
4,500
Distance along Transect (feet)


Transect M0016C
Depth in Feet
0
2
4
6
8
0
1,500
3,000
4,500
Distance along Transect (feet)

M0017



0 0.05 0.1 0.15 0.2 Miles

Lake M0017

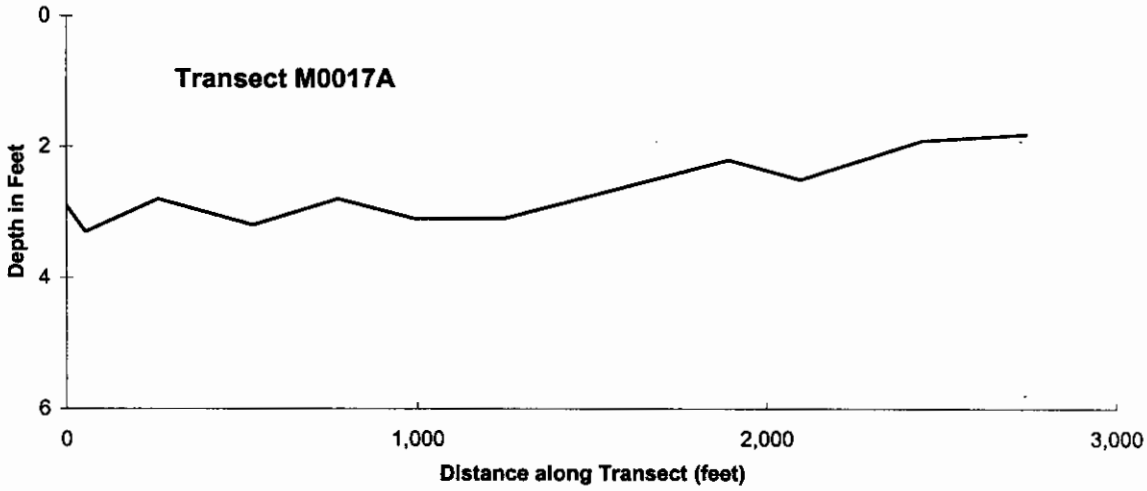
Other Names:
Location: 70°06.10N 152°08.13W
USGS Quad Sheet: Harrison Bay A-4: Section 28 of T9N R1W
Habitat:
Area: 70 acres
Maximum Depth: 3.3 feet
Active Outlet:
Spec. Conductance: 266 µS/cm
pH: 7.6
Calculated Volume: 24.9 million gallons
Permittable Volume: No fish concern

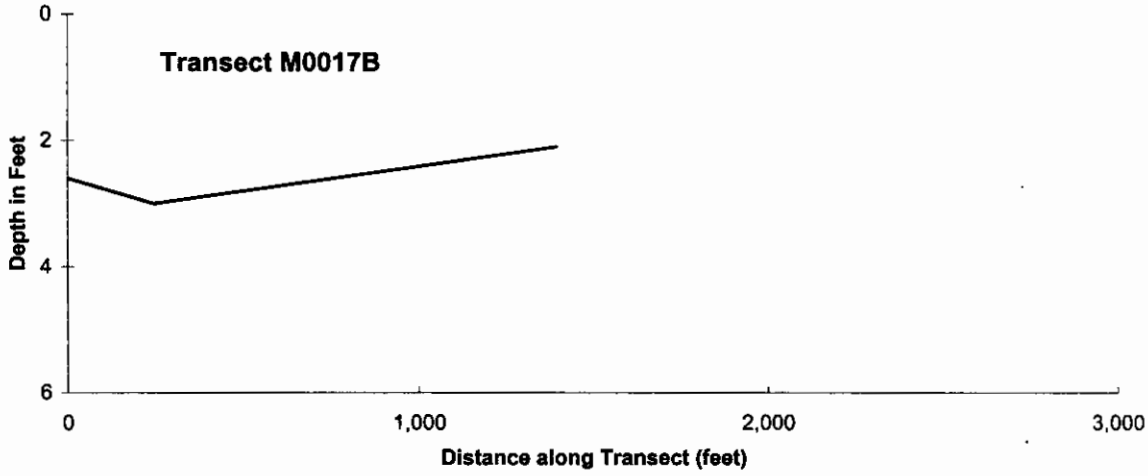
Water Quality:

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
2000	16.3	8.9	34.2	6.8	133	162	this study

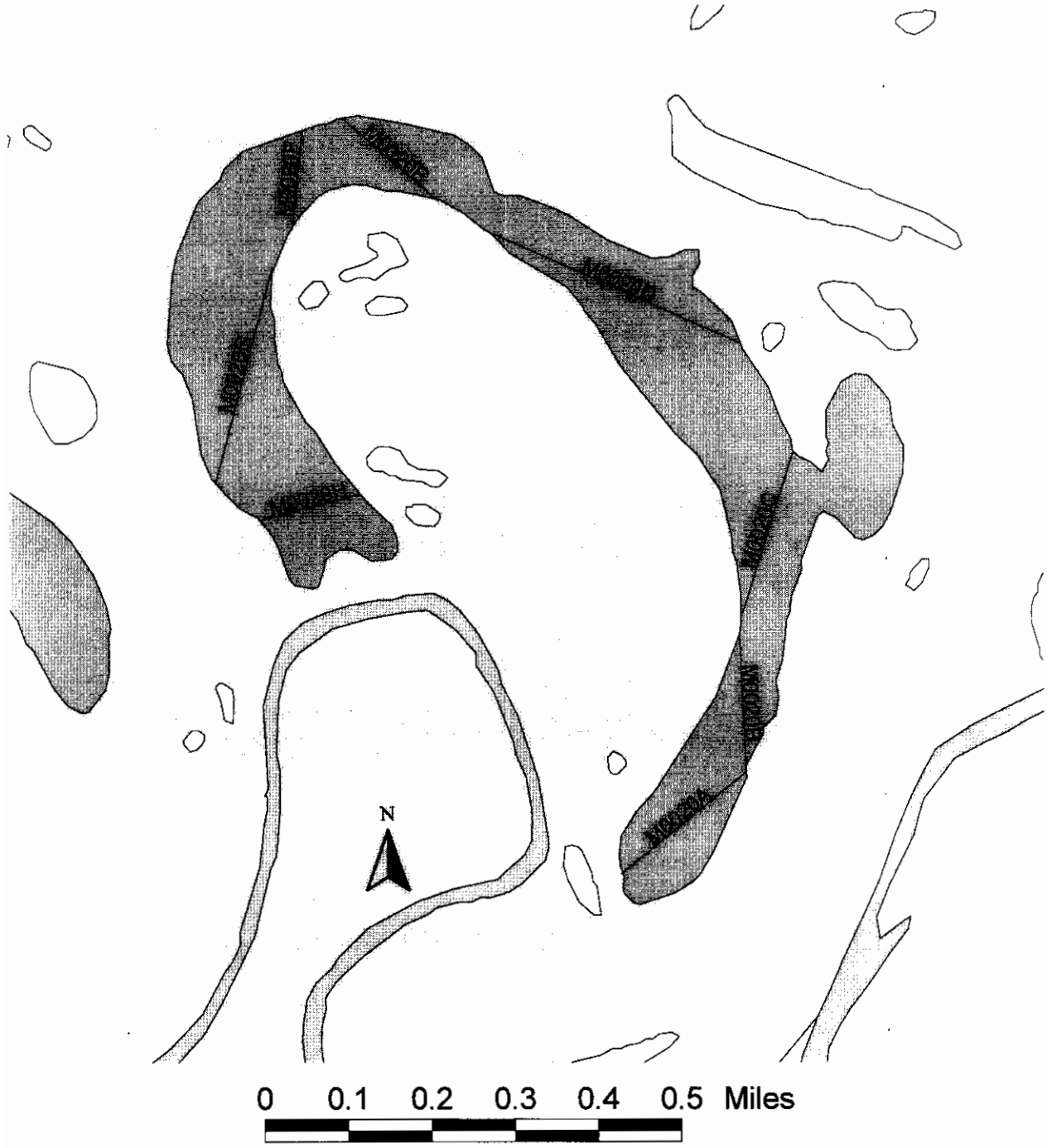
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 24 00	2.2	None	0
Minnow Traps	Jul 24 00	5.7	None	0


Transect M0017A
Depth in Feet
0
2
4
6
0
1,000
2,000
3,000
Distance along Transect (feet)


Transect M0017B
Depth in Feet
0
2
4
6
0
1,000
2,000
3,000
Distance along Transect (feet)

M0020



Lake M0020

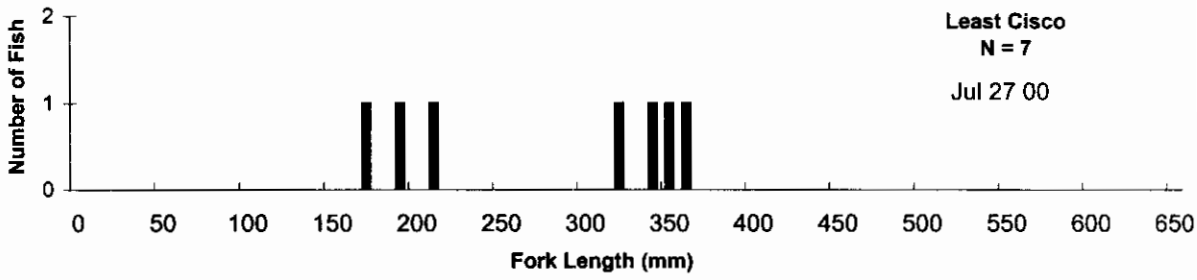
Other Names:
Location: 70°16.38'N 151°44.00'W
USGS Quad Sheet: Harrison Bay B-3: Section 30/31 of T11N R2E
Habitat:
Area: 124 acres
Maximum Depth: 16.1 feet
Active Outlet:
Spec. Conductance: 142 µS/cm
pH: 7.9
Calculated Volume: 214.8 million gallons
Permittable Volume: 18.2 million gallons

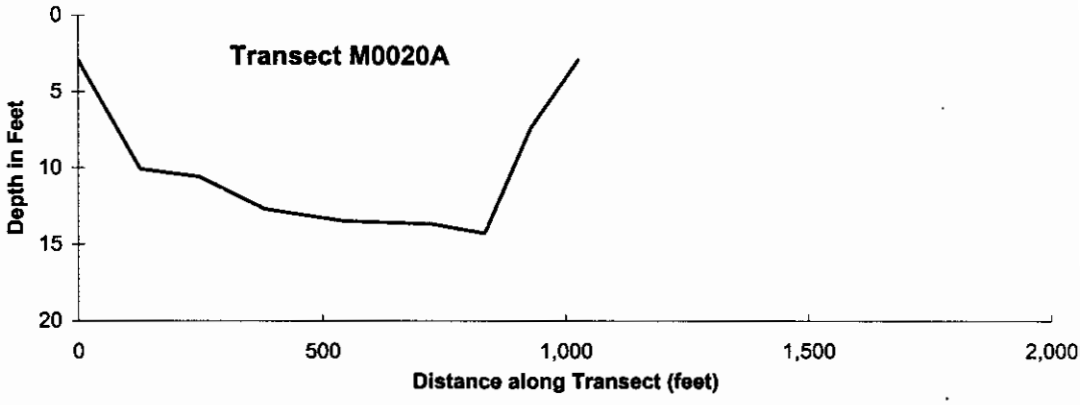
Water Quality:

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
2000	11.1	4.9	18.4	3.2	59	122	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 27 00	1.8	Least cisco	7	173-369
Minnow Traps	Jul 27 00	1.9	None	0	




Transect M0020A
Depth in Feet
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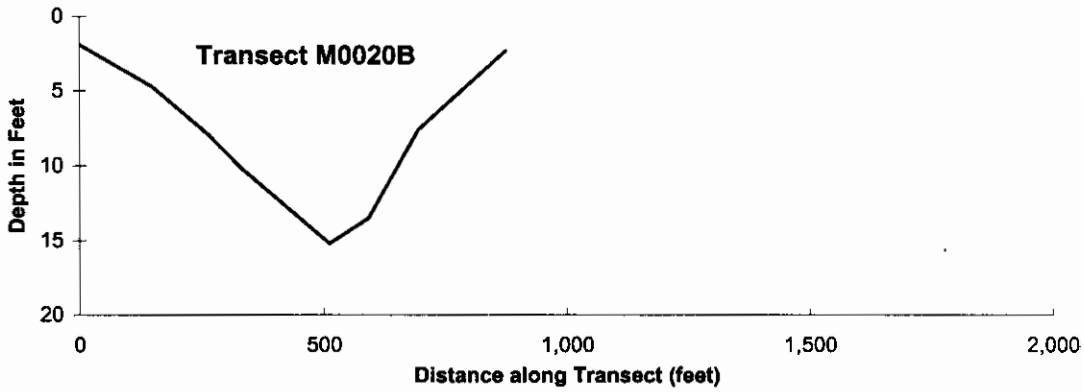
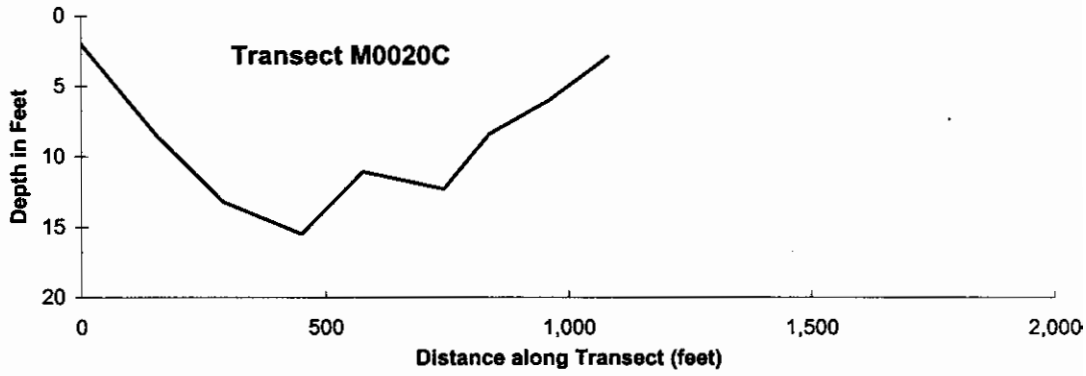
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0020B
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0020C
Depth in Feet
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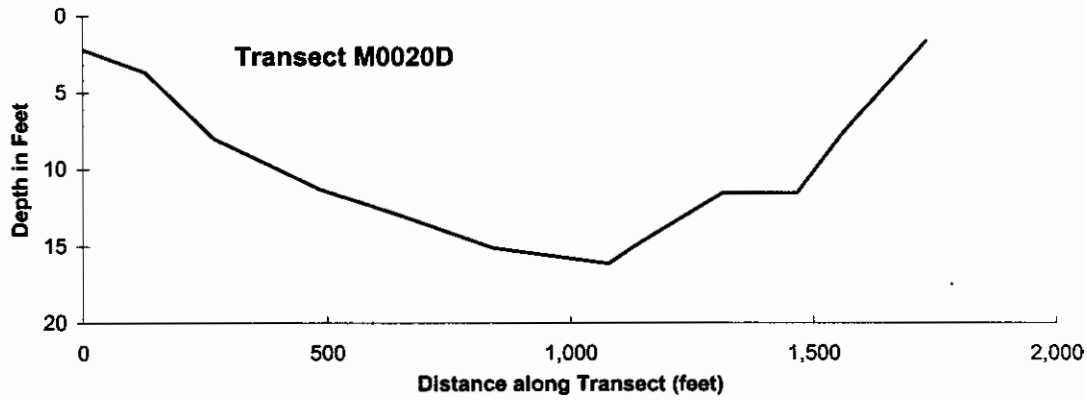
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0020D
Depth in Feet
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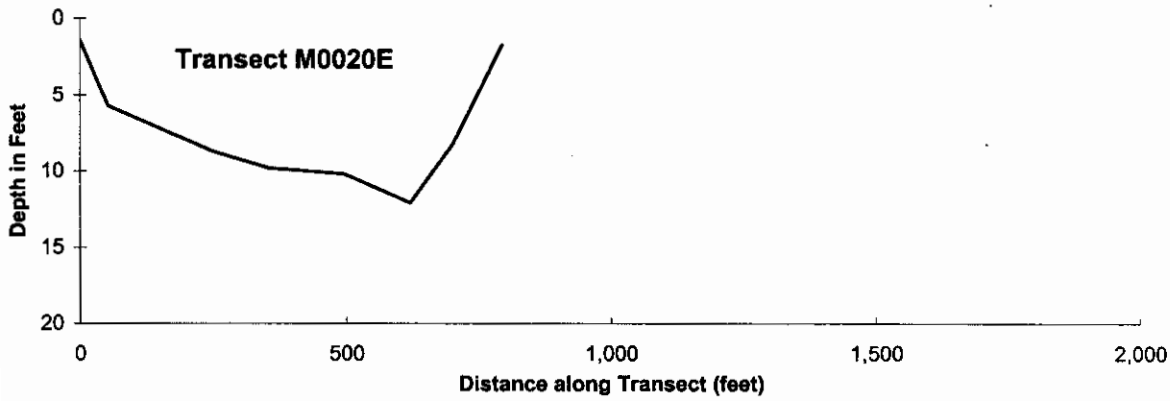
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0020E
Depth in Feet
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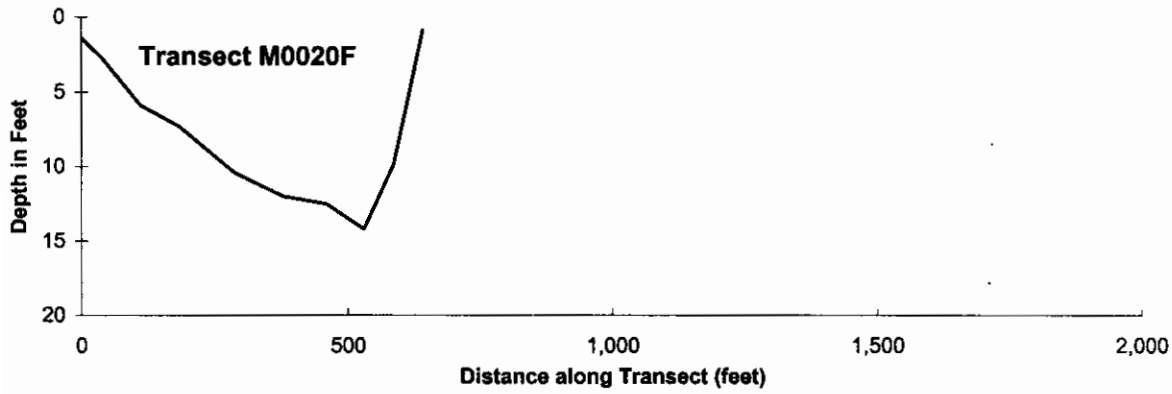
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0020F
Depth in Feet
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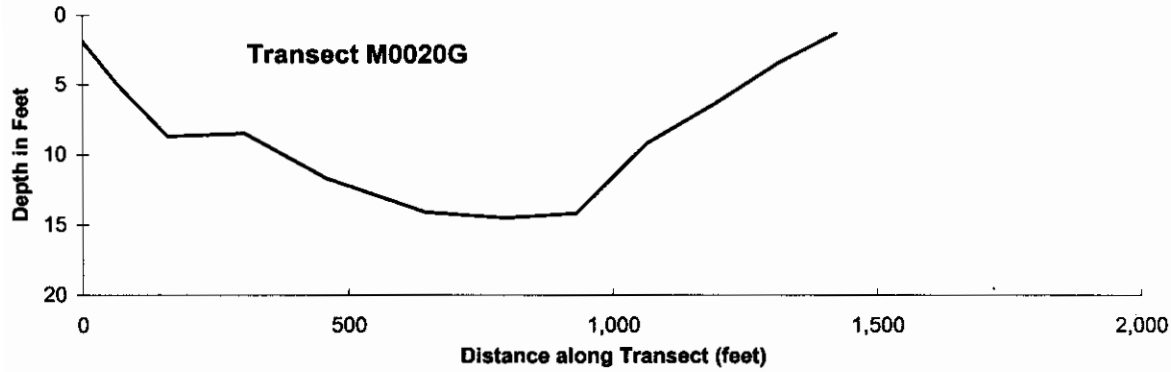
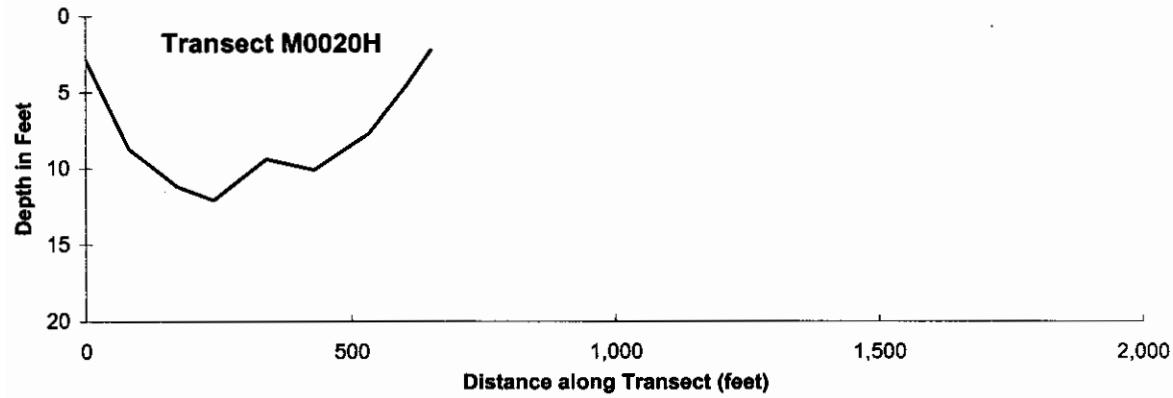
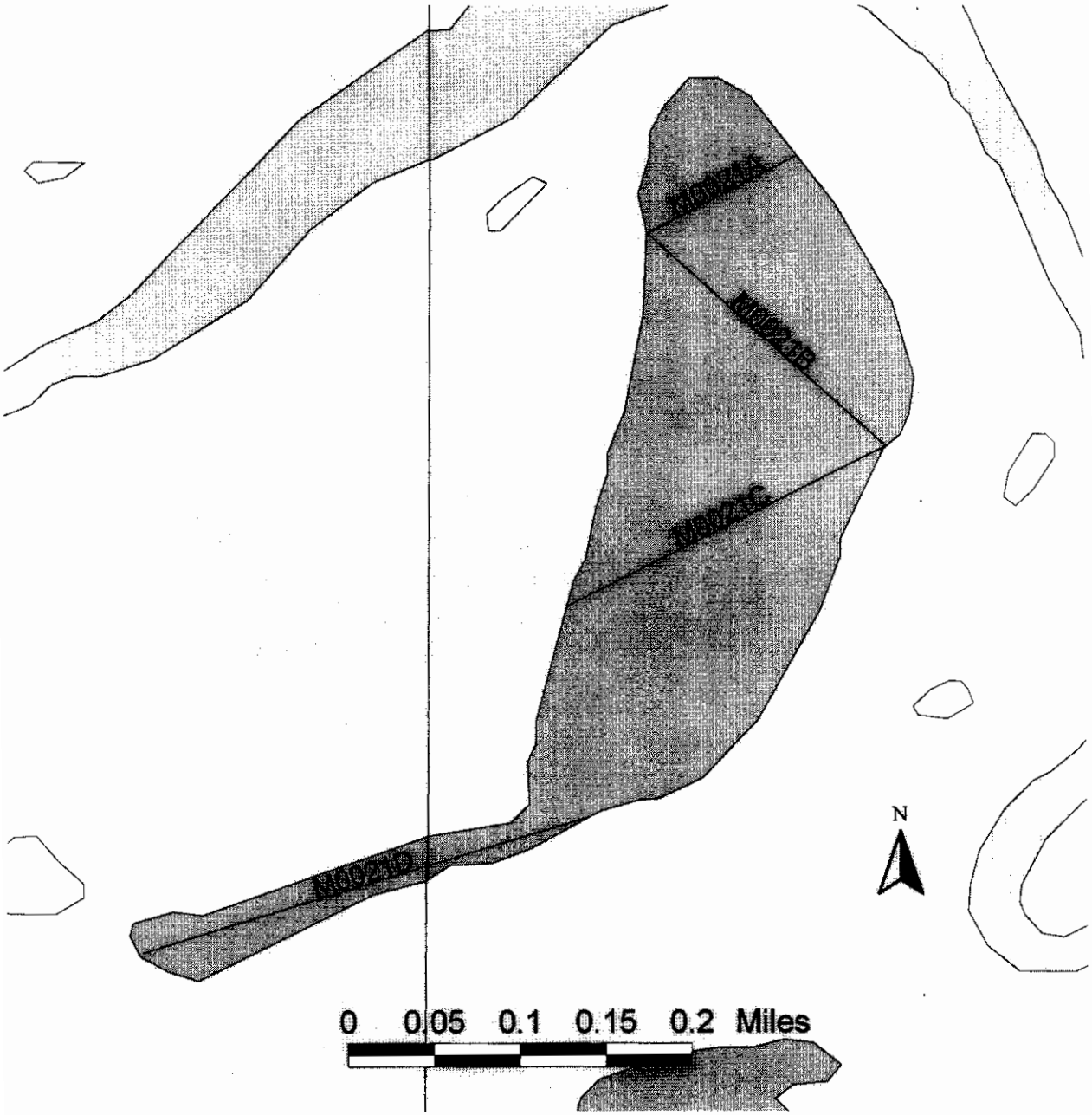
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0020G
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)


