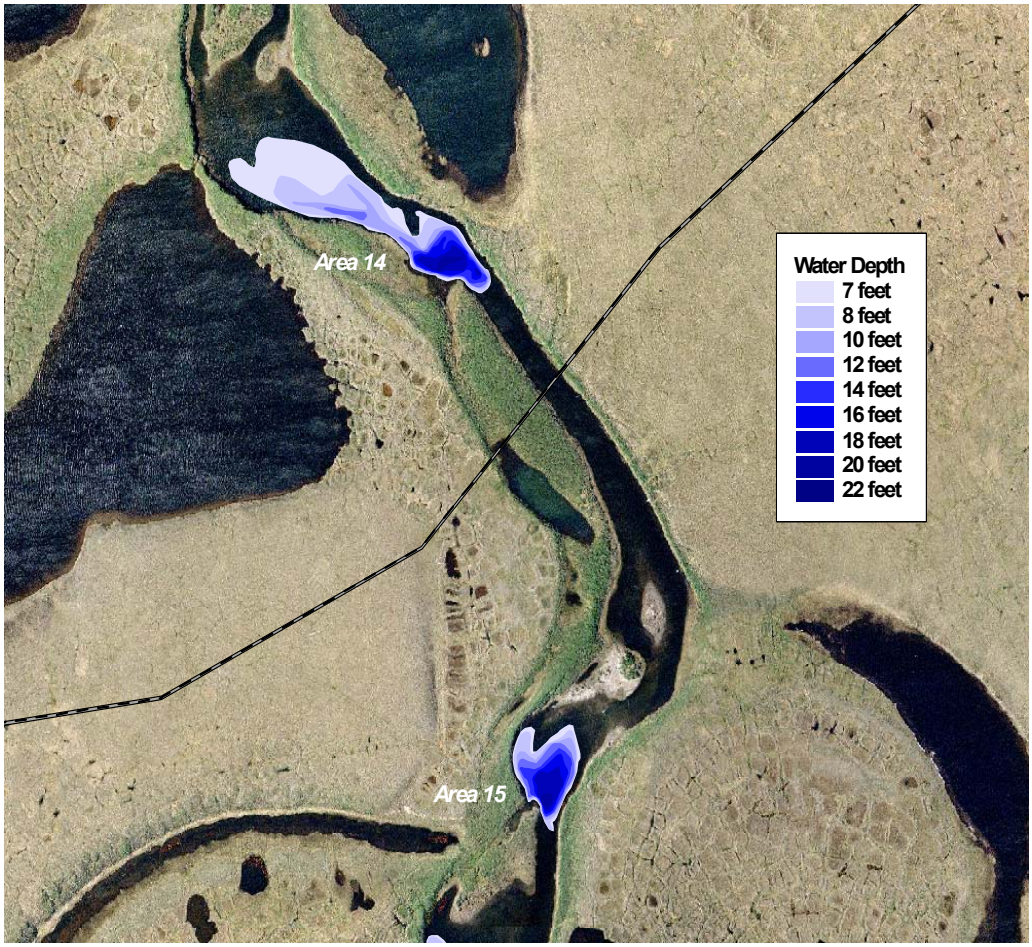
BASELINE SURVEYS OF FISH HABITATS IN EASTERN NPR-A, 2004

Final Report

February 2005



Prepared by:

MJM Research
1012 Shoreland Drive
Lopez Island, WA

Prepared for:
ConocoPhillips Alaska, Inc.
700 G Street
Anchorage, AK

and

Anadarko Petroleum Corp.
1200 Timberloch Place
The Woodlands, TX

BASELINE SURVEYS OF FISH HABITATS IN EASTERN NPR-A, 2004

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Prepared by:

Lawrence L. Moulton
MJM Research
1012 Shoreland Drive
Lopez Island, WA

Prepared for:

ConocoPhillips Alaska, Inc.
700 G Street
Anchorage, AK

and

Anadarko Petroleum Corp.
1200 Timberloch Place
The Woodlands, TX

EXECUTIVE SUMMARY

ConocoPhillips Alaska Inc. (CPAI) has been exploring for oil within the eastern portion of the National Petroleum Reserve–Alaska (NPR-A) since the winter of 1999/2000. Oil reserves have been located in the region, and the feasibility of developing a producing field in the area is being investigated. Part of the evaluation process includes assessing the potential environmental impacts. The inventory of fish and fish habitat provides information for assisting permitting decisions regarding road and pipeline routing. In addition, streams in the area may be crossed by ice roads, so an understanding of potential overwintering areas is also desirable. A key element of the study is identifying movements and distribution of fish utilizing the stream systems.

The present study was the first detailed examination of fish populations in the drainages of eastern NPR-A. The study was designed to provide details of fish populations in eastern NPR-A and the habitats used by those populations, so that oilfield facilities can be sited, designed and constructed in a manner that will avoid or minimize impacts. Specific objectives of the 2004 fish survey were to conduct studies on the Uvlutuuq (Fish Creek) and Tingmiaqsiugvik (Ublutuoch River) drainage systems to:

a) describe fish populations and habitat use patterns within streams and lakes of eastern NPR-A,
b) obtain information on fish movements within the drainages,
c) evaluate potential fish wintering areas in the Tingmiaqsiugvik (Ublutuoch River),
d) estimate available water in lakes in or near potential development areas.

METHODS

During summer 2004, fyke nets were used to sample small streams and lakes in the eastern NPR-A study area. Sampling was by fyke net so that fish could be released unharmed. Sampling covered late June to evaluate post-breakup movements, late July-early August to evaluate fish use of channels after spring out-migration was complete, and late August to evaluate potential movements to wintering areas. Water chemistry parameters, including water temperature, specific conductance, dissolved oxygen, pH, and turbidity, were measured to assess habitat conditions and provide information on the suitability of the water for domestic and industrial uses. Fish were tagged to reveal movements within the study area.

Bathymetric data were collected to allow estimating lake volume and identify potential wintering areas in the lower Tingmiaqsiugvik (Ublutuoch River). Water volume was estimated by contour mapping of depth intervals.

RESULTS

Ten species were captured in small streams in eastern NPR-A during fyke net sampling in 2004. Ninespine stickleback were the most abundant species, followed by Arctic grayling. Bill's Creek and Crea Creek, small tributary streams, produced the greatest number of grayling, followed by the Tingmiaqsiugvik (Ublutuoch River).

An unusual event during 2004 was the catch of 4 adult chinook salmon (685-900 mm) in the Tingmiaqsiugvik (Ublutuoch River) during August. Three were captured on August 3 and an additional one on August 23. Chinook salmon are rarely encountered along the Beaufort Sea coast and are considered strays from streams farther south.

Tags were applied to 517 Arctic grayling in 2004, bringing the total number of tagged grayling in eastern NPRA to 1,101 since 2001 (Table 3). During 2004, 73 tagged grayling were recovered, with 144 recaptured from 2001 to 2004. Most were recaptured near the release location although one moved almost 10 miles from Iqalliqpiq (Judy Creek) into upper Uvlutuuq (Fish Creek), another moved nearly 16.5 miles from MC7916 to the confluence of Uvlutuuq (Fish Creek) and Iqalliqpiq (Judy Creek), and two moved about 29.7 miles from the confluence of Uvlutuuq (Fish Creek) and Iqalliqpiq (Judy Creek) to the Tingmiaqsiugvik (Ublutuoch River) sampling station. Multiple recaptures of the same fish are common, with one fish recaptured four times during the summer and another being captured for the fifth time since its original release in 2001 Tag returns indicate that Arctic grayling are wide ranging within the Fish Ck/Judy Ck drainage system, however, many appear to consistently use the clear water creeks and lakes associated with the Ublutuoch River. One fish demonstrating remarkable consistency was captured at the Tingmiaqsiugvik (Ublutuoch River) site on the following dates:

June 25, 2001
June 25, 2002
June 22, 2003
June 23, 2004

Catch rates of Arctic grayling in the small streams were consistently higher in 2004 as compared to 2003, but the size ranges were similar within each creek in both years. The higher catches in 2004 may be a result of greater activity caused by warmer water temperatures. Oil Creek, the smallest of surveyed tributaries, contained primary ages 1 and 2 while both Crea Creek and Tingmiaqsiugvik (Ublutuoch River) supported a wide range of ages.