Transect M0020H
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
2,000
Distance along Transect (feet)

M0021



Lake M0021

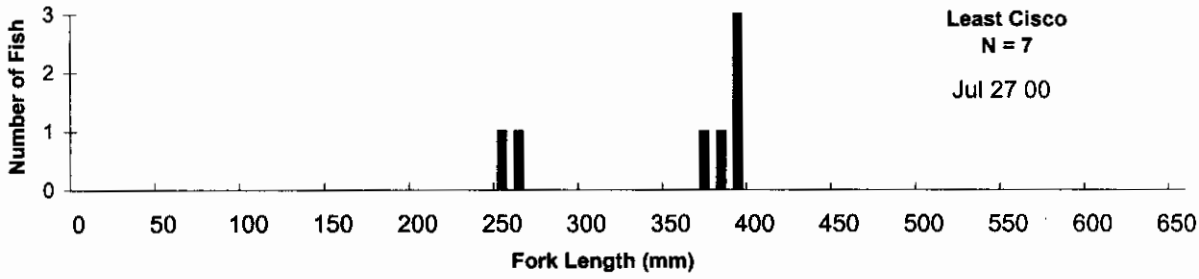
Other Names:
Location: 70°15.95'N 151°47.66'W
USGS Quad Sheet: Harrison Bay B-3: Section 35 of T11N R1E
Habitat:
Area: 36 acres
Maximum Depth: 17.7 feet
Active Outlet:
Spec. Conductance: 117 µS/cm
pH: 7.9
Calculated Volume: 69.1 million gallons
Permittable Volume: 6.3 million gallons

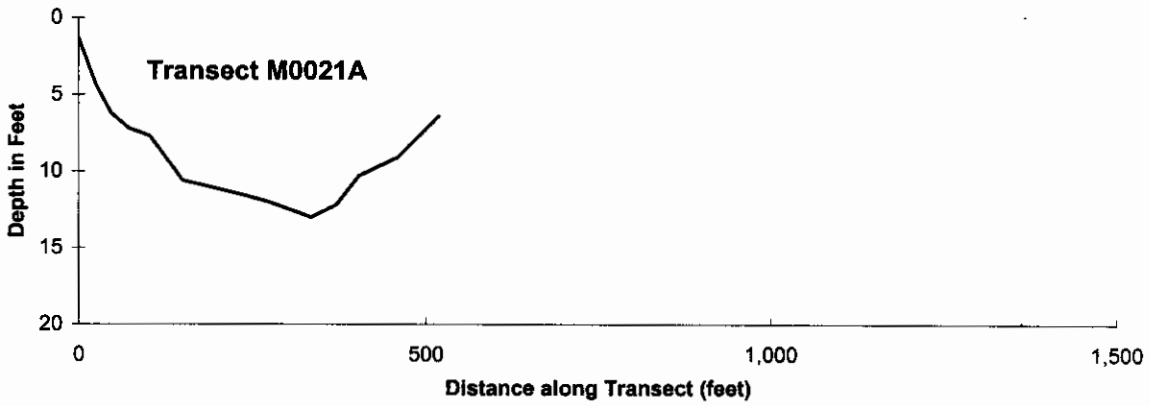
Water Quality:

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
2000	7.6	3.2	16.6	2.6	52	102	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 27 00	2.7	Least cisco	7	258-395
Minnow Traps	Jul 27 00	4.0	None	0	




Transect M0021A
Depth in Feet
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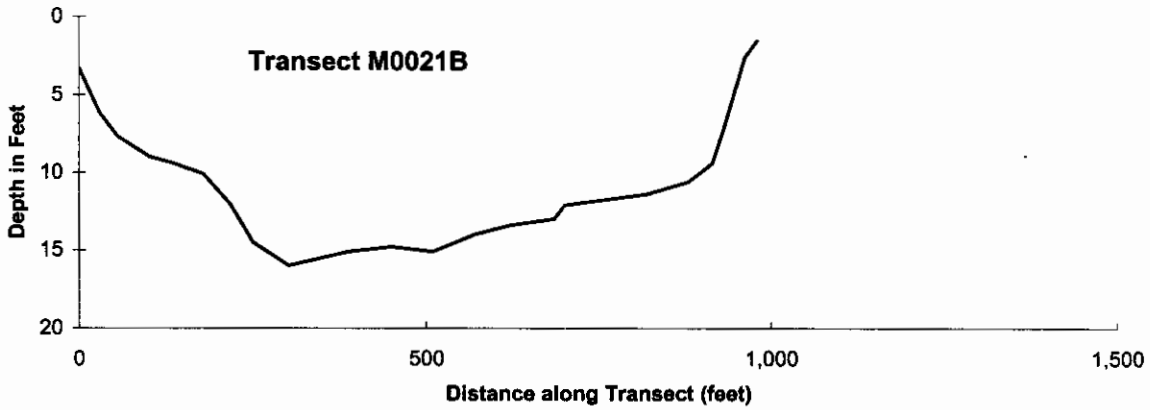
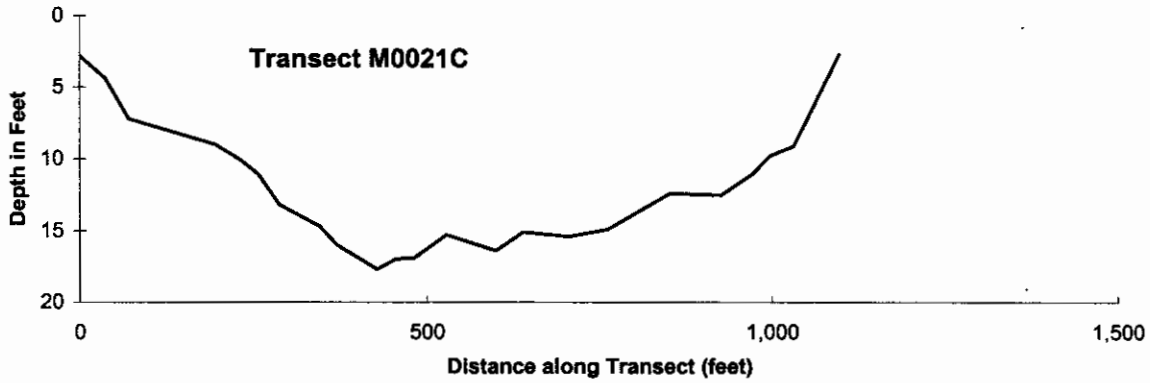
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0021B
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0021C
Depth in Feet
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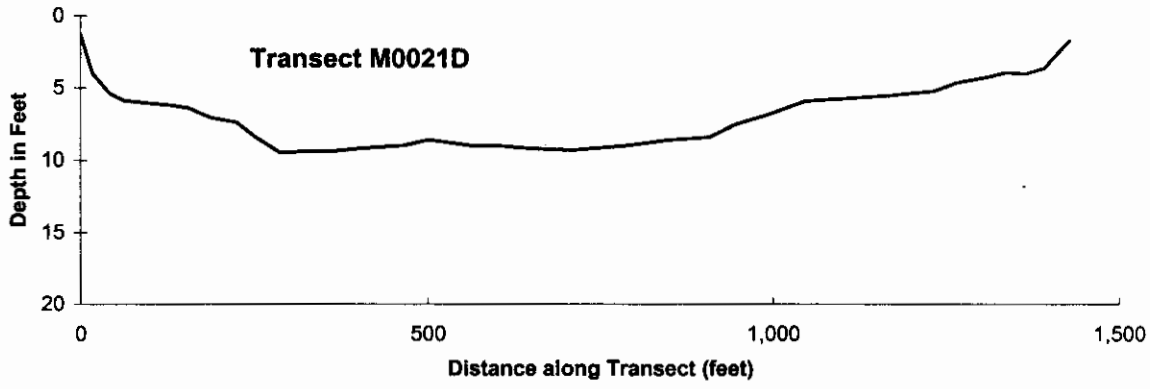
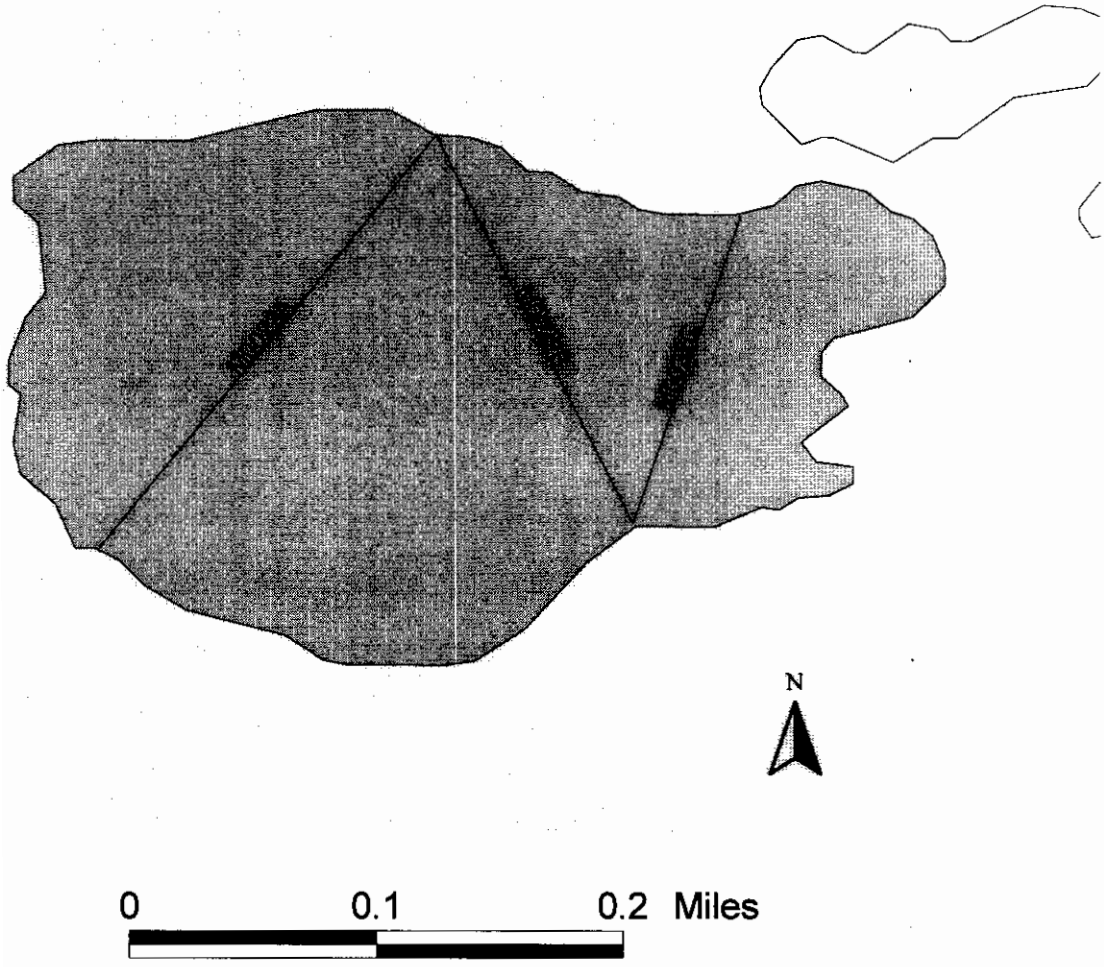
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0021D
Depth in Feet
0
5
10
15
20
0
500
1,000
1,500
Distance along Transect (feet)

M0022



Lake M0022

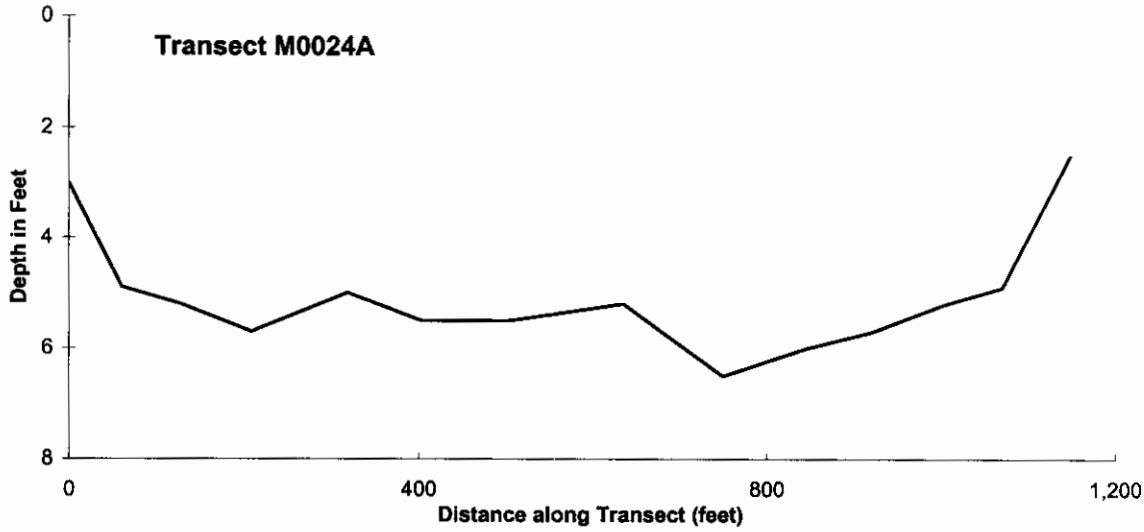
Other Names:
Location: 70°13.27'N 151°40.00'W
USGS Quad Sheet: Harrison Bay A-3: Section 17 of T10N R2E
Habitat:
Area: 38 acres
Maximum Depth: 6.5 feet
Active Outlet:
Spec. Conductance: 96.2 µS/cm
pH: 8.0
Calculated Volume: 26.5 million gallons
Permittable Volume: No fish concern

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
2000	11.5	5.1	10.0	2.4	35	84	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 29 00	8.8	None	0
Minnow Traps	Jul 29 00	10.0	None	0


Transect M0024A
Depth in Feet
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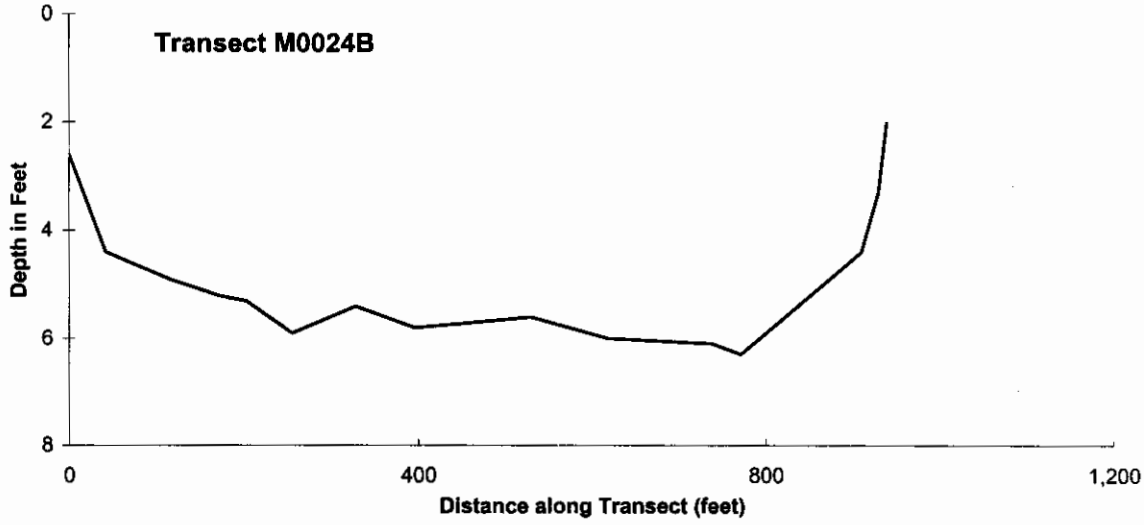
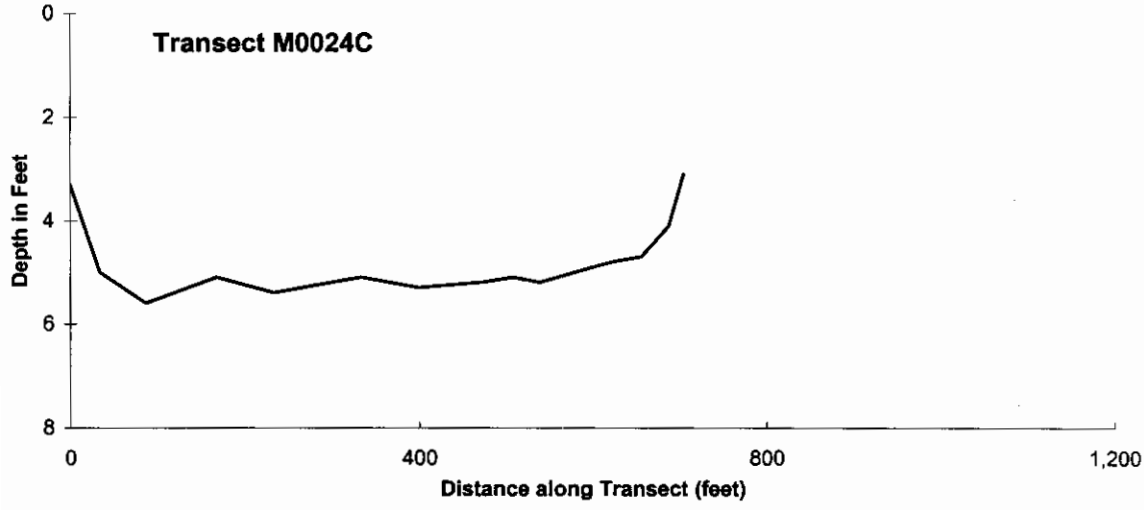
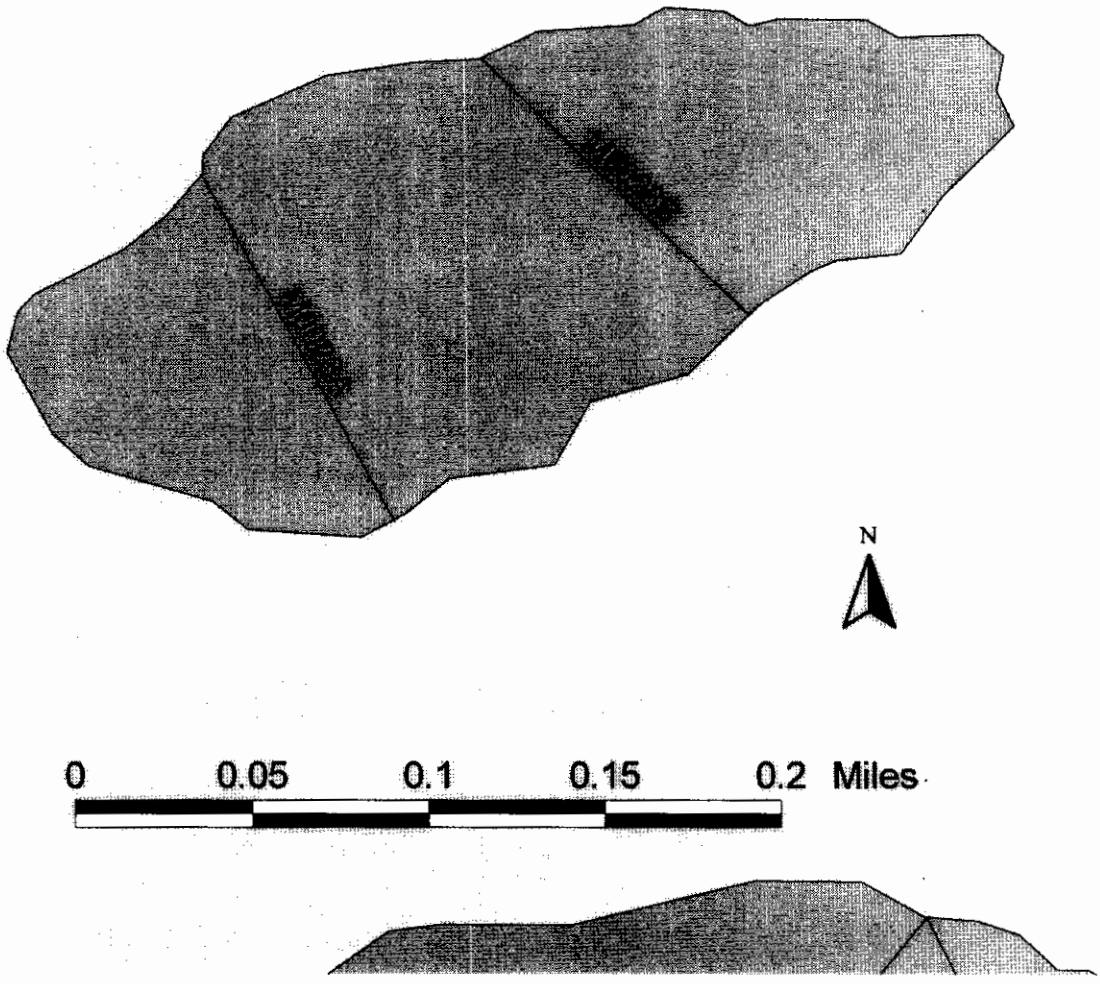
2
4
6
8
0
400
800
1,200
Distance along Transect (feet)


Transect M0024B
Depth in Feet
0
2
4
6
8
0
400
800
1,200
Distance along Transect (feet)


Transect M0024C
Depth in Feet
0
2
4
6
8
0
400
800
1,200
Distance along Transect (feet)

M0023



Lake M0023

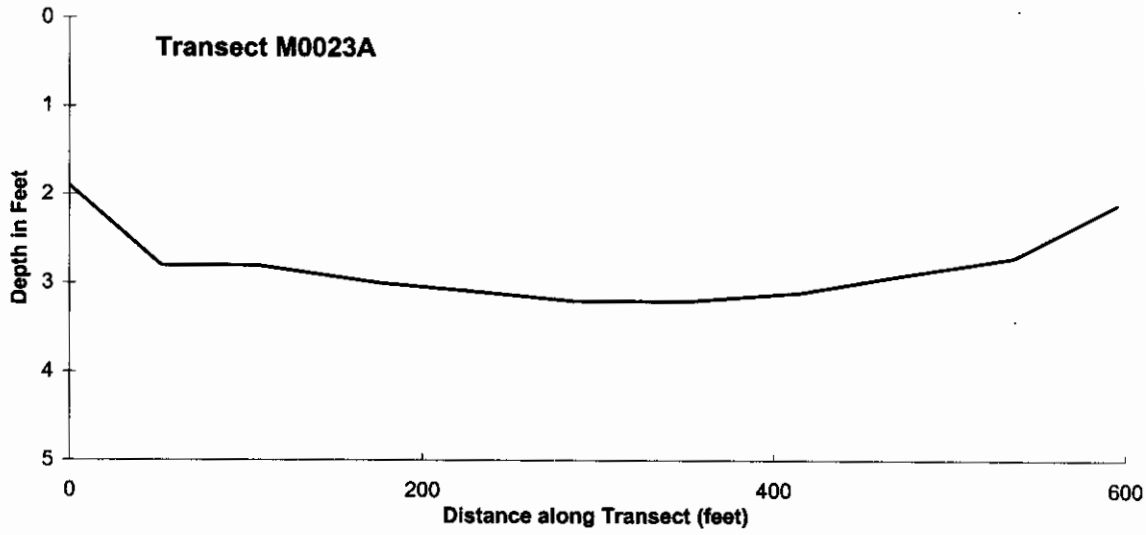
Other Names:
Location: 70°13.45'N 151°41.25'W
USGS Quad Sheet: Harrison Bay A-3: Section 17 of T10N R2E
Habitat:
Area: 16 acres
Maximum Depth: 3.9 feet
Active Outlet:
Spec. Conductance: 191.8 µS/cm
pH: 7.9
Calculated Volume: 6.9 million gallons
Permittable Volume: No fish concern

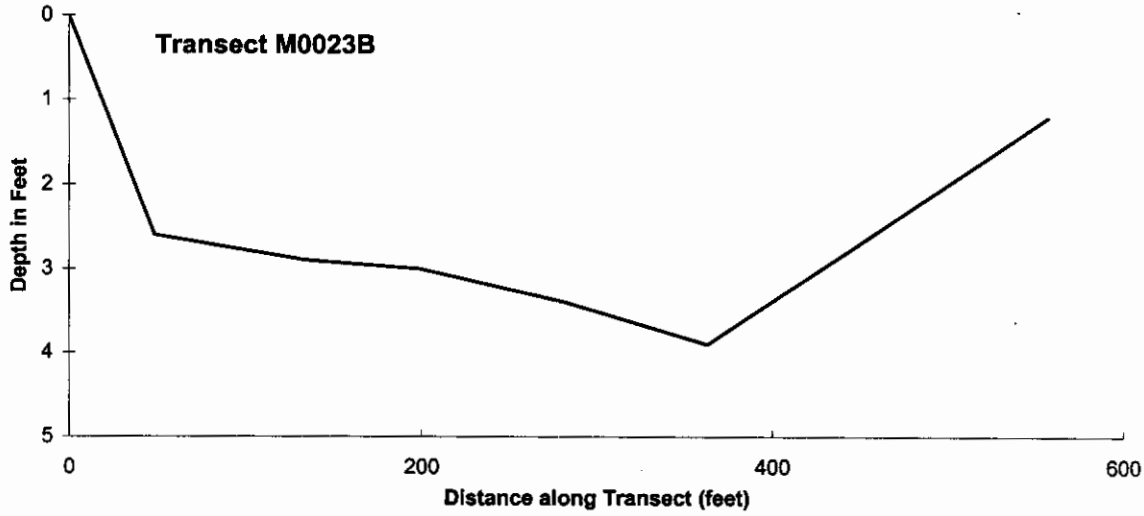
Water Quality:

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
2000	22.6	9.9	19.0	4.6	67	128	this study

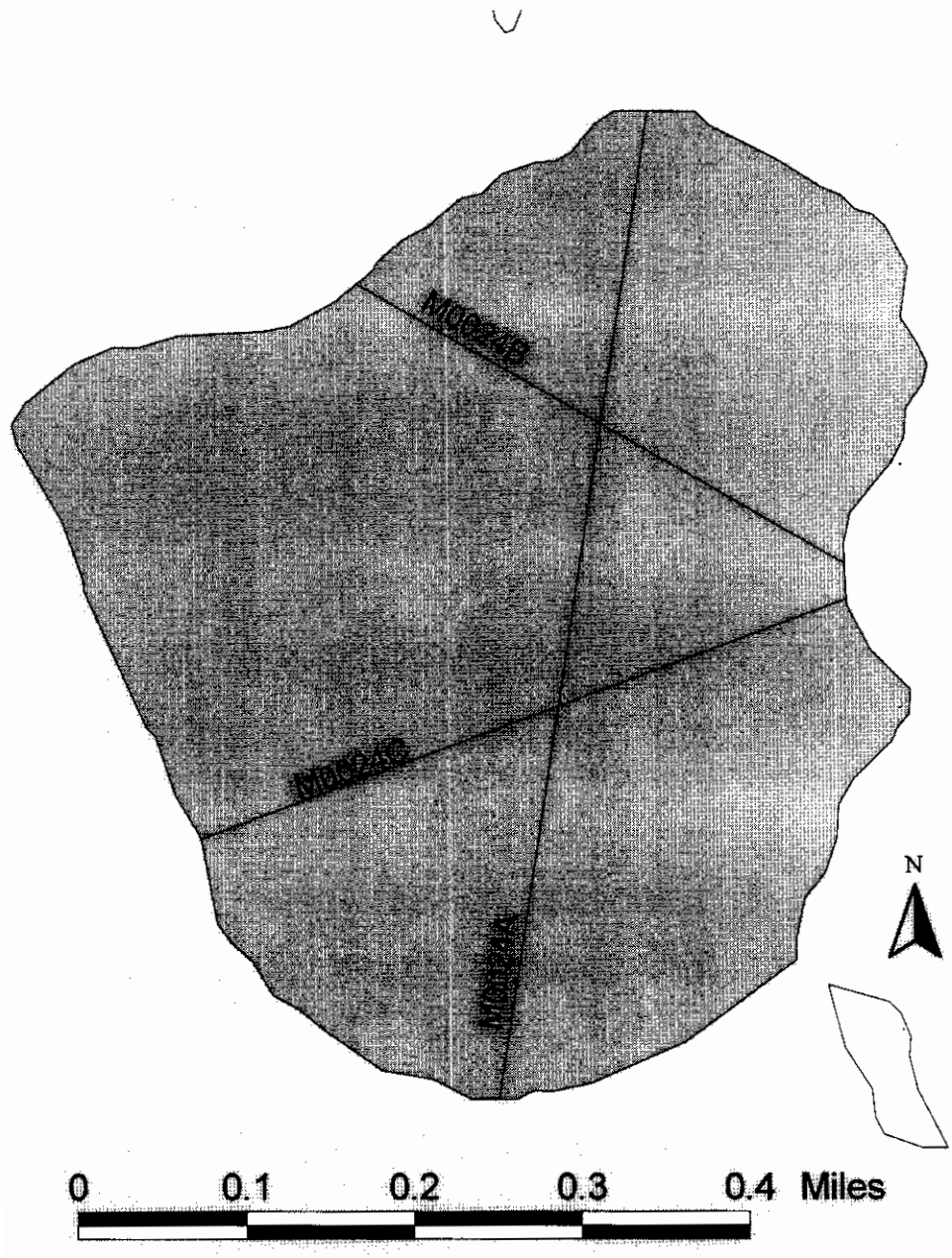
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 29 00	0.9	None	0
Minnow Traps	Jul 29 00	3.0	None	0


Transect M0023A
Depth in Feet
0
1
2
3
4
5
0
200
400
600
Distance along Transect (feet)


Transect M0023B
Depth in Feet
0
1
2
3
4
5
0
200
400
600
Distance along Transect (feet)