There was substantial movement of fish in clear water tributaries connected to lake systems. Both Bill's Creek and Crea Creek are connected to lake systems by well-defined streams. Bill's Creek had the highest diversity followed by Crea Creek. In contrast, other clear water streams without significant lake area or with ephemeral connecting streams supported lower densities and diversity. It is clear that connected lakes with predictable access provide important rearing areas for many fish species during summer.

Nineteen lakes in eastern were sampled by fyke net during 2004. Fifteen of these lakes were tundra lakes remote from streams and contained only ninespine stickleback and Alaska blackfish. The other four lakes were connected by stream to Bill's Creek and Crea Creek. All four of these connected lakes contained Arctic grayling, while two contained broad whitefish and one contained least cisco.

Large isolated tundra lakes had the highest overall catch rates, with all of the catch being ninespine

stickleback and Alaska blackfish. Lack of access prevents other species from dispersing into these lakes except under extremely high flow or runoff, and the shallowness of these lakes limits wintering success.

The lower portion of the Tingmiaqsiugvik (Ublutuoch River) was identified as a wintering area in 2001/2002 based on results of radio-tracked broad whitefish, Arctic grayling and burbot. A bathymetric survey on July 19-20, 2004 identified 34 potential wintering sites, ranging in volume from 600 cubic feet to over 2.85 million cubic feet. Wintering sites were spread from near the mouth upstream to near river kilometer 19.

Twenty-eight lakes in the eastern NPR-A study area were evaluated as potential water-source lakes, either by initial survey or re-survey using new techniques. Twenty-six of the lakes were confirmed to contain ninespine stickleback; because of similar habitat, it is likely the remaining two lakes also contained this species. Nine of the lakes supported sensitive species, including Arctic grayling, broad whitefish and least cisco. The 28 lakes could provide up to 131.4 million gallons of water for use, with up to 2,755 acres available for removing chips for ice aggregate.

CONCLUSIONS

Sampling in eastern NPR-A during 2004 indicated, as in previous years, that the Tingmiaqsiugvik (Ublutuoch River) is heavily used by Arctic grayling and broad whitefish, with round whitefish and least cisco also present during summer. Clearwater tributaries to the Tingmiaqsiugvik (Ublutuoch River) that have strong connections to lakes supported high densityies of juvenile Arctic grayling, as well as a variety of other species, indicating the importance of these small connected streams as summer feeding areas. Adult Arctic grayling also ascended these small tundra drainages to feed, resulting in some tag recaptures.

A substantial portion of the lower Tingmiaqsiugvik (Ublutuoch River) contains water deep enough to support wintering fish, with over 10.7 million cubic feet of potential wintering habitat. Use of this reach as a wintering area has been previously documented (Morris 2003).

Lakes connected to the rivers also provide important fish habitat, as evidenced by the heavy use of connected lakes and associated streams, and results from radio-tagged broad whitefish, Arctic grayling, and burbot. The value of a lake increases as predictability of access increases. Lakes remote from stream systems supported ninespine stickleback, while lakes with seasonal connections to stream systems also supported Alaska blackfish and low densities of juvenile Arctic grayling..

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BASELINE SURVEYS OF FISH HABITATS IN EASTERN NPR-A, 2004

INTRODUCTION

ConocoPhillips Alaska Inc. (CPAI) has been exploring for oil within the eastern portion of the National Petroleum Reserve–Alaska (NPR-A) since the winter of 1999/2000. Oil reserves have been located in the region, and the feasibility of developing a producing field in the area is being investigated. Part of the evaluation process includes assessing the potential environmental impacts, which requires information specific to the activity area in order to evaluate the biological sensitivity of streams and lakes in the region. Streams in the area may be crossed by ice roads during winter or by roads and/or pipelines after development. An understanding of the fish populations in these streams is needed to minimize effects to these populations during field development. The inventory of fish and fish habitat provides information for assisting permitting decisions regarding road and pipeline routing.

Streams in the study region have previously been investigated by Netsch et al. (1977), and Bendock and Burr (1984). These surveys consisted of one-day visits at each site for inventory-level surveys over a wide area, with sampling by gill net, seine, minnow trap, and angling. Species reported from Uvlutuuq (Fish Creek) and Iqalliqpiq (Judy Creek) included broad whitefish, Arctic grayling, round whitefish, slimy sculpin and ninespine stickleback. The Tingmiaqsiugvik (Ublutuoch River) was also reported to contain Arctic grayling, slimy sculpin and ninespine stickleback.

The present study was begun in 2001 as the first detailed examination of fish habitats and populations in the eastern NPR-A study area (Moulton 2002, 2003). The study was designed to provide details of fish populations in eastern NPR-A (Figure 1), and the habitats used by those populations, so that oilfield facilities can be sited, designed and constructed in a manner that will avoid or minimize impacts.

Specific objectives of the 2004 fish survey were to conduct studies on the Uvlutuuq (Fish Creek) and Tingmiaqsiugvik (Ublutuoch River) drainage systems to:

a) describe fish populations and habitat use patterns within streams and lakes of eastern NPR-A,
b) obtain information on fish movements within the drainages,
c) evaluate potential fish wintering areas in the Tingmiaqsiugvik (Ublutuoch River),
d) estimate available water in lakes in or near potential development areas.

METHODS

Biological Sampling

During summer 2004, fyke nets were used to sample smaller drainages and lakes in the eastern NPR-A study area (Figures 2 and 3). Initial stream sampling begun in 2001 consisted of fyke net stations in lower and upper Uvlutuuq (Fish Creek) (i.e. upstream from the confluence of Uvlutuuq (Fish Creek) and Iqalliqpiq (Judy Creek)), Iqalliqpiq (Judy Creek), and the Tingmiaqsiugvik (Ublutuoch River). In 2002 and 2003, sampling was expanded to smaller tundra stream drainages associated with the greater Uvlutuuq (Fish Creek)/Iqalliqpiq (Judy Creek) system. Additional stations were sampled in lakes throughout the study region.

During summer 2004, the study design included two tasks to investigating fish habitat in eastern NPR-A. The first task was to re-sample small streams in the eastern NPR-A study area in the vicinity of potential development (Figure 2). Streams selected were tundra streams previously sampled in 2003 that discharged directly into Uvlutuuq (Fish Creek) and Tingmiaqsiugvik (Ublutuoch River) or into lakes associated with those two drainages. The second task involved re-sampling with fyke nets in selected lakes that had previously been sampled by gill net, or in lakes that were attached to the stream systems (Figure 3).

Sampling was by fyke net so that fish could be released unharmed. Fyke nets used had an opening 0.9 m deep by 1.1 m wide, the trap end was 4.9 m long, made of 9.5 mm mesh. The wings (5 m long) and lead (15 m long) were made of 12.7 mm mesh. The nets were emptied daily. Fish were measured and released, with no fish retained for laboratory analysis. Duration of each set was recorded to allow calculation of catch rates. In 2004, fyke nets were arranged to sample fish moving both upstream and downstream.

Water chemistry measurements taken in conjunction with the fyke net sampling included water temperature, specific conductance, dissolved oxygen, turbidity and pH.

In 2004, fish longer than 180 mm were tagged to reveal the extent to which fish caught in the study area contribute to the subsistence catch. Floy FD-94 anchor tags (monofilament = 1/2 inch, vinyl = 3/4 inch) were applied to whitefish, cisco, and burbot caught by fyke net. Recapture was monitored in research sampling within Colville Delta and eastern NPR-A study areas, in the Nuiqsut subsistence fishery and in the Colville Delta commercial fishery.

Water Chemistry Sampling

Water chemistry parameters were measured to assess habitat conditions and provide information on the suitability of water for use. Water chemistry measurements included surface measures of water temperature, specific conductance, dissolved oxygen, pH, and turbidity. Temperature, specific conductance and dissolved oxygen were *in situ* measurements taken at a depth of approximately 0.5 m near the trap end of the fyke net with a YSI Model 85 meter. A sample obtained from about 15

cm below the surface was returned to the field office to measure pH and turbidity. PH was measured with either a Coning pH meter or an Oaktron pH Tester III. Turbidity was measured with an H.F. Scientific DRT15CE turbidity meter.

Estimating Water Volumes

Bathymetric data were collected in 2004 to:

1) allow estimating lake volume, and
2) identify potential wintering areas in the Tingmiaqsiugvik (Ublutuoch River).

Many of the lakes surveyed in 2004 had previously been surveyed for one-time use during exploration, while several were surveyed for the first time. With the potential for continued long-term use to support field development, there was a need to better define the available water in those lakes previously sampled. Methods described by MBJ (2003) were used to provide a consistent approach to estimating water volumes.

Location and depth were recorded on a Lowrance Model LCX-15MT integrated GPS/depth sounder at approximately 1-2 second intervals. For lake surveys, the study design was to record at least six to eight depth transects on each lake. Lake volume was estimated by contour mapping of depth intervals. Contour maps were prepared by plotting the position and depth data obtained by GPS on a geo-referenced photomosaic basemap developed by Aeromap and plotting the contours in 1 ft intervals on maps of the surveyed lakes (included in Appendix D). Four lakes were outside the area covered by the Aeromap photomosaic – these were mapped on a geo-referenced photomosaic obtained from BLM. The surface area of each contour was obtained, then the volume was estimated using the formula for truncated cones:

$V = h/3*(A1+A2+(A1*A2) (1/2))$

Where h = vertical depth of the stratum, A1 = area of the upper surface, and A2 = area of the lower surface of the stratum whose volume is to be determined. The volumes of individual strata are summed to obtain the volume of the desired depth intervals.

The amount allowed for winter water withdrawal when sensitive fish species are present is currently set by ADF&G at 15% of the volume of the lake deeper than 7 feet. When only resistant fish species (i.e. ninespine stickleback and Alaska blackfish) are present, the current allocation recommended by ADF&G is 30% of the volume deeper than 5 feet. There is no withdrawal limit if fish are not present.

The area potentially available for ice aggregate was estimated by calculating the area of the lake shallower than 4 feet, assuming that the ice would grow to at least 4 feet prior to the need for ice aggregate. If the ice is thinner than 4 feet at the time of ice removal, then the area available for ice aggregate will be less

A bathymetric survey was conducted on the Tingmiaqsiugvik (Ublutuoch River) from upstream of the backwater influence of Fish Creek (approximately N70°15.1' W151°16.5' NAD83) to the mouth. The survey was conducted on July 19 to 20, 2004 from a 12 foot inflatable boat that was driven from bank to bank in a zig-zag fashion, with approximately 100 foot spacing on the transects (see Appendix A, figures A-8 to A-13). When water deeper than 9 feet was encountered, multiple passes were made across the area to define the extent of deep water.

Potential wintering sites were defined as continuous areas with maximum depths exceeding 8 feet. The identified potential wintering areas were contoured as with lakes, however, contouring only included water deeper than 7 feet. The contour for 7 feet was outlined to define the extent of the pool, then 2 foot contours, beginning at 8 feet, were mapped. Area and volume of the wintering pools was calculated as above for lakes.

RESULTS AND DISCUSSION

Physical Environment

Sampling in 2004, as in previous years, began in June as stream flows were receding from peak break-up flows. By the onset of sampling on June 16, water temperatures in the streams were already high, reaching between 15 to 19°C by mid-June (Figure 4). Temperatures fluctuated between 6 and 14°C through July into early August, but then increased again to around 16 to 17°C in late August before decreasing near the end of the sampling. Water temperatures in June and late August 2004 were substantially higher than observed from 2001 to 2003.

Specific conductance rose slowly at all sites through the summer as snow melt and runoff decreased. Some reversals to this trend were apparent after rain (Figure 4). Specific conductance was consistently highest in Oil Creek. It is likely that this stream intercepts some relict marine soils within its drainage basin. Turbidity was highest in Uvlutuuq (Fish Creek) after break-up, then gradually declined through the summer. Turbidity in the Tingmiaqsiugvik (Ublutuoch River) and tributaries to Uvlutuuq (Fish Creek) was low throughout the summer, generally in the range of 1 NTU, indicating consistently clear water (Appendix Table B-1).

Biological Observations

Movements Within Drainages

Substantial differences were found in fish use of small drainages of eastern NPR-A. Ten species were captured in small streams in eastern NPR-A during fyke net sampling in 2004 (Table 2). Ninespine stickleback were the most abundant species, followed by Arctic grayling. Stations B0401/B0402 in Bill's Creek and CK0301 in Crea Creek, small tributary streams, produced the greatest number of grayling, followed by Station U0301 on the Tingmiaqsiugvik (Ublutuoch River). While juvenile grayling dominated the catches, adults were also present (Appendix Table D-1).

An unusual event during 2004 was the catch of 4 adult chinook salmon (685-900 mm) in the Tingmiaqsiugvik (Ublutuoch River) during August. Three were captured on August 3 and an additional one on August 23. Chinook salmon are rarely encountered along the Beaufort Sea coast and are considered strays from streams farther south (Craig and Haldorson 1986).

Tags were applied to 517 Arctic grayling in 2004, bringing the total number of tagged grayling in eastern NPRA to 1,101 since 2001 (Table 3). During 2004, 73 tagged grayling were recovered, with 144 recaptured from 2001 to 2004. Most were recaptured near the release location (Table 3), although one moved almost 10 miles from Iqalliqpiq (Judy Creek) into upper Uvlutuuq (Fish Creek), another moved nearly 16.5 miles from MC7916 to the confluence of Uvlutuuq (Fish Creek) and Iqalliqpiq (Judy Creek), and two moved about 29.7 miles from the confluence of Uvlutuuq (Fish Creek) and Iqalliqpiq (Judy Creek) to the Tingmiaqsiugvik

(Ublutuoch River) sampling station. In 2003, three grayling that had been tagged in 2001 in the Tingmiaqsiugvik (Ublutuoch River) were recaptured in the same drainage, although two had moved into Crea Creek.

Multiple recaptures of the same fish are common (Table 4), with one fish recaptured four times during the summer and another being captured for the fifth time since its original release in 2001 Tag returns indicate that Arctic grayling are wide ranging within the Fish Ck/Judy Ck drainage system, however, many appear to consistently use the clear water creeks and lakes associated with the Ublutuoch River. One fish (Tag Code MJM010118) demonstrating remarkable consistency was captured at the Tingmiaqsiugvik (Ublutuoch River) site on the following dates:

June 25, 2001
June 25, 2002
June 22, 2003
June 23, 2004

In 2004, fyke nets were placed to catch fish moving both upstream and downstream in Bill's Creek, Crea Creek, Oil Creek and the Tingmiaqsiugvik (Ublutuoch River). Most Arctic grayling appeared to be moving downstream in July to early August, with relatively few remaining in late August (Figure 5), while broad whitefish remained in the streams into late August (Figure 6). All sizes of Arctic grayling were still present by late August, while most of the remaining broad whitefish remaining were small fish (less than 100 mm) (Figures 7 and 8).