M0024



Lake M0024

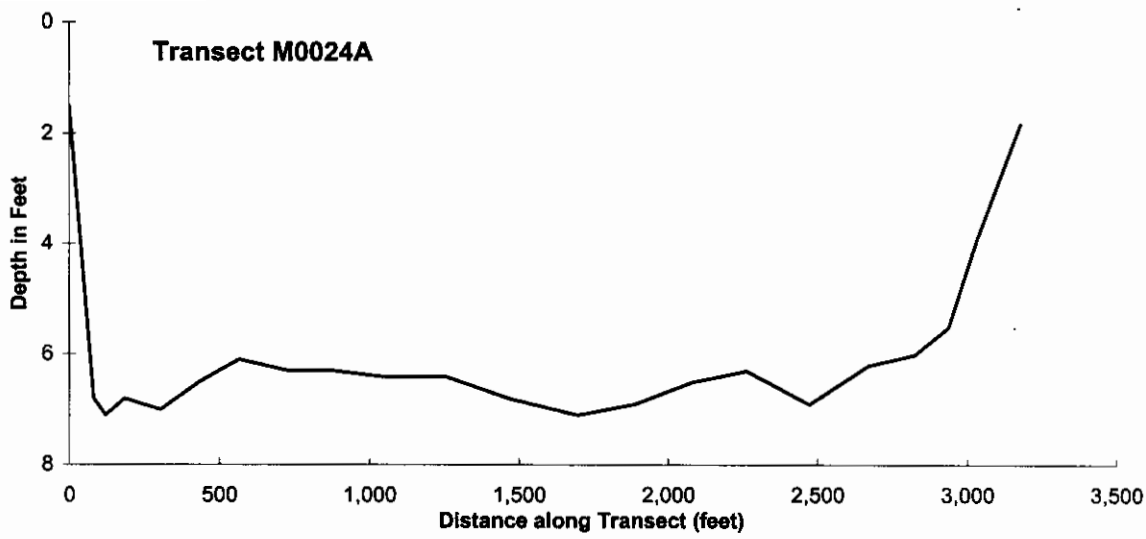
Other Names:
Location: 70°12.58'N 151°39.09'W
USGS Quad Sheet: Harrison Bay A-3: Section 21 of T10N R2E
Habitat:
Area: 139 acres
Maximum Depth: 7.3 feet
Active Outlet:
Spec. Conductance: 107.2 µS/cm
pH: 7.9
Calculated Volume: 108.8 million gallons
Permittable Volume: No fish concern

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
2000	14.3	4.8	11.2	2.9	40	70	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 29 00	10.3	None	0
Minnow Traps	Jul 29 00	11.2	None	0


Transect M0024A
Depth in Feet
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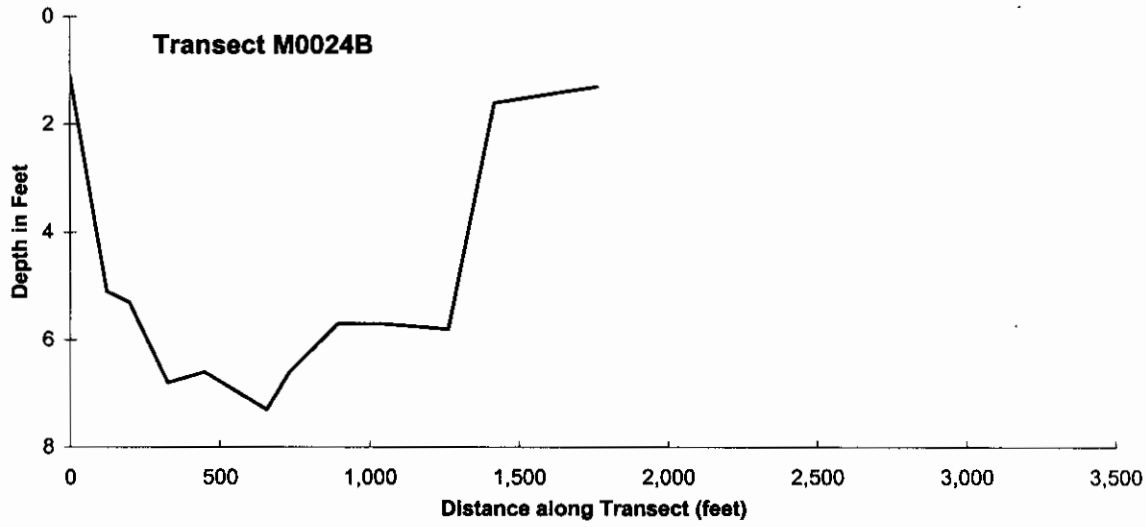
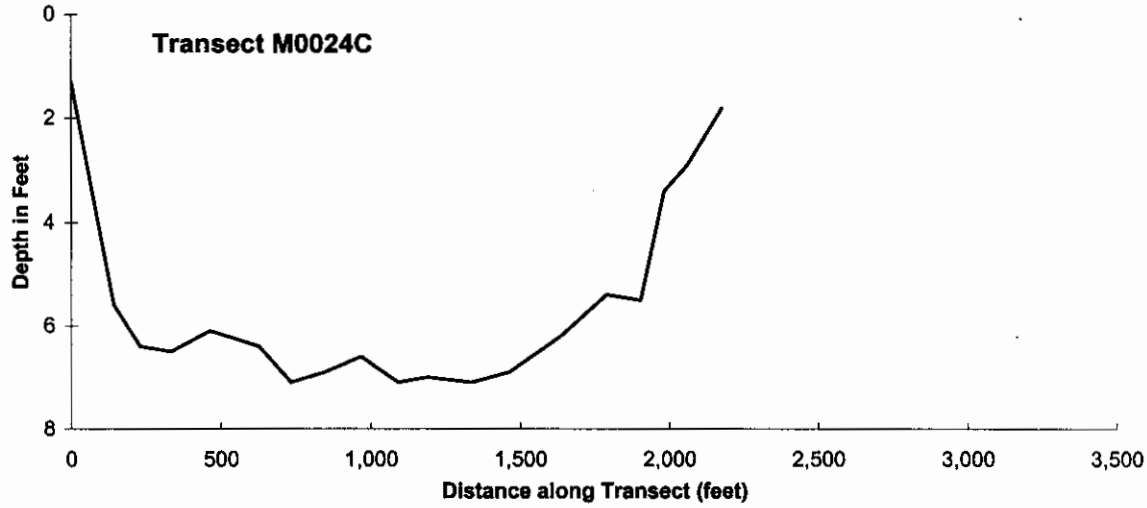
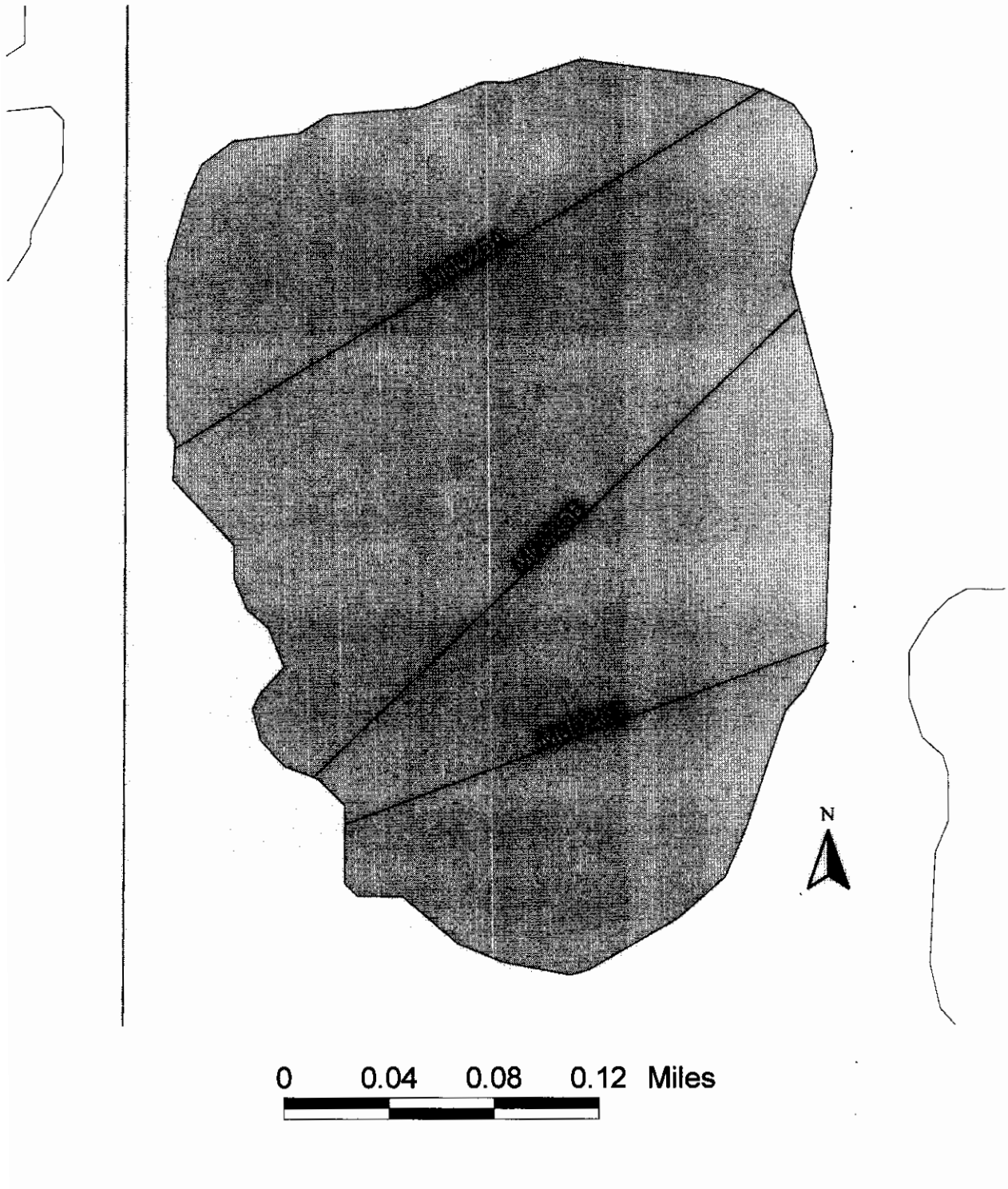
2
4
6
8
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)


Transect M0024B
Depth in Feet
0
2
4
6
8
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)


Transect M0024C
Depth in Feet
0
2
4
6
8
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)

M0025



Lake M0025

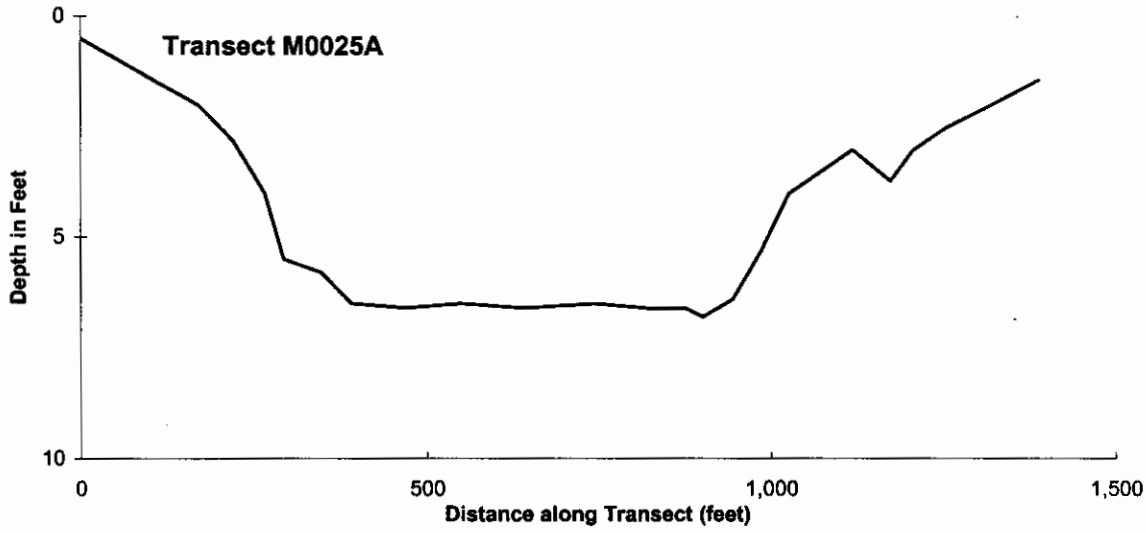
Other Names:
Location: 70°12.58'N 151°39.09'W
USGS Quad Sheet: Harrison Bay B-3: Section 26 T11N R1E
Habitat:
Area: 44 acres
Maximum Depth: 8.2 feet
Active Outlet:
Spec. Conductance: 99.7 µS/cm
pH:
Calculated Volume: 39.0 million gallons
Permittable Volume: No fish concern

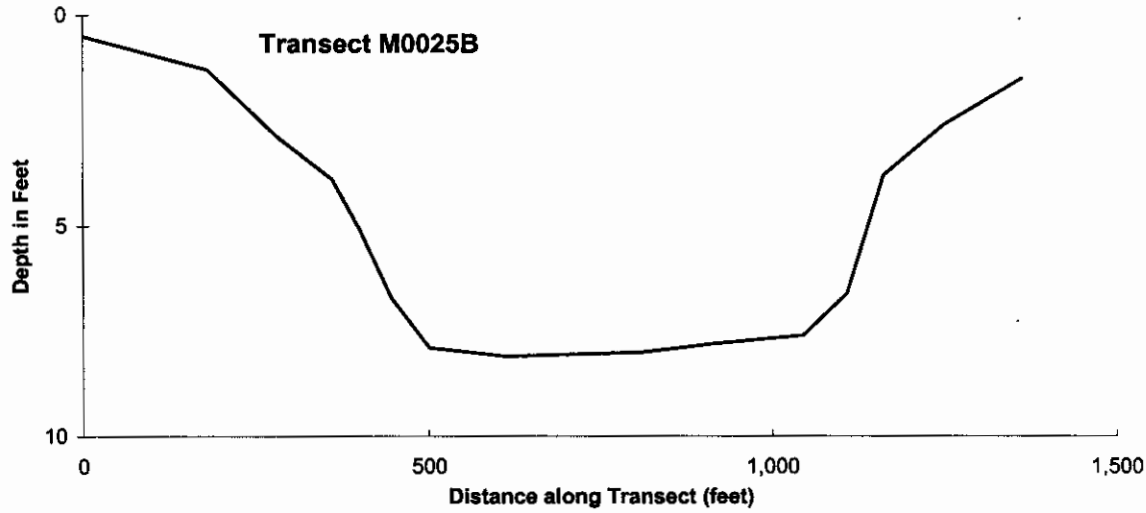
Water Quality:

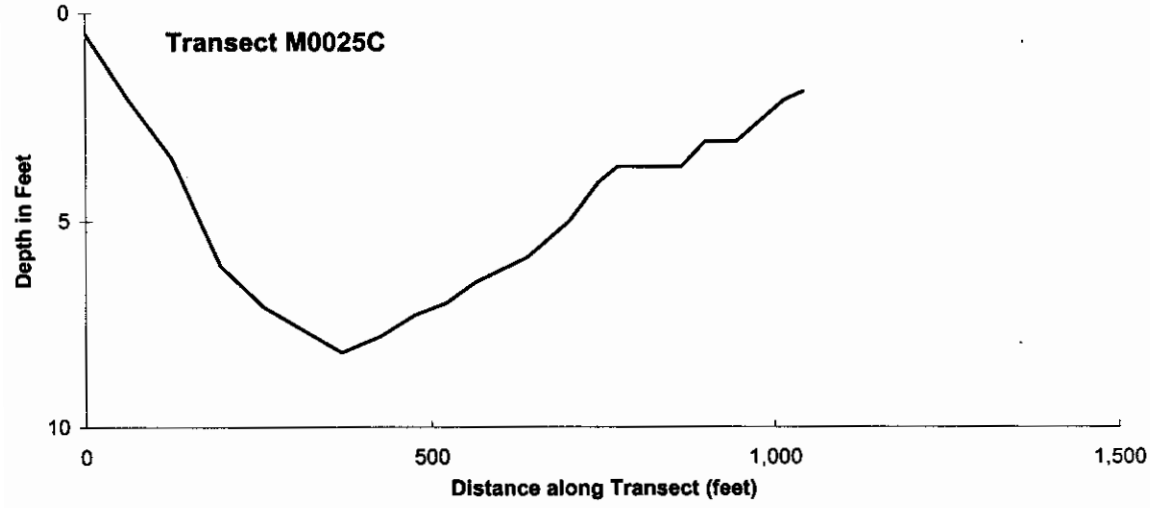
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	10.7	4.9	10.5	2.6	37	66	this study

Catch Record:

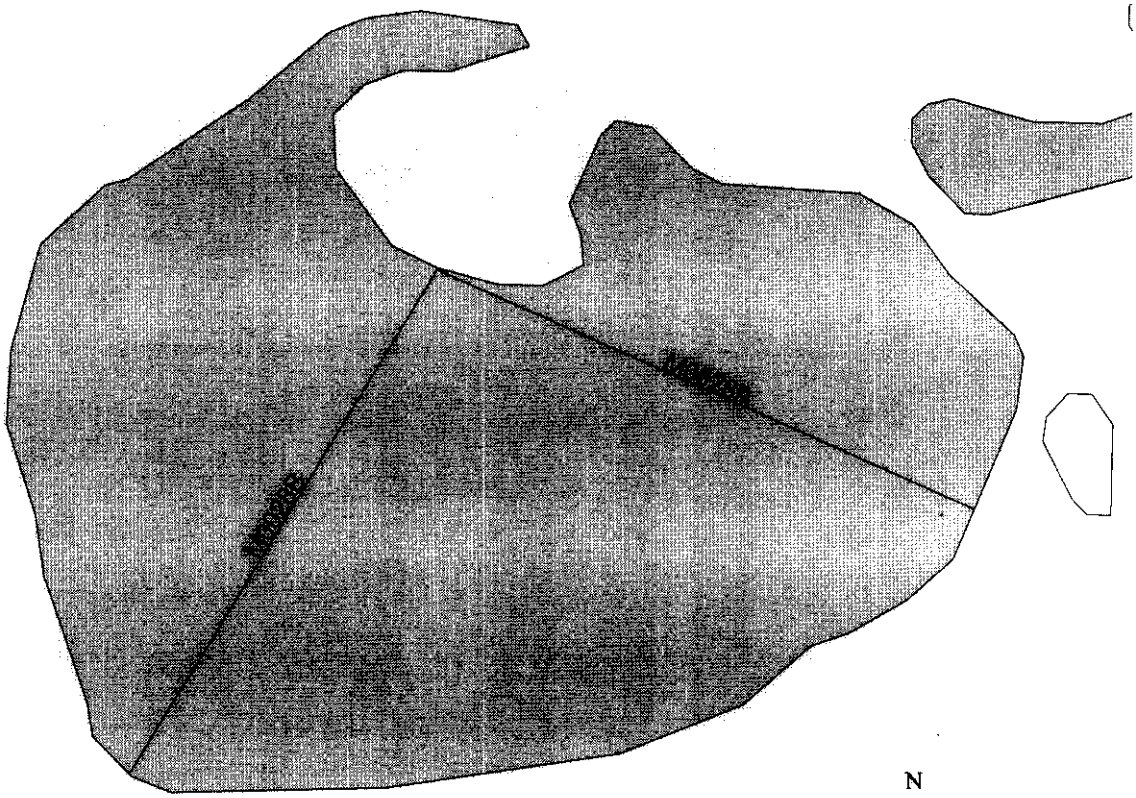
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 31 00	8.0	None	0
Minnow Traps	Jul 31 00	9.5	None	0