Tags were applied to 48 broad whitefish in 2004, bringing the total number of tagged broad whitefish in eastern NPRA to 194 since 2001. Only two tagged broad whitefish were recovered during 2004, both at the release station in Bill's Creek within 2 days of their release.

Catch rates of Arctic grayling in the small streams were consistently higher in 2004 as compared to 2003, but the size ranges were similar within each creek in both years (Figures 9 and 10). The higher catches in 2004 may be a result of greater activity caused by the warmer water temperatures. Oil Creek, the smallest of surveyed tributaries to the Tingmiaqsiugvik (Ublutuoch River), contained primary ages 1 and 2 while both Crea Creek and Tingmiaqsiugvik (Ublutuoch River) supported a wide range of ages.

As seen in previous years, and discussed in Morris (2003) and Moulton (2004), there was substantial movement of fish in clear water tributaries connected to lake systems. Both Bill's Creek and Crea Creek are connected to lake systems by well-defined streams and there are similar stream/lake systems upstream from the Tingmiaqsiugvik (Ublutuoch River) sampling stations (Figure 11). Bill's Creek had the highest diversity, with 8 species caught, followed by Crea Creek, with 7 species. In contrast, other clear water streams without significant lake area (CK16 and F0307) or with ephemeral connecting streams, such as Oil Creek, supported lower densities and diversity. Only ninespine stickleback and Alaska blackfish were caught In 114 hours (5 days) of fyke net sampling in lakes of the Oil Creek drainage (Table 2, Moulton 2004). It is clear that connected lakes with predictable access provide important rearing areas for many fish species during summer.

Habitat Use in Lakes

Nineteen lakes in eastern were sampled by fyke net during 2004 (Table 5). Fifteen of these lakes were tundra lakes remote from streams and contained only ninespine stickleback and Alaska blackfish. The other four lakes were connected by stream to Bill's Creek and Crea Creek.

The four lakes on Bill's Creek and Crea Creek are fish-bearing lakes connected to the major drainages by small tundra streams. All four of these lakes contained Arctic grayling, while two (L9811 and M0420) contained broad whitefish and one (L9819) contained least cisco. Connections to the lakes can be either continuous through summer or ephemeral, with greatest access afforded during break-up and lesser access after late summer rains. Morris (2003) found substantial use of connected lakes by radio-tagged broad whitefish and Arctic grayling. The presence of connected lakes on small drainages, such as Bill's Creek and Crea Creek, may explain some of the high catch rates on these creeks (Figure 9). Use of these drainage lakes varies greatly, most likely influenced primarily by the frequency at which the connecting stream is active during the open-water season. Lakes far up small tributaries, such as M9914, contained a few juvenile Arctic grayling, but catches were sporadic through the summer (Moulton 2004). Alaska blackfish were present in 6 of 7 drainage lakes surveyed in 2002-2004.

Large isolated tundra lakes had the highest overall catch rates, with all of the catch being ninespine stickleback and Alaska blackfish (Table 5). Lack of access likely prevents other species from dispersing into these lakes except under extremely high flow or runoff, and the shallowness of these lakes likely limits wintering success. Similar results were found from 2001-2003 (Moulton 2004).

Habitat Use by Dominant Species

During 2004, four species (Arctic grayling, broad whitefish, humpback whitefish and least cisco) comprised 95% of the catch, excluding ninespine stickleback. Ninespine stickleback were 72% of the total catch and were ubiquitous, being most abundant in lakes, and present in low numbers in the river channels (Table 2). In previous years, burbot were encountered in several habitats, and while not numerous, were conspicuous because of their large size. However, only three burbot were caught in 2004.

Arctic Grayling. Arctic grayling were second in abundance to ninespine stickleback and were the most consistently caught species across all habitats except remote tundra lakes, being present in all time periods (Figure 5). Two clear streams, Bill's Creek and Crea Creek, contained the highest abundance of adult Arctic grayling, with the Tingmiaqsiugvik (Ublutuoch River) third in abundance (Table 2). Rearing juveniles, primarily ages 1 and 2, were particularly abundant in the clear water tributaries to Tingmiaqsiugvik (Ublutuoch River), although larger grayling were also abundant in Bill's Creek and Crea Creek (Figure 7). Young-of-the-year were caught in small numbers in Bill's Creek, Crea Creek and Tingmiaqsiugvik (Ublutuoch River).

Broad Whitefish. Broad whitefish were the third most abundant fish caught (Table 2). Larger broad whitefish were caught primarily in Bill's Creek during mid-July and the Tingmiaqsiugvik (Ublutuoch River) during the late August sampling period, with only scattered records of larger individuals at other locations and during other time periods (Figures 6 and 8).

Least Cisco. Least cisco were most abundant in Bill's Creek and Tingmiaqsiugvik (Ublutuoch River), apparently moving upstream to access connected lakes.

Humpback Whitefish. Humpback whitefish were fifth in abundance, with all the catch recorded from Bill's Creek. In previous years, most of the humpback whitefish had been caught in theTingmiaqsiugvik (Ublutuoch River), and secondarily from the tapped lake, MC7916 (Moulton 2004). Unlike other species, most of the captured humpback whitefish were adults. As in previous years, there was a strong upstream movement of large humpback whitefish in Bill's Creek during July sampling (July 14-20), which accounted for all the catch.

Wintering Areas in the Tingmiaqsiugvik (Ublutuoch River)

The lower portion of the Tingmiaqsiugvik (Ublutuoch River) was identified as a wintering area in 2001/2002 based on results of radio-tracked broad whitefish, Arctic grayling and burbot (Morris 2003). A bathymetric survey was conducted to identify and map specific wintering sites in the lower river. Potential wintering sites were defined as continuous areas with maximum depths exceeding 8 feet. A total of 34 potential wintering sites were identified, ranging in volume from 600 cubic feet to over 2.85 million cubic feet (Table 6). Wintering sites were spread from near the mouth upstream to near river kilometer 19 (Figure 12; detailed maps of wintering areas and transect data used to develop the maps are in Appendix A).

Lake Volumes

Twenty-eight lakes in the eastern NPR-A study area were evaluated as potential water-source lakes, either by initial survey or re-survey using new techniques (Figure 13, Table 7). Some of the lakes had previously been surveyed for use during exploration, while others were surveyed for the first time in 2004. Information on depth distribution and fish presence were used to evaluate the volumes of water potentially available for use (Table 8). Twenty-six of the lakes were confirmed to contain ninespine stickleback; because of similar habitat, it is likely the remaining two lakes also contained this species. Nine of the lakes supported sensitive species, including Arctic grayling, broad whitefish and least cisco.

The 28 lakes surveyed during 2004 could provide up to 131.4 million gallons of water for use, with up to 2,755 acres available for removing chips for ice aggregate (Table 9).

CONCLUSIONS

Sampling in eastern NPR-A during 2004 indicated, as in previous years, that the Tingmiaqsiugvik (Ublutuoch River) is heavily used by Arctic grayling and broad whitefish, with round whitefish and least cisco also present during summer. Clearwater tributaries to the Tingmiaqsiugvik (Ublutuoch River) that have strong connections to lakes supported high densityies of juvenile Arctic grayling, as well as a variety of other species, indicating the importance of these small connected streams as summer feeding areas. Adult Arctic grayling also ascended these small tundra drainages to feed, resulting in some tag recaptures.

A substantial portion of the lower Tingmiaqsiugvik (Ublutuoch River) contains water deep enough to support wintering fish, with over 10.7 million cubic feet of potential wintering habitat. Use of this reach as a wintering area has been previously documented (Morris 2003).

Lakes connected to the rivers also provide important fish habitat, as evidenced by the heavy use of connected lakes and associated streams, and results from radio-tagged broad whitefish, Arctic grayling, and burbot (Morris 2003). The value of a lake increases as predictability of access increases. Lakes remote from stream systems supported ninespine stickleback, while lakes with seasonal connections to stream systems also supported Alaska blackfish and low densities of juvenile Arctic grayling.

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Table 1. Location of fyke net stations fished in eastern NPRA during 2004.

Creek Stations

Station	Location	Dates Fished	Latitude (NAD83)	Longitude (NAD83)
B0401 (US)	Bill's Creek (trib to Ublutuoch)	Jul 13-Aug 24	70.22592	151.26387
B0401 (DS)	Bill's Creek (trib to Ublutuoch)	Jul 13-Aug 24		
CK0301 (US)	Crea Creek (trib to Ublutuoch)	Jun 16-Aug 24	70.27969	151.33000
CK0301 (DS)	Crea Creek (trib to Ublutuoch)	Jul 13-Aug 24		
CK0302 (US)	Oil Creek (trib to Ublutuoch)	Jun 16-Jul 30	70.30246	151.27462
CK0302 (DS)	Oil Creek (trib to Ublutuoch)	Jul 29-30		
CK16C (US)	Fish Ck tributary	Jun 16-Jul 31	70.27519	151.48118
CK0306 (US)	Ublutuoch River tributary	Jun 18-Jul 11	70.28360	151.29025
F0307 (US)	Fish Ck trib	Jun 16-Jul 12	70.27310	151.54366
U0102 (US)	Ublutuoch River	Jul 14-Aug 24	70.24875	151.29120
U0102 (DS)	Ublutuoch River	Jul 30-Aug 24		
U0301 (US)	Ublutuoch River	Jun 16-Jul 13	70.23952	151.30293

DS = net catching fish moving downstream
US = nett catching fish moving upstream

Lake Stations

Station	Location	Dates Fished	Latitude (NAD83)	Longitude (NAD83)
FL9804	Lake L9804	Jul 19-21	70.24558	151.22484
FL9805	Lake L9805	Jul 19-21	70.24876	151.17057
FL9806	Lake L9806	Jul 14-17	70.24607	151.10195
FL9811	Lake L9811	Jul 21-23	70.21242	151.19809
FL9812	Lake L9812	Jul 30-Aug 2	70.19554	151.14306
FL9813	Lake L9813	Jul 27-29	70.19225	151.15765
FL9817	Lake L9817	Jul 16-19	70.23153	151.34636
FL9819	Lake L9819	Jul 19-21	70.27028	151.36853
FL9821	Lake L9821	Jul 21-23	70.28662	151.35713
FL9911	Lake L9911	Jul 23-25	70.17903	151.80090
FM0009	Lake M0009	Jul 26-28	70.28196	151.82697
FM0015	Lake M0015	Jul 24-26	70.11434	152.06466
FM0017	Lake M0017	Jul 24-26	70.10365	152.13750
FM0025	Lake M0025	Jul 24-27	70.28003	151.79258
FM0029	Lake M0029	Jul 26-28	70.12023	152.20615
FM0030	Lake M0030	Jul 27-29	70.12111	152.20319
FMB0302	Lake MB0302	Jul 22-25	70.28273	151.43578
FM0420	Lake M0420	Jul 20-22	70.20979	151.21591
M9907	Lake M9907	Jul 28-30	70.24068	151.88001

Table 2. Comparison of fish catches in small streams of eastern NPRA during 2004.

Species	Bill's Ck	Crea Ck	Oil Ck	CK16C	CK0306	F0307	Ublutuoch River	Total Catch
Chinook salmon							4	4
Broad whitefish	122	8	18				76	224
Humpback whitefish	24							24
Least cisco	12	1					13	26
Round whitefish	3							3
Arctic grayling	1,837	1,175	186	11	2		749	3,960
Burbot		3						3
Alaska blackfish	2	5	56	53	29	4		149
Ninespine stickleback	938	1,213	5,090	1,074	444	2,713	296	11,768
Slimy sculpin	17	5	46				5	73
Total catch	2,955	2,410	5,396	1,138	475	2,717	1,143	16,234
Number of Species	8	7	5	3	3	2	6	10
Effort (hours)	933.1	1,331.3	489.9	311.3	215.3	259.6	987.3	4,527.8

Table 3. Summary of Arctic grayling recaptures in small streams and associated lakes of eastern NPRA - 2001-2004.

Release Station	Recapture Station													Total Recaps	Total Released	Percent Recaps
	Bill's Ck	Crea Ck	Ublutuoch	CK17A/B	F0102A	F0103	J0103A	L9811	L9819	M9910	M0352	M0356	MC7916			
Bill's Ck	14		1											15	117	12.8%
Crea Ck	3	57	1						2					63	258	24.4%
Oil Cr														0	1	0.0%
Ublutuoch	5	5	25											35	453	7.7%
CK17A/B				2										2	19	10.5%
CK0305														0	2	0.0%
F0101														0	4	0.0%
F0102A			2											2	12	16.7%
F0103						2								2	18	11.1%
F0104														0	2	0.0%
J0103/J0103A						1	1							2	32	6.3%
F0310														0	7	0.0%
L9811	1							2						3	34	8.8%
L9819									2					2	27	7.4%
M9910										11				11	39	28.2%
M0142														0	1	0.0%
M0352											1			1	4	25.0%
M0356												1		1	3	33.3%
M0420														0	38	0.0%
MC7916				1	1								3	5	30	16.7%
Total	23	62	29	3	1	3	1	2	4	11	1	1	3	144	1101	13.1%

Table 4. Multiple recaptures of Arctic grayling

Tag	Release			Recapture			
Number	Station	Date	Length	Station	Date	Length	Days Out
MJM010118	U0101	6/25/2001	309	U0102	6/25/2002	319	365
	U0102	6/25/2002	319	U0301	6/22/2003	338	362
	U0301	6/22/2003	338	U0301	7/13/2003	336	21
	U0301	7/13/2003	336	U0301	7/16/2003	337	3
	U0301	7/16/2003	337	CK0301	6/23/2004	347	343
MJM020027	U0102	6/21/2002	211	B0401	7/15/2004	273	755
	B0401	7/15/2004	273	U0102	8/4/2004	281	20
MJM021264	CK0301	7/12/2004	227	CK0301	7/29/2004	228	17
	CK0301	7/29/2004	228	CK0301	8/2/2004	231	4
MJM021299	CK0301	7/14/2004	205	CK0301	7/20/2004	207	6
	CK0301	7/20/2004	207	CK0301	8/23/2004	215	34
MJM021325	U0301	6/19/2004	210	CK0301	8/2/2004	237	44
	CK0301	8/2/2004	237	CK0301	8/18/2004	244	16
MJM021374	CK0301	6/20/2004	267	CK0301	7/15/2004	282	25
	CK0301	7/15/2004	282	CK0301	7/20/2004	281	5
MJM021480	CK0301	7/12/2003	198	CK0301	6/19/2004	235	343
	CK0301	6/19/2004	235	CK0301	8/4/2004	274	46
	CK0301	8/4/2004	274	CK0301	8/18/2004	276	14
	CK0301	8/18/2004	276	CK0301	8/21/2004	278	3
MJM021489	CK0301	7/12/2003	235	CK0301	7/29/2004	281	383
	CK0301	7/29/2004	281	CK0301	8/2/2004	283	4

Table 5. Daily catches of fish by fyke nets in eastern NPRA lakes during 2004.
(BDWF = broad whitefish, BKFH = Alaska blackfish, GRAY = Arctic grayling, LSCS = least cisco, NSSB = ninespine stickleback)