Transect M0025A
Depth in Feet
0
5
10
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0025B
Depth in Feet
0
5
10
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0025C
Depth in Feet
0
5
10
0
500
1,000
1,500
Distance along Transect (feet)

M0028



0 0.05 0.1 0.15 Miles

Lake M0028

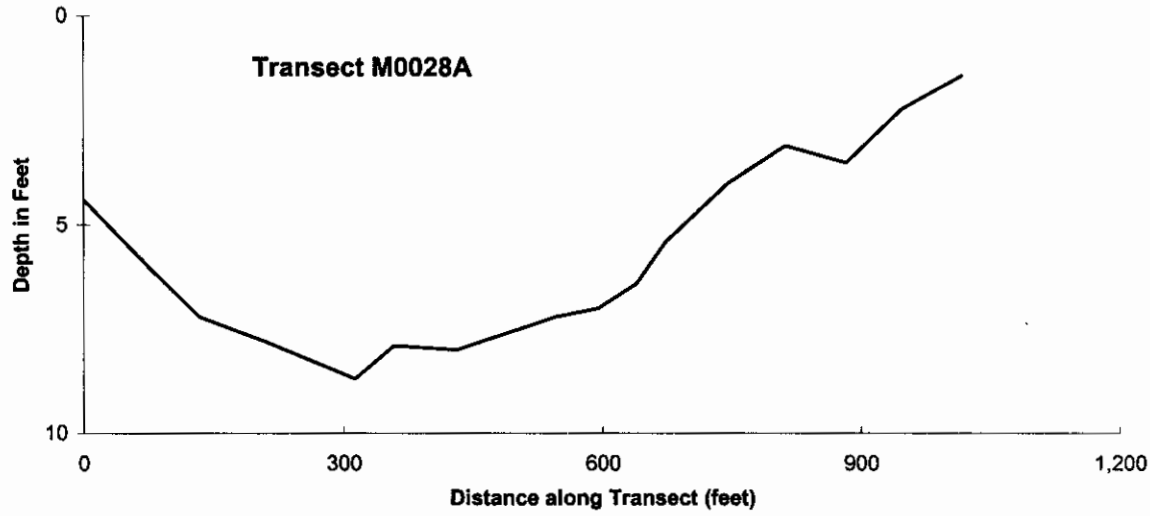
Other Names:
Location: 70°15.62N 151°52.33'W
USGS Quad Sheet: Harrison Bay B-4: Section 34 T11N R1E
Habitat:
Area: 36 acres
Maximum Depth: 8.7 feet
Active Outlet:
Spec. Conductance: 119.4 µS/cm
pH: 8.2
Calculated Volume: 34.1 million gallons
Permittable Volume: No fish concern

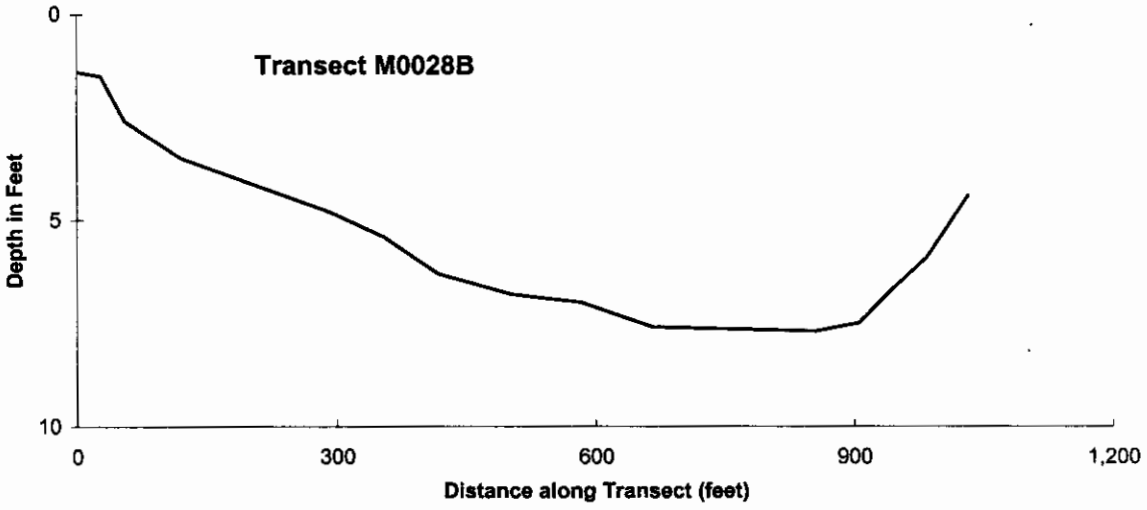
Water Quality:

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
2000	10.4	5.0	13.7	3.4	48	74	this study

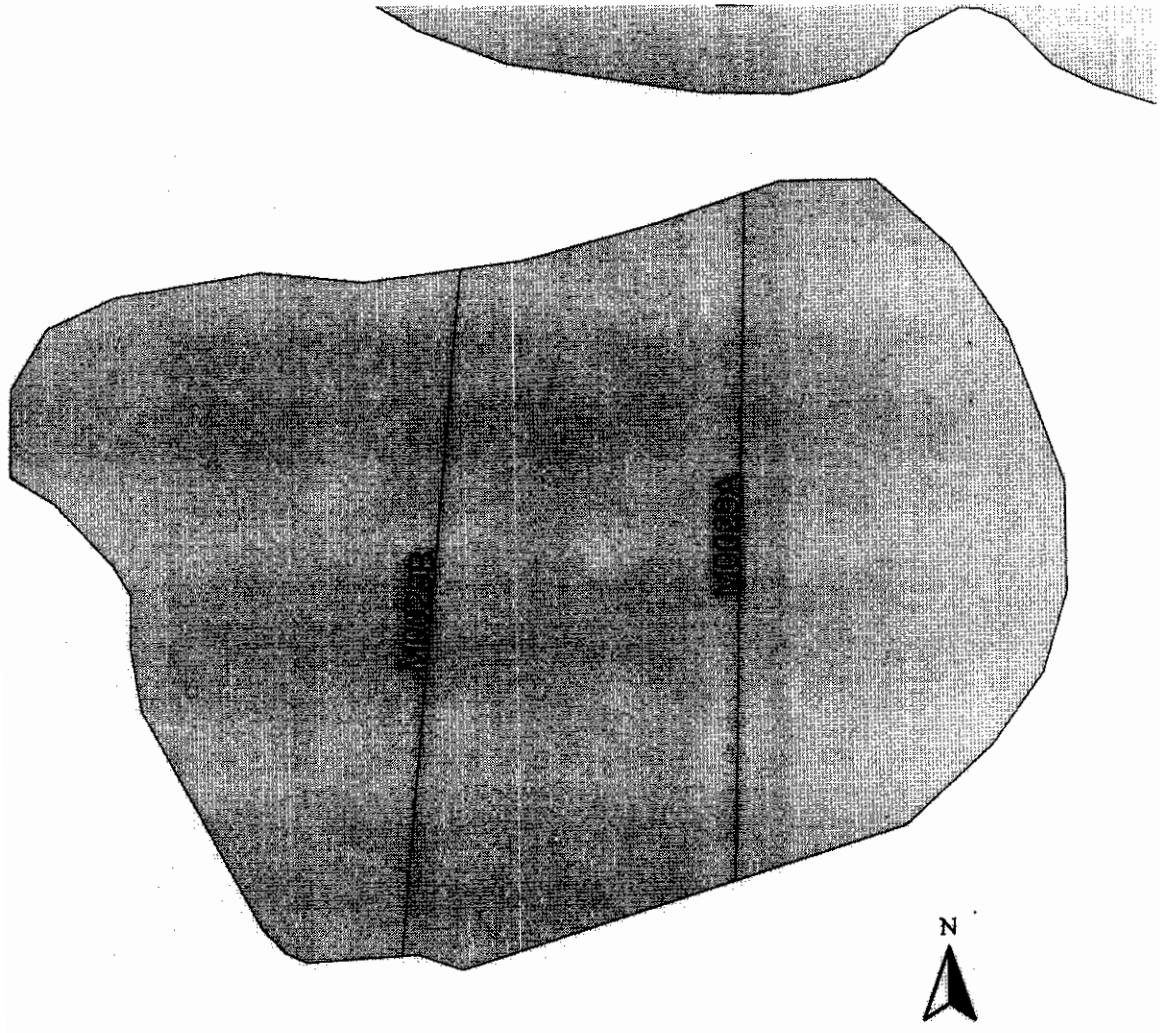
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Aug 2 00	8.0	None	0
Minnow Traps	Aug 2 00	9.5	Ninespine stickleback	1


Transect M0028A
Depth in Feet
0
5
10
0
300
600
900
1,200
Distance along Transect (feet)


Transect M0028B
Depth in Feet
0
5
10
0
300
600
900
1,200
Distance along Transect (feet)

M0029



Lake M0029

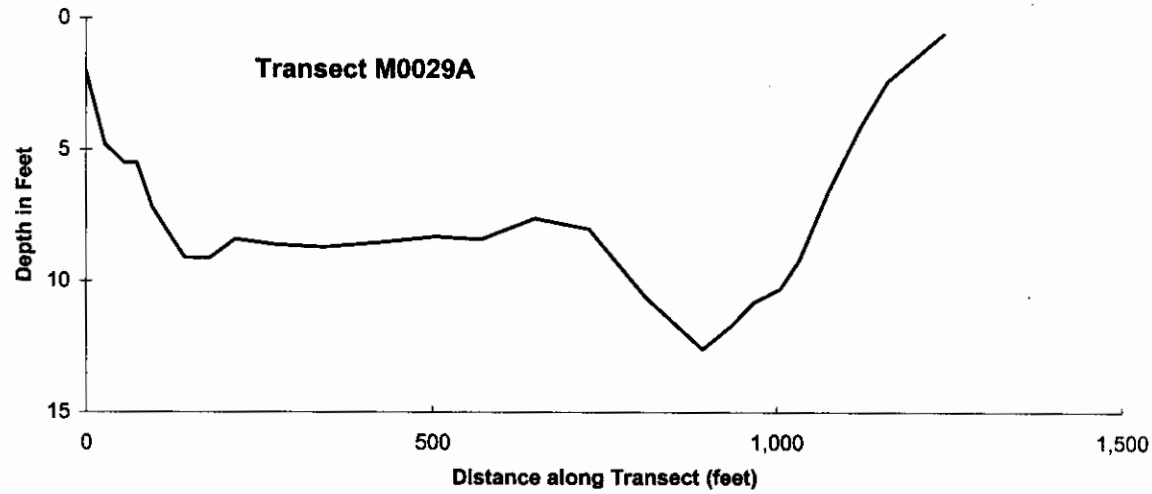
Other Names:
Location: 70°07.10'N 152°12.55'W
USGS Quad Sheet: Harrison Bay A-4: Section 20 of T9N R1W
Habitat:
Area: 44 acres
Maximum Depth: 12.6 feet
Active Outlet:
Spec. Conductance: 468.3 µS/cm
pH: 8.5
Calculated Volume: 60.2 million gallons
Permittable Volume: No fish concern

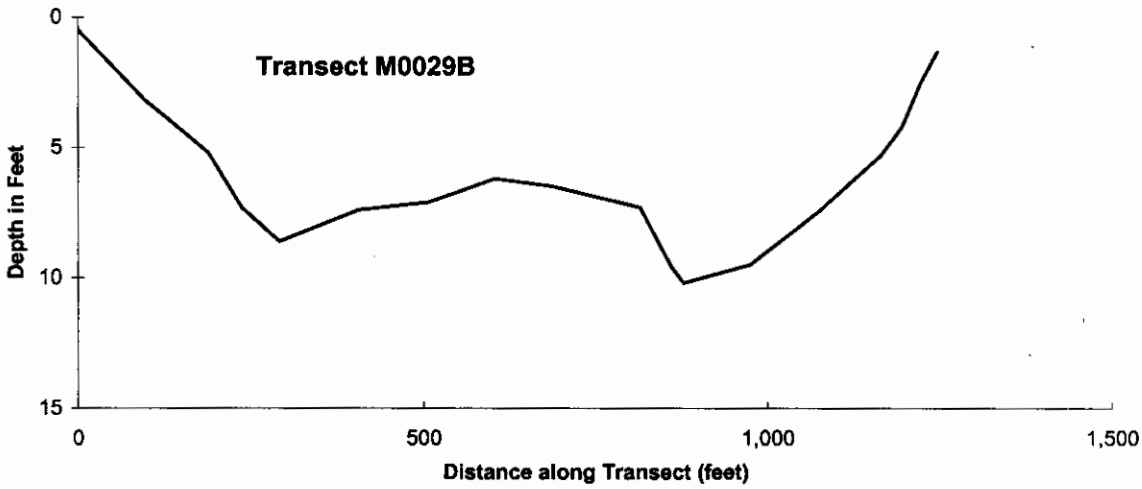
Water Quality:

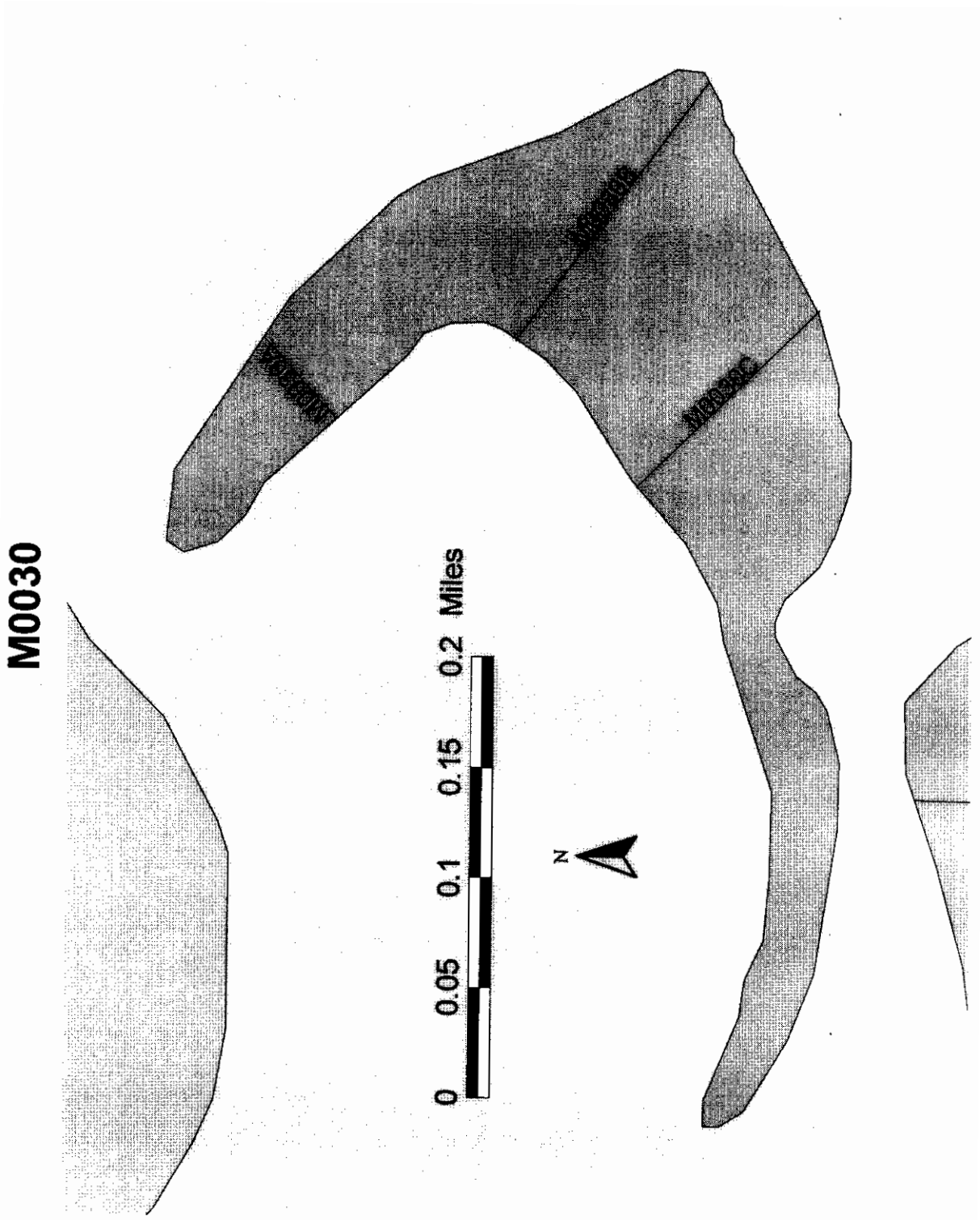
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	45.9	29.3	39.2	10.6	142	254	this study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Aug 3 00	10.9	None	0	
Minnow Traps	Aug 3 00	12.0	Ninespine stickleback	3	52-56


Transect M0029A
Depth in Feet
0
5
10
15
0
500
1,000
1,500
Distance along Transect (feet)


Transect M0029B
Depth in Feet
0
5
10
15
0
500
1,000
1,500
Distance along Transect (feet)


M0030
0
0.05
0.1
0.15
0.2 Miles
N

Lake M0030

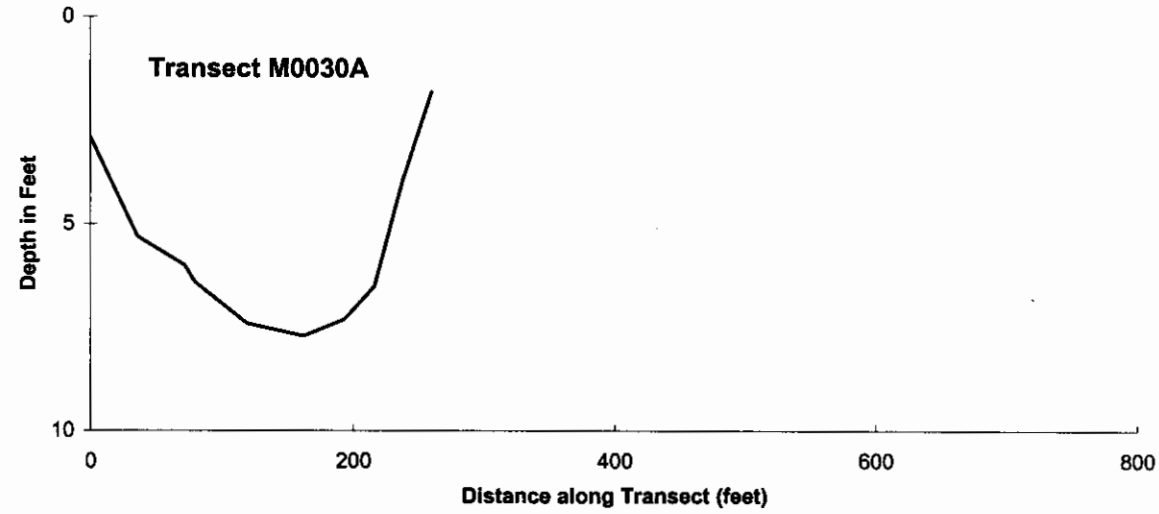
Other Names:
Location: 70°07.34'N 152°11.83'W
USGS Quad Sheet: Harrison Bay A-4: Section 20 of T9N R1W
Habitat:
Area: 26 acres
Maximum Depth: 8.3 feet
Active Outlet:
Spec. Conductance: 198.1 µS/cm
pH: 8.3
Calculated Volume: 23.2 million gallons
Permittable Volume: No fish concern

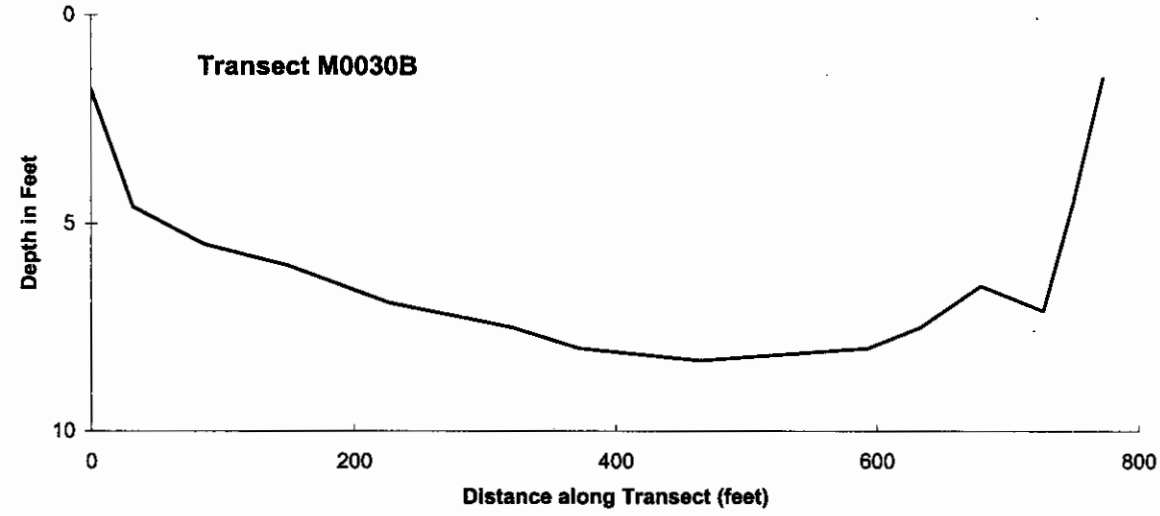
Water Quality:

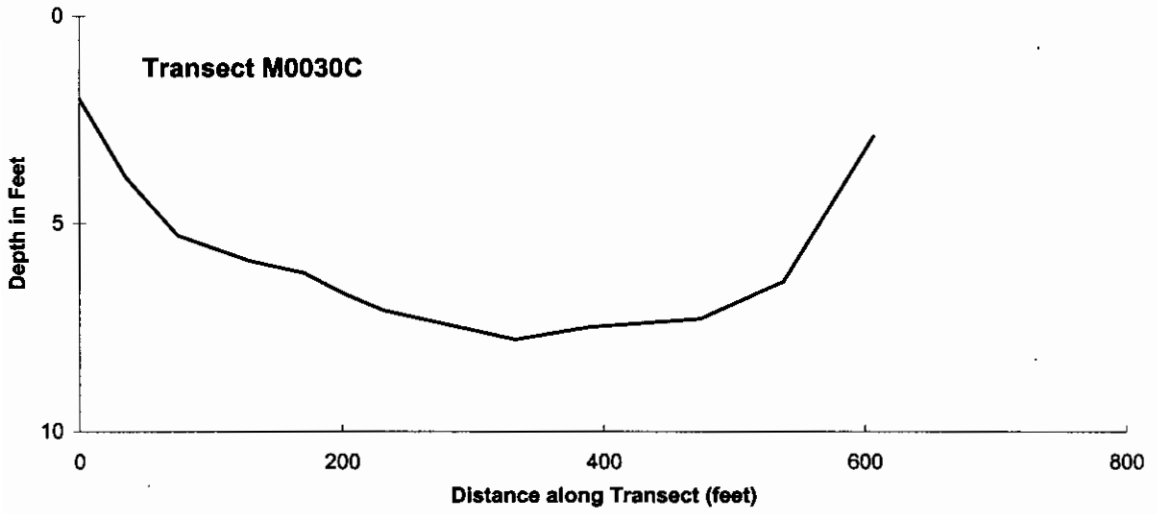
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	20.1	10.0	22.6	4.4	75	66	this study

Catch Record:

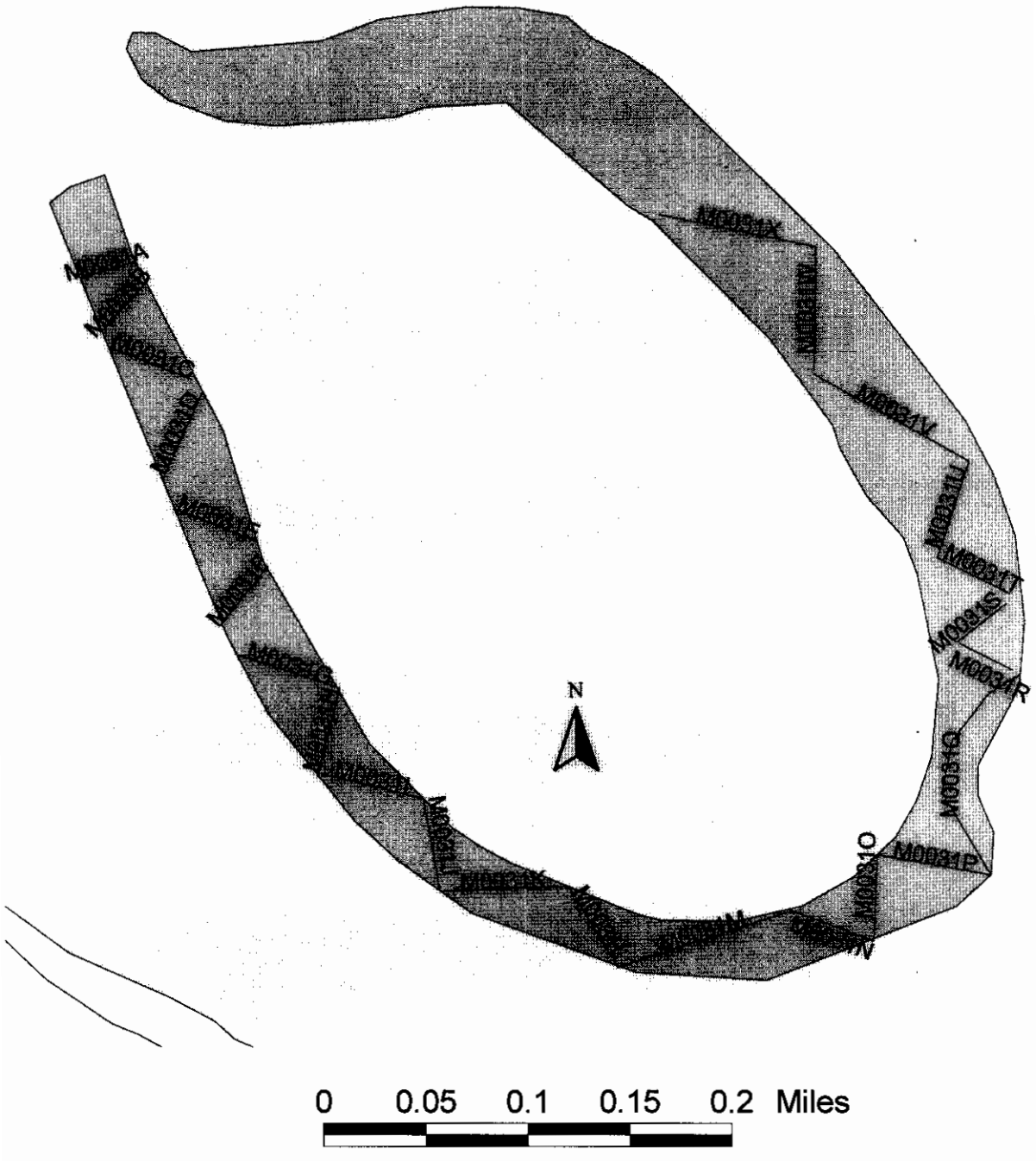
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Aug 3 00	11.0	None	0
Minnow Traps	Aug 3 00	12.0	None	0


Transect M0030A
Depth in Feet
0
5
10
0
200
400
600
800
Distance along Transect (feet)


Transect M0030B
Depth in Feet
0
5
10
0
200
400
600
800
Distance along Transect (feet)


Transect M0030C
Depth in Feet
0
5
10
0
200
400
600
800
Distance along Transect (feet)

M0031


M0031X
M0031V
M0031U
M0031T
M0031S
M0031R
M0031Q
M0031P
M0031O
N
0 0.05 0.1 0.15 0.2 Miles

Lake M0031

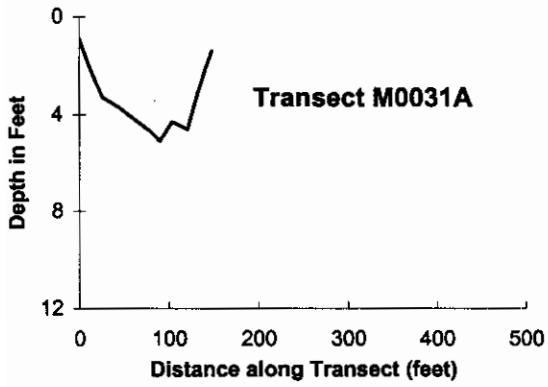
Other Names:
Location: 70°07.54'N 152°10.30'W
USGS Quad Sheet: Harrison Bay A-4: Section 17 of T9N R1W
Habitat:
Area: 33 acres
Maximum Depth: 11.4 feet
Active Outlet:
Spec. Conductance: 120 µS/cm
pH: 8.0
Calculated Volume: 40.9 million gallons
Permittable Volume: No fish concern

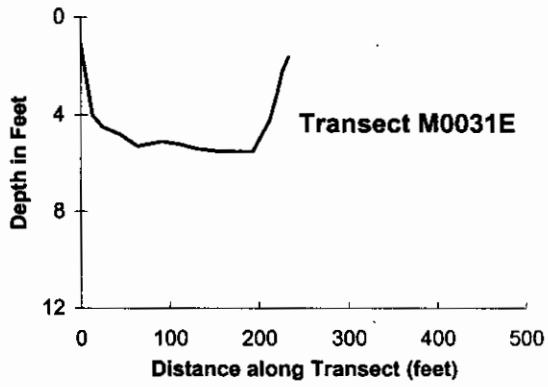
Water Quality:

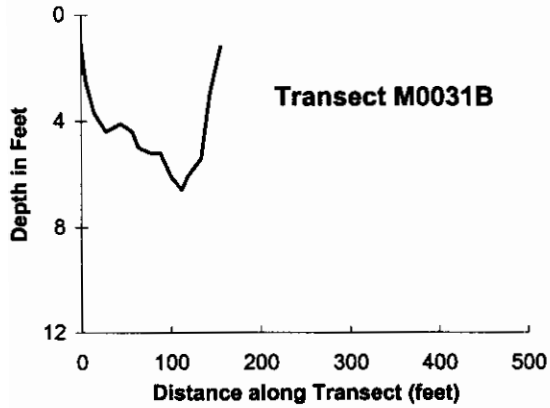
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	6.9	4.4	16.9	2.3	52	56	this study

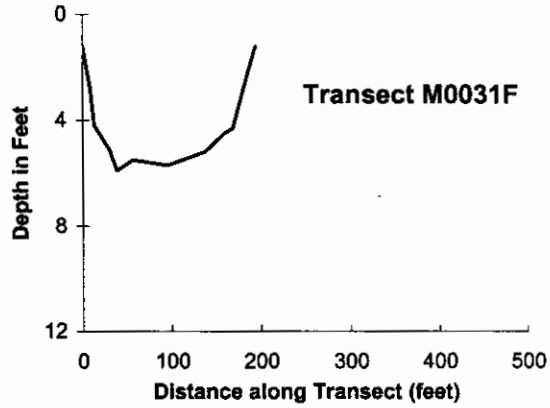
Catch Record:

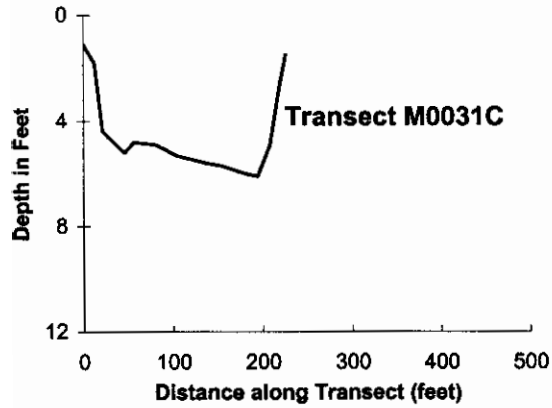
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Aug 3 00	11.1	None	0
Minnow Traps	Aug 3 00	11.5	None	0