Lake	Species	Jul 14	Jul 15	Jul 16	Jul 17	Jul 18	Jul 19	Jul 20	Jul 21	Jul 22	Jul 23	Jul 24	Jul 25	Jul 26	Jul 27	Jul 28	Jul 29	Jul 30	Jul 31	Aug 01	Aug 02
L9804	NSSB						124	275	212												
L9805	NSSB						246	155	191												
L9806	NSSB	1	0	2	0																
L9811	BDWF								0	4	0										
	GRAY								23	22	145										
	NSSB								33	64	227										
L9812	NSSB																	42	367	110	76
L9813	GRAY														11	14	4				
	NSSB														17	18	19				
L9817	NSSB			0	1	0	0														
L9819	GRAY						22	40	26												
	LSCS						0	1	0												
	NSSB						674	37	146												
L9821	NSSB								3	14	60										
L9911	NSSB										135	3149	532								
M0009	NSSB													28	7	60					
M0015	NSSB											750	1712	796							
M0017	NSSB											14	112	114							
M0025	NSSB											430	303	850	560						
M0029	NSSB													21	206	134					
M0030	BKFH														1	1	1				
	NSSB														115	100	66				
M9907	NSSB															169	131	141			
MB0302	BKFH									0	0	1	0								
	NSSB									10	62	370	462								
M0420	GRAY							36	22	22											
	BDWF							0	2	0											
	NSSB							0	16	11											

Table 6. Depth and volumes of potential wintering areas in the Tingmiaqsiugvik (Ublutuoch River) based on bathymetry from July 19-20, 2004.

Wintering Area	Maximum Depth (feet)	Mean Depth (feet)	Surface Area at 7 foot depth (ft^2x1000)	Volume under 7 ft (ft^3x1000)
1	14.8	8.9	103.3	196.4
2	26.7	10.2	884.8	2,850.7
3	22.1	10.6	441.2	1,609.4
4	20.4	8.7	405.1	671.7
5	22.0	9.7	423.6	1,127.2
6	16.1	9.3	209.8	481.9
7	21.2	10.0	427.3	1,272.6
8	17.7	9.7	228.5	624.7
9	18.0	9.9	15.7	46.2
10	14.5	8.5	38.4	58.2
11	12.1	9.0	19.5	38.8
12	9.7	8.0	7.5	7.1
13	22.8	13.0	56.0	335.2
14	21.6	10.1	93.7	287.1
15	21.4	13.2	31.2	193.2
16	17.0	9.4	84.5	203.3
17	10.3	8.1	3.8	4.0
18	17.0	8.9	48.1	93.6
19	18.1	11.9	22.7	112.3
20	12.4	9.0	5.5	11.2
21	9.6	7.9	2.4	2.2
22	11.5	9.3	9.1	21.0
23	13.9	9.2	35.8	78.5
24	15.2	10.0	47.7	141.6
25	14.9	9.4	22.8	54.6
26	11.8	8.4	81.7	114.2
27	11.7	7.8	7.3	5.5
28	14.6	10.1	6.6	20.2
29	11.9	8.6	25.1	40.6
30	9.4	7.7	2.1	1.4
31	8.1	7.4	0.80	0.33
32	9.1	7.5	2.2	1.1
33	9.6	8.0	2.1	2.0
34	9.1	7.7	0.90	0.60
Total:			3,796.9	10,708.8

Table 7. Location and volumes of 28 lakes sampled in eastern NPRA, 2004.

Lake Name	Latitude (NAD83)	Longitude (NAD83)	Town	Range	Section	Surface Area (acres)	Maximum Depth (feet)	Calculated Volume (mill. gals)
L9803	70.25889	151.18904	10/11N	4E	5/32	170.7	6.7	176.47
L9804	70.24263	151.21213	10N	4E	6/7	252.7	5.2	235.95
L9805	70.23779	151.15888	10N	4E	5/8/9	439.4	5.7	429.96
L9806	70.24957	151.09729	10N	4E	3/4/10	361.7	6.8	423.15
L9811	70.20844	151.16652	10N	4E	16/17/24/25/29	1,034.0	8.0	1,414.08
L9812	70.19413	151.12577	10N	4E	21/22/27/28	380.4	8.0	330.54
L9813	70.18487	151.15671	10N	4E	28/29/32/33	390.6	6.3	433.91
L9817	70.23310	151.34001	10N	3E	10	62.3	9.3	104.88
L9819	70.27020	151.35573	10N	3E	34	266.5	7.9	371.37
L9821	70.28711	151.34823	11N	3E	22/27	117.1	4.1	96.88
L9824	70.28428	151.26772	11N	3E	25	20.7	11.5	37.26
L9911	70.17016	151.78795	9/10N	1E	35/36/1/2	559.1	8.0	792.89
L9916	70.26205	151.84226	11N	1E	34	170.5	14.3	296.63
M9909	70.26295	151.66464	11N	2E	33	130.4	19.0	342.43
M9910	70.25340	151.71385	10N	2E	6	161.9	9.0	301.6
M9924	70.26479	151.51290	11N	2E	36	36.2	3.8	30.37
M0009	70.27871	151.83024	11N	1E	26	50.8	10.1	52.09
M0015	70.10864	152.05727	9N	1W	26	479.4	7.5	643.39
M0017	70.10083	152.13332	9N	1W	28	51.3	3.3	28.19
M0020	70.27144	151.72814	11N	2E	30	119.6	18.5	310.90
M0025	70.28070	151.79700	11N	1E	26	46.2	8.2	53.32
M0029	70.11847	152.21073	9N	1W	20	46.4	12.6	91.88
M0030	70.12211	152.19899	9N	1W	20	27.8	8.6	41.88
M0255	70.25027	151.61012	10N	2E	3	67.3	3.9	56.80
M0420	70.20733	151.21644	10N	4E	18/19	125.8	6.0	91.04
MB0301	70.31183	151.19450	11N	4E	17	78.3	7.3	84.37
MB0302	70.28256	151.43758	11N	2E	29	25.2	8.0	37.41
R0076	70.29379	151.83276	11N	1E	22/23	335.9	8.0	404.10

Table 8. Estimated water volumes available for winter withdrawal from lakes surveyed during 200[illegible] in eastern NPRA.

(requested water based on 15% of winter volume deeper than 7 ft when sensitive species are present, 30% of winter volume deeper than 5 ft when resistant fish are likely to be present).

Lake	Surface Area (acres)	Max. Depth (feet)	Calculated Volume (mil. gals)	Volume Under 4ft of Ice (mil. gals)	30% of 5 ft Winter Volume (mil. gals)	15% of 7 ft Winter Volume (mil. gals)	Sensitive Fish Species Present[1]	Resistant Fish Species Present[2]	Available Water (mil. gals)
L9803	170.7	6.7	176.47	12.00	0.44	0.00	none	(NSSB)	0.44
L9804	252.7	5.2	235.95	3.32	0.00	0.00	none	NSSB	0.00
L9805	439.4	5.7	429.96	11.90	0.01	0.00	none	NSSB	0.01
L9806	361.7	6.8	423.15	101.65	14.63	0.00	none	NSSB	14.63
L9811	#####	8.0	1,414.08	367.26	52.10	0.94	GRAY,BDWF	NSSB	0.94
L9812	380.4	8.0	330.54	41.32	5.23	0.10	none	NSSB	5.23
L9813	390.6	6.3	433.91	39.21	1.83	0.00	GRAY	NSSB	0.00
L9817	62.3	9.3	104.88	32.55	5.49	0.45	none	NSSB	**
L9819	266.5	7.9	371.37	66.30	4.81	0.00	GRAY,LSCS	NSSB	0.00
L9821	117.1	4.1	96.88	0.00	0.00	0.00	none	NSSB	0.00
L9824	20.7	11.5	37.26	13.80	2.79	0.39	GRAY	NSSB,BKFH	0.39
L9911	559.1	8.0	792.89	213.41	29.54	0.08	none	NSSB	29.54
L9916	170.5	14.3	296.63	126.16	28.65	6.25	LSCS	NSSB	6.25
M9909	130.4	19.0	342.43	192.05	47.88	15.14	BDWF,LSCS,BURB	NSSB,BKFH	15.14
M9910	161.9	9.0	301.57	110.81	21.28	1.44	HBWF,LSCS,GRAY	NSSB,BKFH	1.44
M9924	36.2	3.8	30.37	0.00	0.00	0.00	none	NSSB	0.00
M0009	50.8	10.1	52.09	8.01	0.54	0.00	none	NSSB	0.54
M0015	479.4	7.5	643.39	129.56	8.85	0.00	none	NSSB	8.85
M0017	51.3	3.3	28.19	0.00	0.00	0.00	none	NSSB	0.00
M0020	119.6	18.5	310.90	177.96	45.05	14.98	LSCS	(NSSB)	14.98
M0025	46.2	8.2	53.32	14.02	2.40	0.07	none	NSSB	2.40
M0029	46.4	12.6	91.88	39.51	8.63	1.58	none	NSSB	8.63
M0030	27.8	8.6	41.88	12.47	2.20	0.10	none	NSSB	2.20
M0255	67.3	3.9	56.80	0.00	0.00	0.00	none	NSSB	0.00
M0420	125.8	6.0	91.04	1.38	0.01	0.00	GRAY,BDWF	NSSB	0.00
MB0301	78.3	7.3	84.37	11.03	0.92	0.00	none	NSSB	0.92
MB0302	25.2	8.0	37.41	8.60	1.21	0.02	none	NSSB	1.21
R0076	335.9	8.0	404.10	105.05	17.67	0.36	none	NSSB	17.67

BDWF = broad whitefish
HBWF = humpback whitefish
GRAY = arctic grayling
BURB = burbot
LSCS = least cisco
NSSB = ninespine stickleback
BKFH = Alaska blackfish

(NSSB) = assumed to be present

** = this lake is the subject of a special permit request

Table 9. Estimated area available for removing ice aggregate, based on the area covered by water shallower than 4 feet, in eastern NPRA during 2004.

Lake	Surface Area (acres)	Max. Depth (feet)	Acres covered by Water shallower 4 feet
L9803	170.7	6.7	113.8
L9804	252.7	5.2	222.9
L9805	439.4	5.7	336.6
L9806	361.7	6.8	189.6
L9811	1034.0	8.0	400.6
L9812	380.4	8.0	--
L9813	390.6	6.3	217.4
L9817	62.3	9.3	11.5
L9819	266.5	7.9	77.7
L9821	117.1	4.1	117.1
L9824	20.7	11.5	5.9
L9911	559.1	8.0	181.8
L9916	170.5	14.3	73.5
M9909	130.4	19.0	28.0
M9910	161.9	9.0	33.2
M9924	36.2	3.8	36.2
M0009	50.8	10.1	27.4
M0015	479.4	7.5	131.2
M0017	51.3	3.3	51.3
M0020	119.6	18.5	31.7
M0025	46.2	8.2	26.1
M0029	46.4	12.6	11.8
M0030	27.8	8.6	10.5
M0255	67.3	3.9	67.3
M0420	125.8	6.0	115.5
MB0301	78.3	7.3	44.7
MB0302	25.2	8.0	9.0
R0076	335.9	8.0	182.5

-- = not evaluated

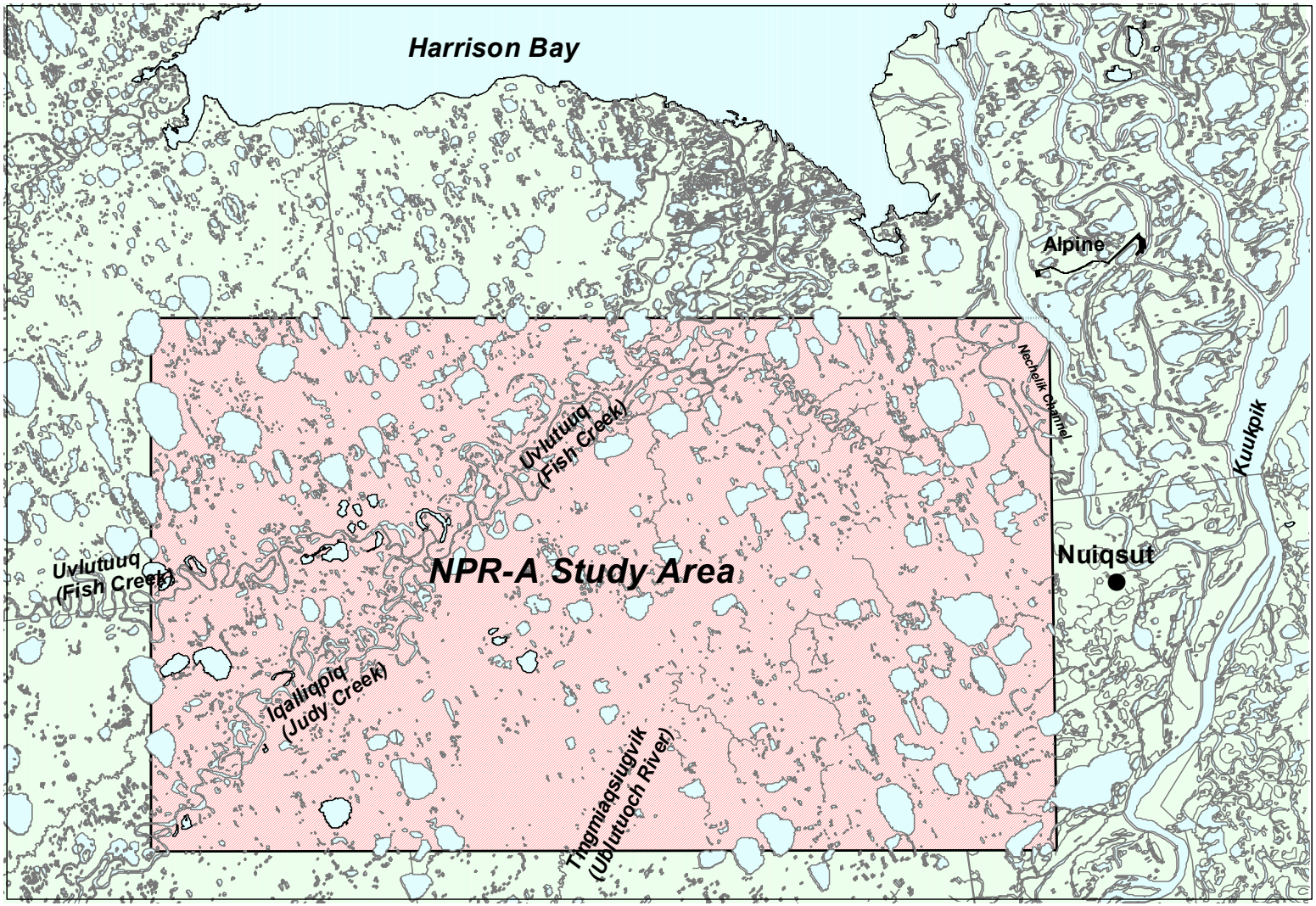


Figure 1. General location of the eastern NPR-A study area, Alaska, 2001-2004.