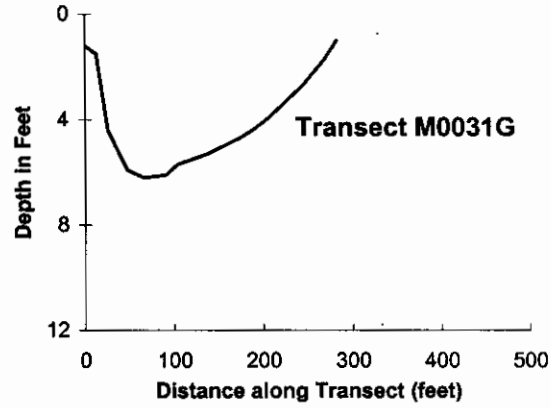

Transect M0031A
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

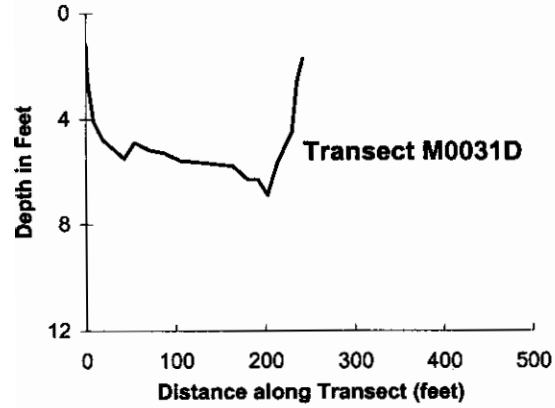

Transect M0031E
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

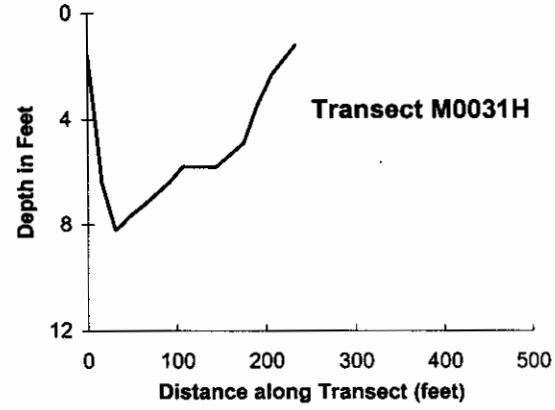

Transect M0031B
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

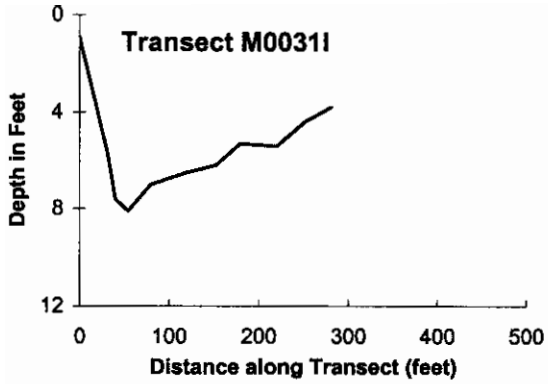

Transect M0031F
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

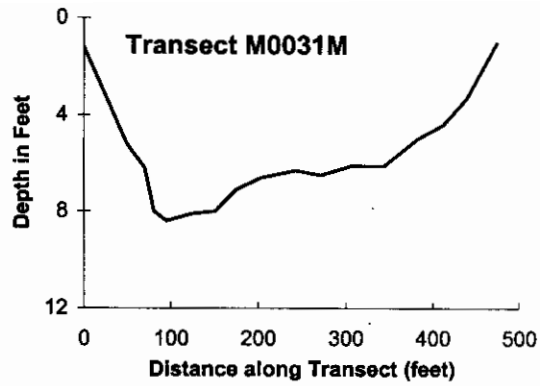

Transect M0031C
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

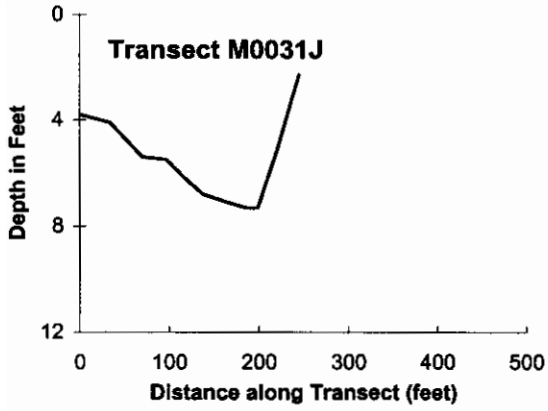

Transect M0031G
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

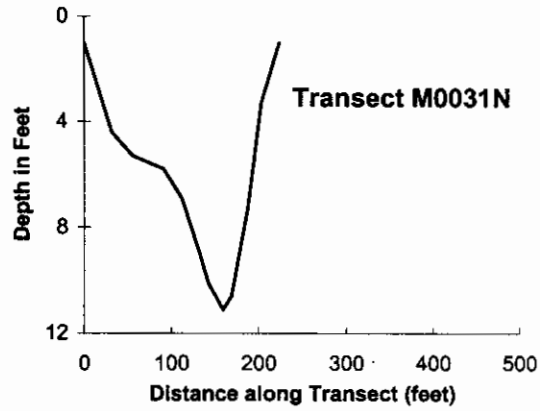

Transect M0031D
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

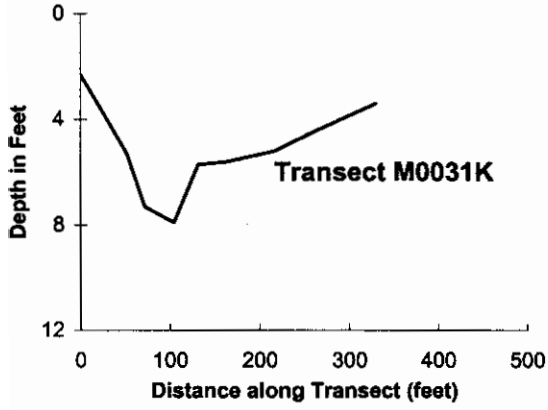

Transect M0031H
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

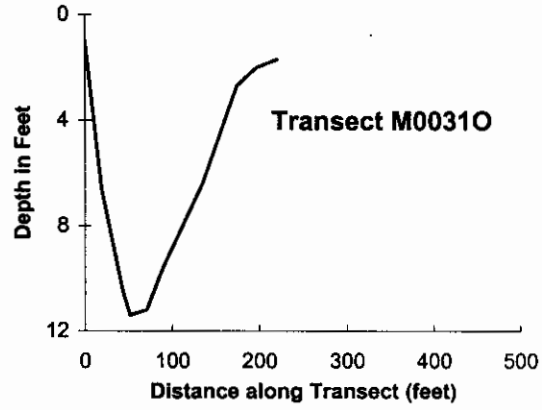

Transect M0031I
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

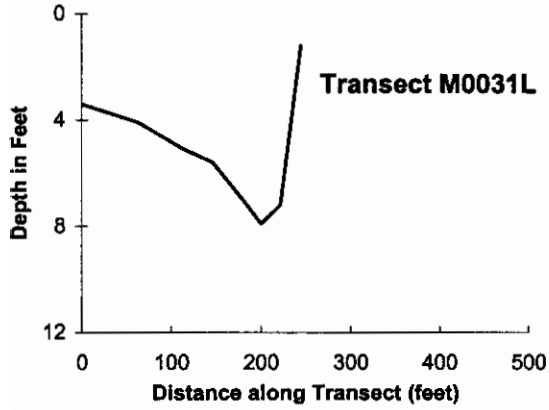

Transect M0031M
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

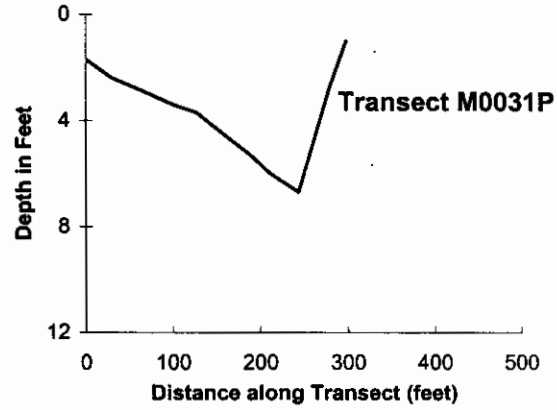

Transect M0031J
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

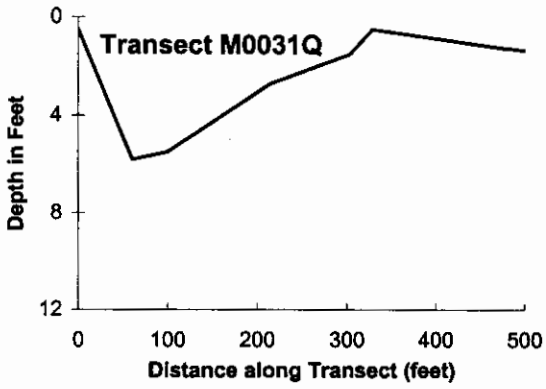

Transect M0031N
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

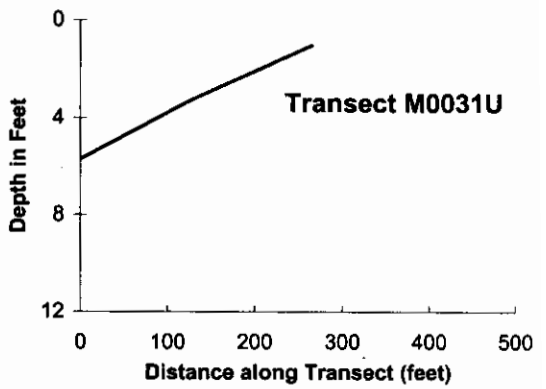

Transect M0031K
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

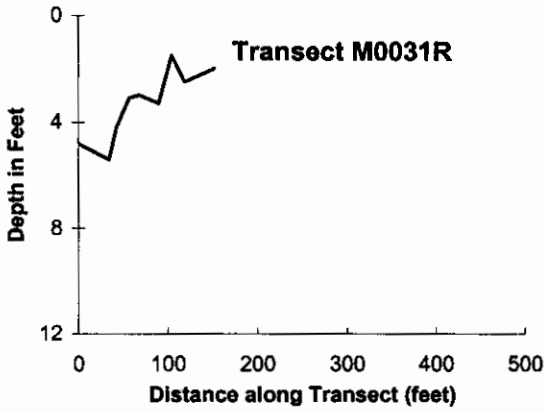

Transect M0031O
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

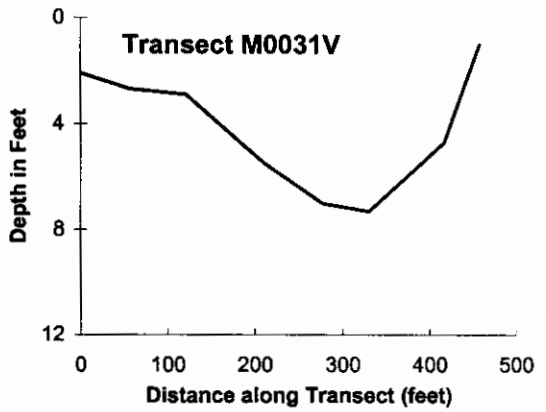

Transect M0031L
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

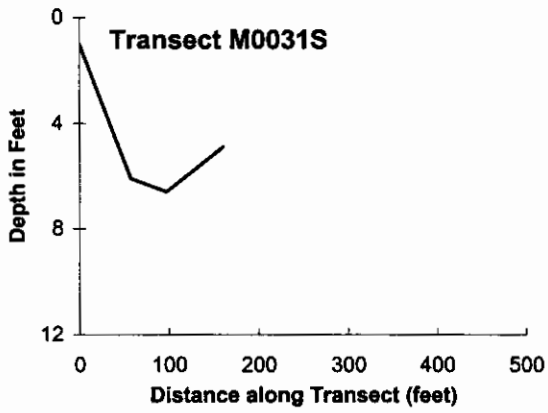

Transect M0031P
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

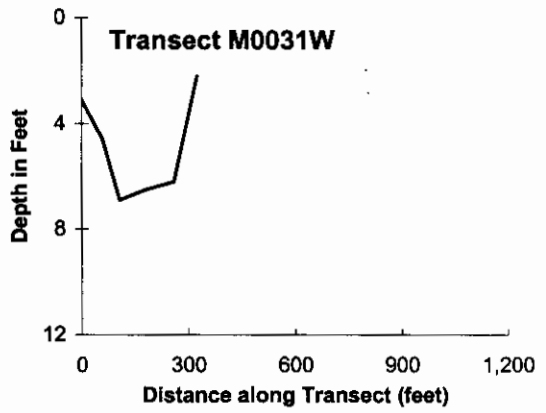

Transect M0031Q
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

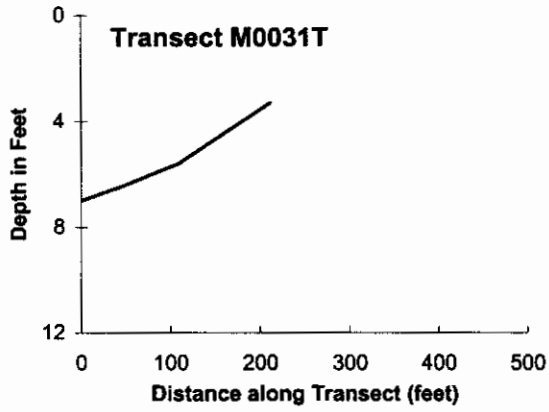

Transect M0031U
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

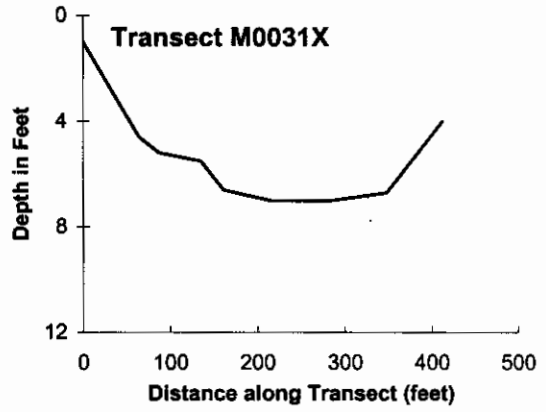

Transect M0031R
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)


Transect M0031V
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)


Transect M0031S
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)


Transect M0031W
Depth in Feet
0
4
8
12
0
300
600
900
1,200
Distance along Transect (feet)


Transect M0031T
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)


Transect M0031X
Depth in Feet
0
4
8
12
0
100
200
300
400
500
Distance along Transect (feet)

M0032
M0032B
M0032C
M0032A
N
0 0.05 0.1 0.15 0.2 Miles

Lake M0032

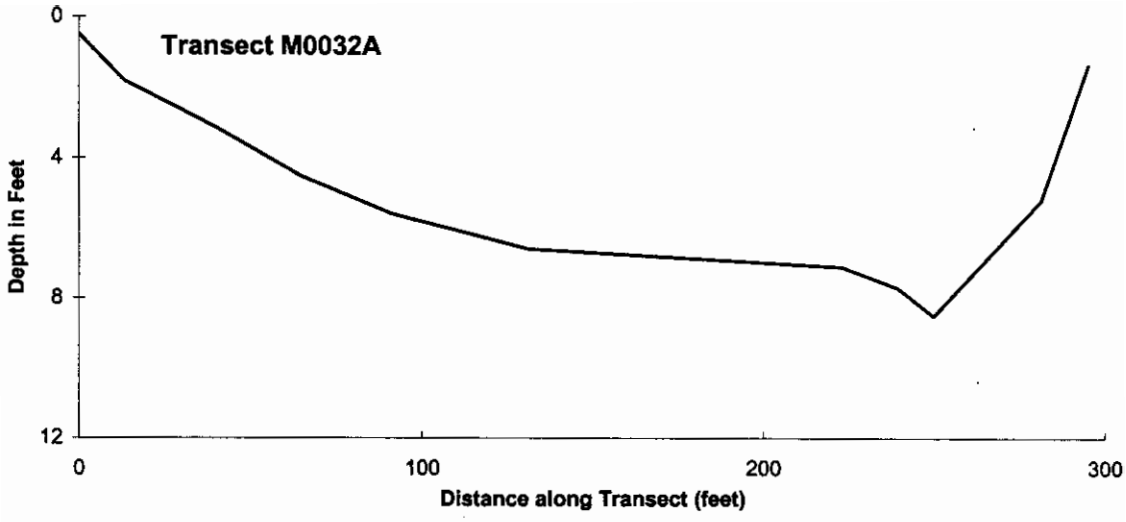
Other Names:
Location: 70°12.93'N 151°54.57'W
USGS Quad Sheet: Harrison Bay A-4: Section 16 of T10N R1E
Habitat:
Area: 29 acres
Maximum Depth: 11.4 feet
Active Outlet:
Spec. Conductance: 205 µS/cm
pH: 8.2
Calculated Volume: 35.0 million gallons
Permittable Volume: 2.0 million gallons

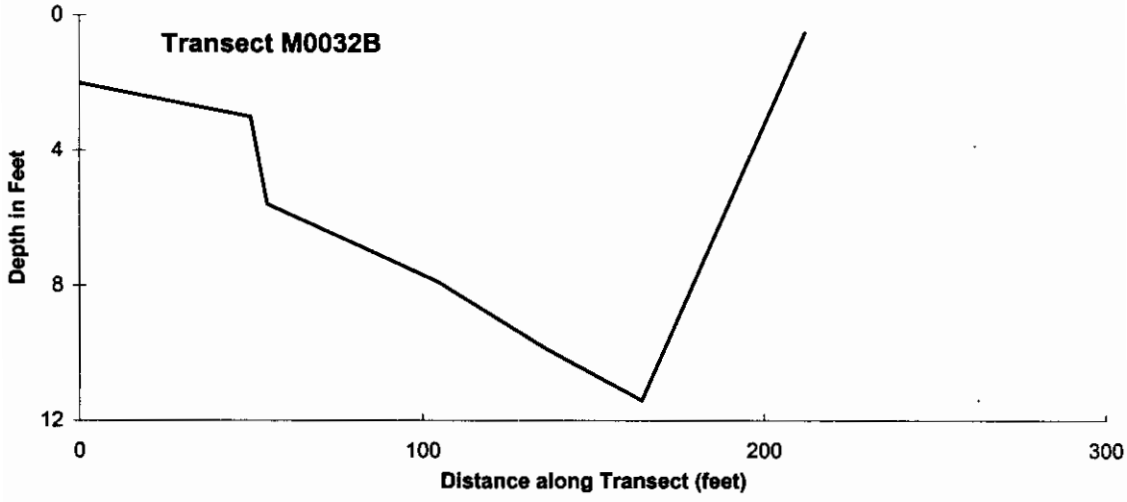
Water Quality:

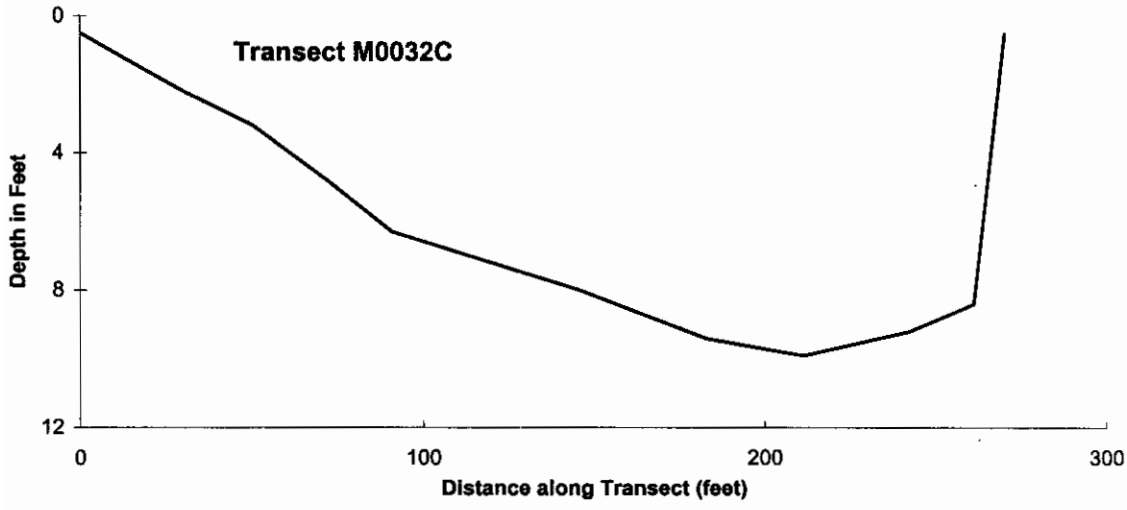
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
2000	21.3	8.2	24.6	4.5	80	114	this study

Catch Record:

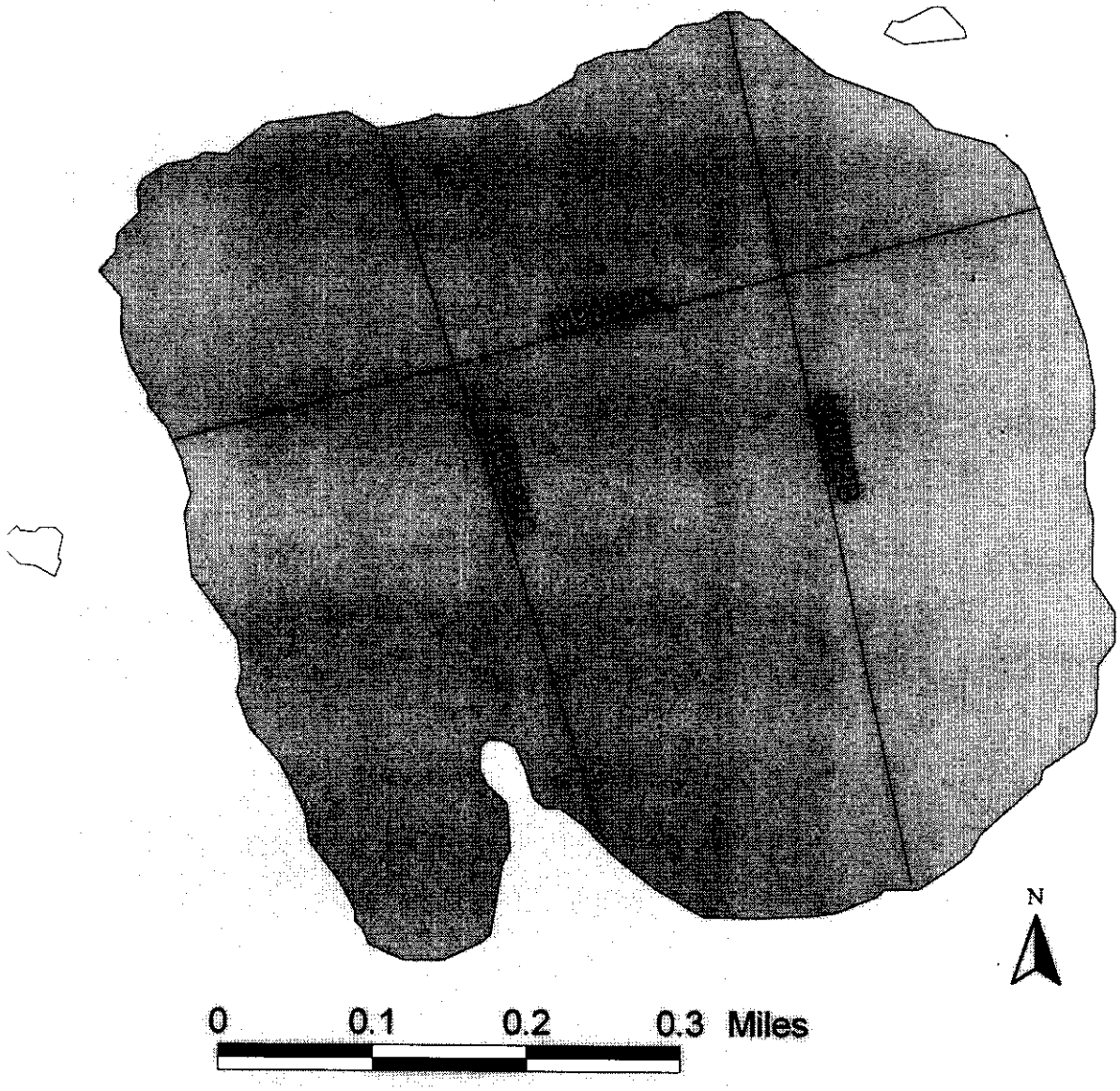
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Aug 4 00	8.5	None	0
Minnow Traps	Aug 4 00	35.5	None	0


Transect M0032A
Depth in Feet
0
4
8
12
0
100
200
300
Distance along Transect (feet)


Transect M0032B
Depth in Feet
0
4
8
12
0
100
200
300
Distance along Transect (feet)


Transect M0032C
Depth in Feet
0
4
8
12
0
100
200
300
Distance along Transect (feet)

M9922



Lake M9922

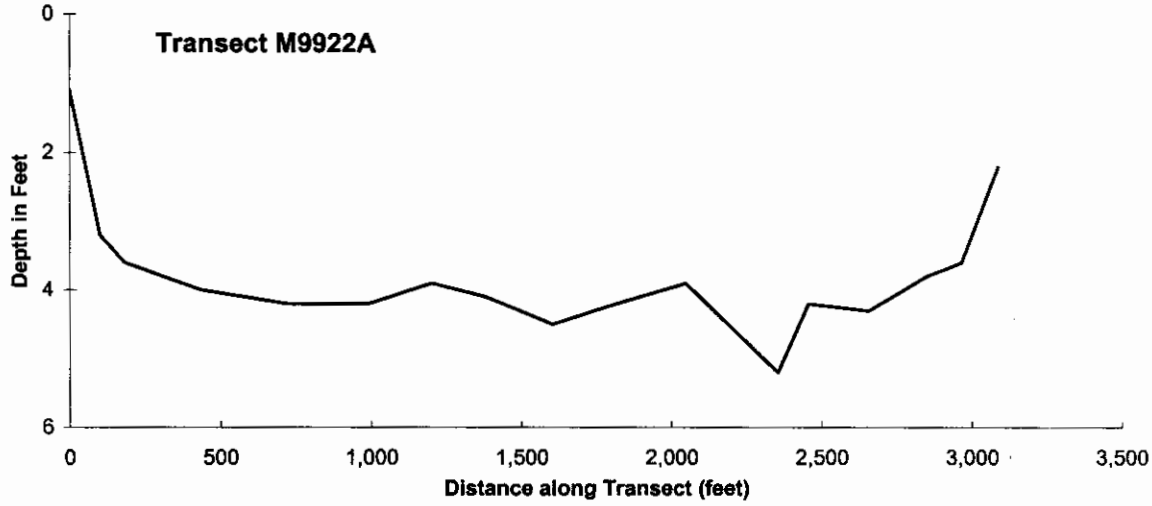
Other Names:
Location: 70°13.80'N 151°35.24'W
USGS Quad Sheet: Harrison Bay A-3: T10N R2E Sect. 10-11, 14-15
Habitat: Tundra lake
Area: 191 acres
Maximum Depth: 5.3 feet
Active Outlet:
Spec. Conductance: 136 µS/cm 1999
135 µS/cm 2000
pH: 7.8 1999
7.8 2000
Calculated Volume: 108.6 million gallons
Permittable Volume: No fish concern

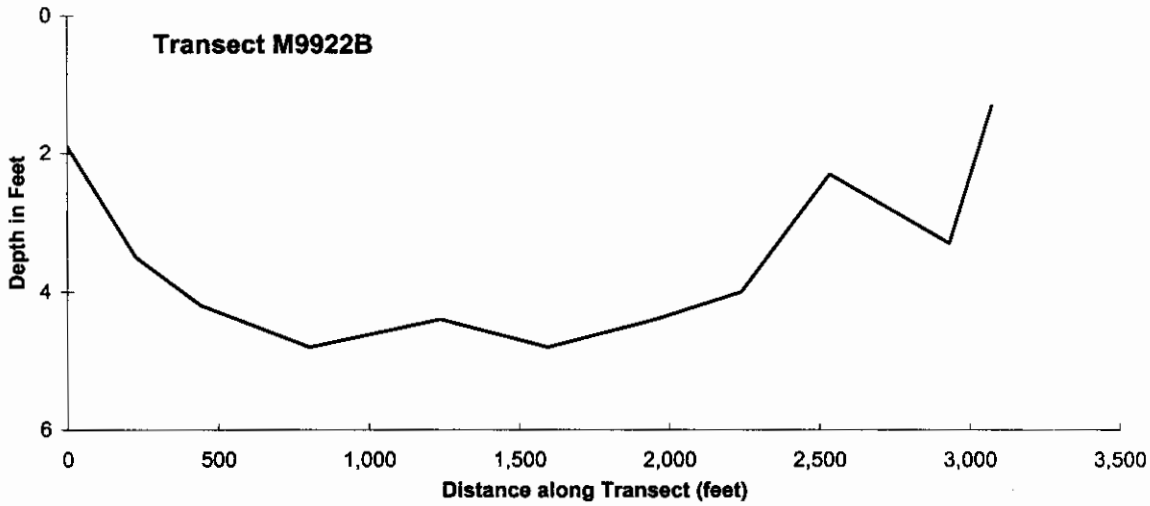
Water Quality:

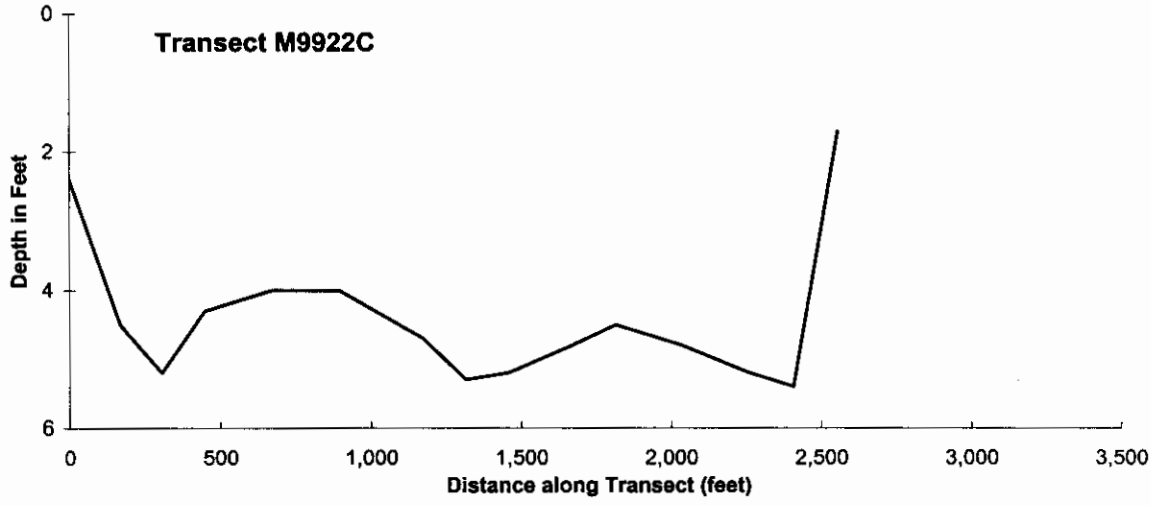
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
1999	23.8	6.2	16.5	4.1	58	92	this study

Catch Record:

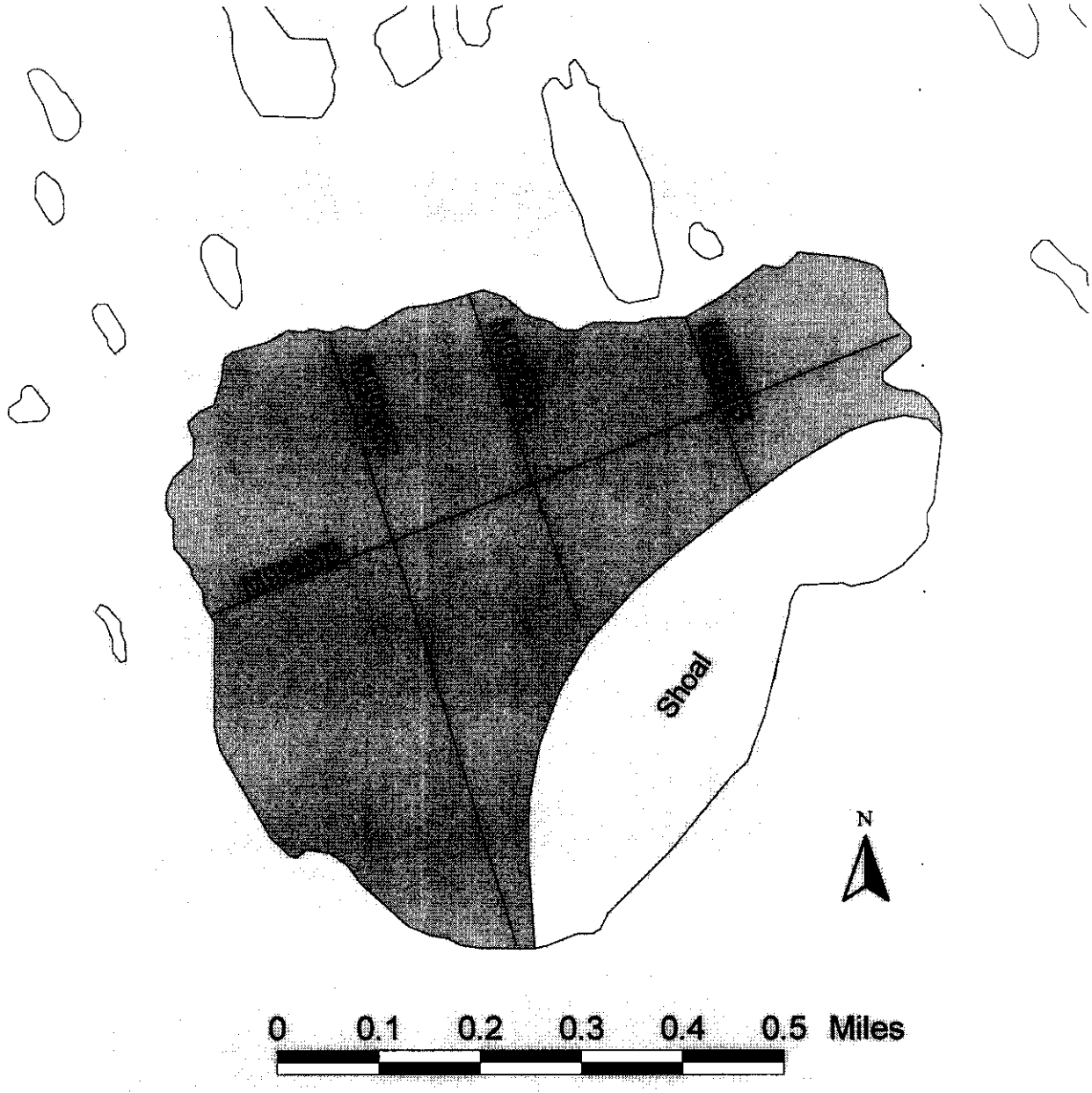
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 15 99	6.4	None	0
Gill Net	Aug 1 00	20.5	None	0
Minnow Traps	Aug 1 00	21.3	Ninespine stickleback	seen


Transect M9922A
Depth in Feet
0
2
4
6
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)


Transect M9922B
Depth in Feet
0
2
4
6
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)


Transect M9922C
Depth in Feet
0
2
4
6
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance along Transect (feet)

M9923



Lake M9923

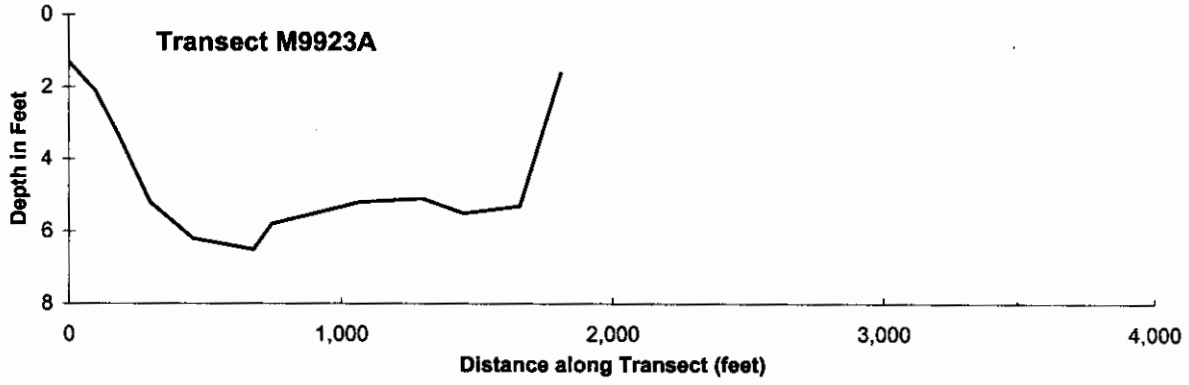
Other Names:
Location: 70°13.70'N 151°31.35'W
USGS Quad Sheet: Harrison Bay A-3: T10N R2E Sect. 12-13
Habitat: Tundra lake
Area: 252 acres
Maximum Depth: 6.5 feet
Active Outlet:
Spec. Conductance: 253 µS/cm 1999
225 µS/cm 2000
pH: 8.2 1999
8.2 2000
Calculated Volume: 175.9 million gallons
Permittable Volume: No fish concern

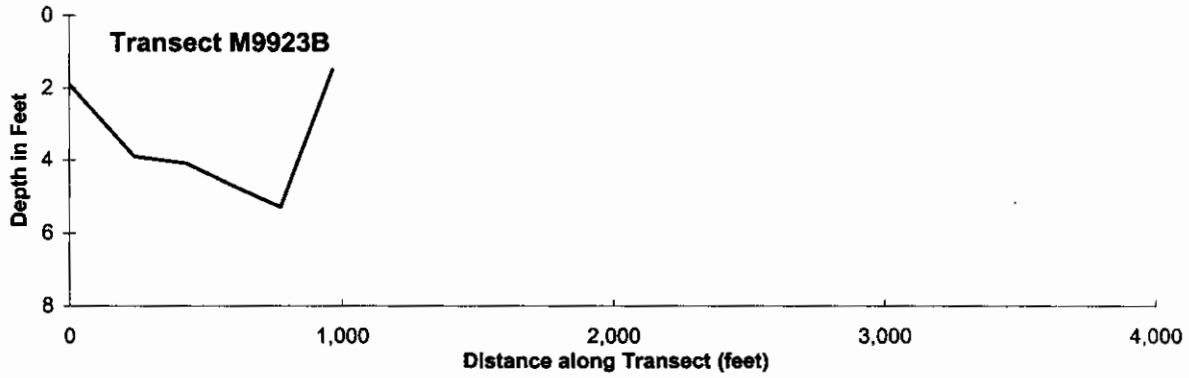
Water Quality:

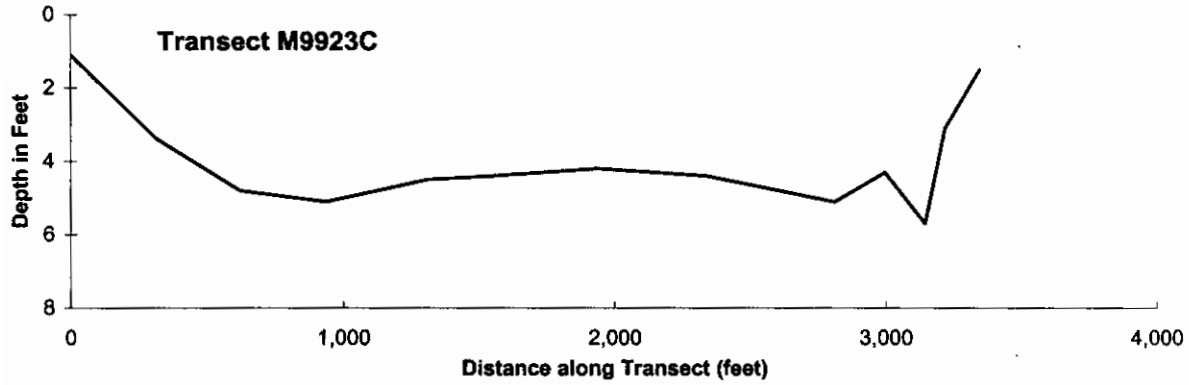
Year of Test	Chloride (mg/l)	Sodium (mg/l)	Calcium (mg/l)	Magnesium (mg/l	Total Hardness [CaCO3] (mg/l)	Total Dissolved Solids (mg/l)	Source
1999	24.1	6.8	38.4	6.3	122	140	this study

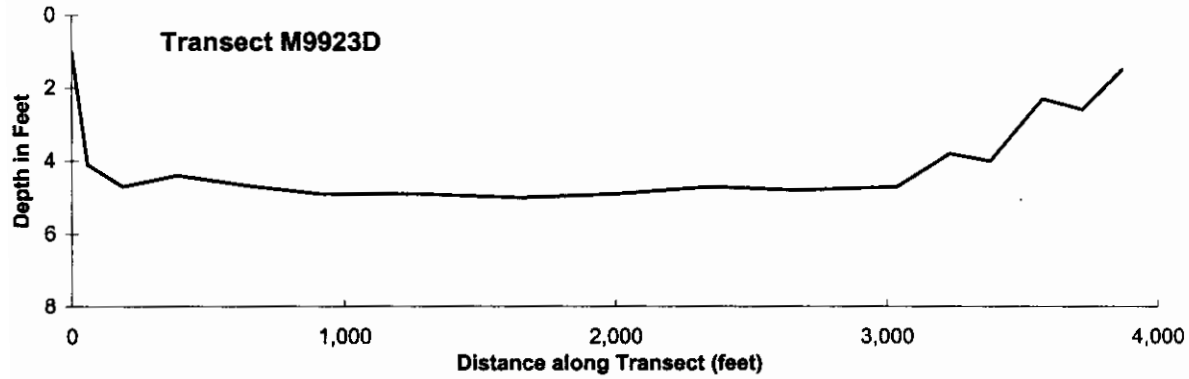
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 17 99	4.0	None	0
Gill Net	Aug 1 00	15.1	None	0
Minnow Traps	Aug 1 00	108.4	None	0


Transect M9923A
Depth in Feet
0
2
4
6
8
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)


Transect M9923B
Depth in Feet
0
2
4
6
8
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)


Transect M9923C
Depth in Feet
0
2
4
6
8
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)


Transect M9923D
Depth in Feet
0
2
4
6
8
0
1,000
2,000
3,000
4,000
Distance along Transect (feet)