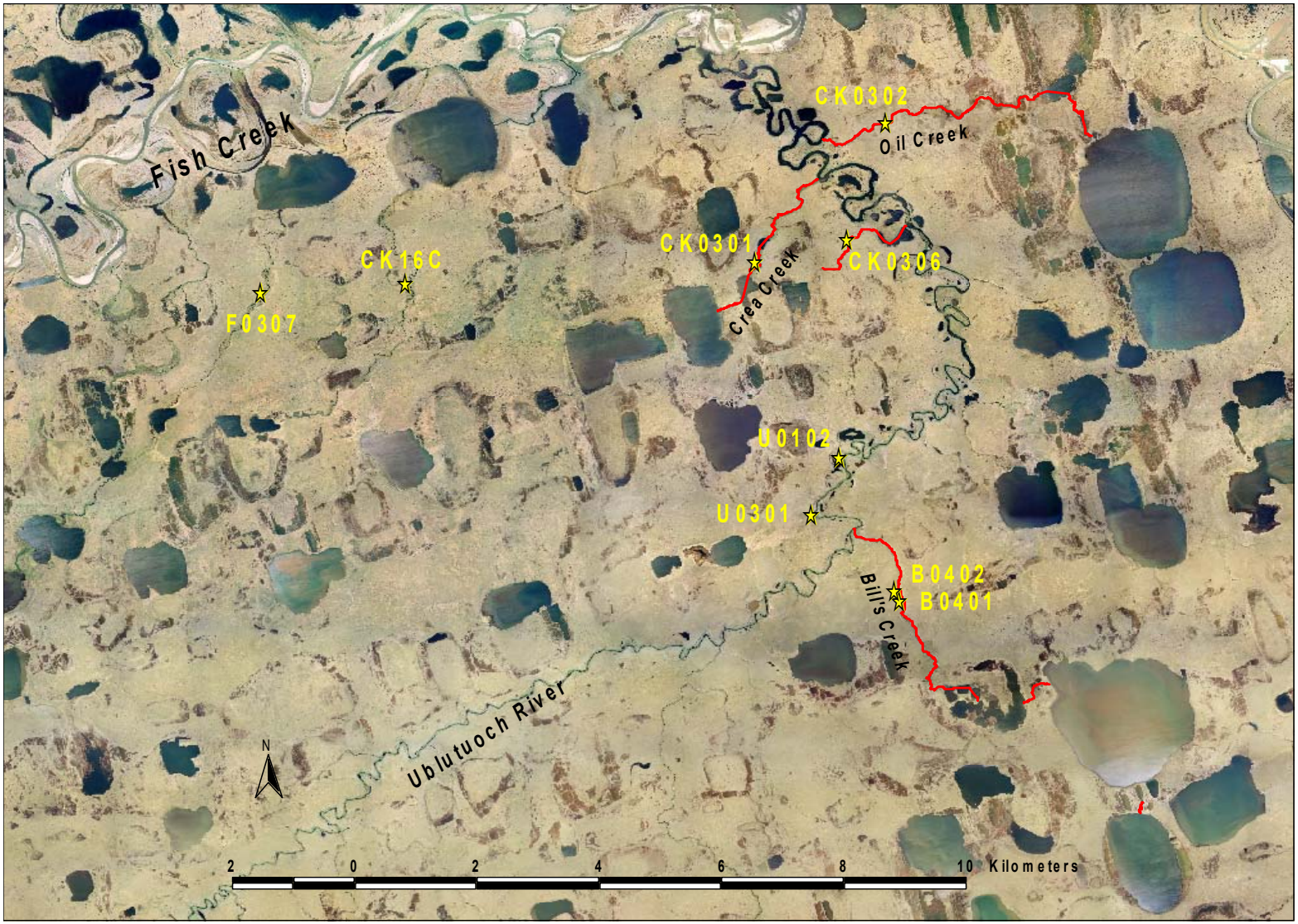


Figure 2. Fyke net locations in streams of eastern NPR-A study area, 2004.

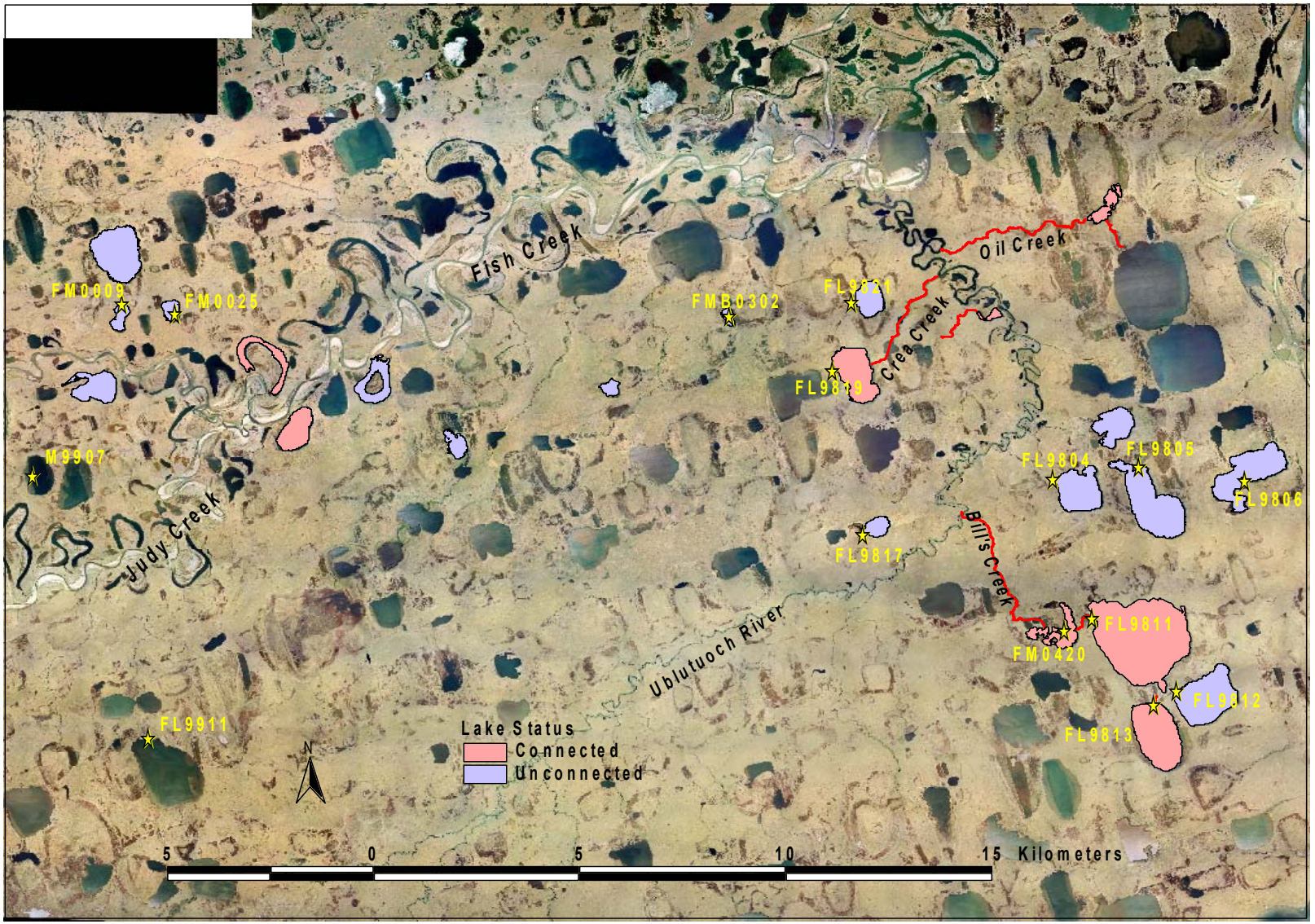


Figure 3. Lakes sampled by fyke net in eastern NPR-A study area, 2004

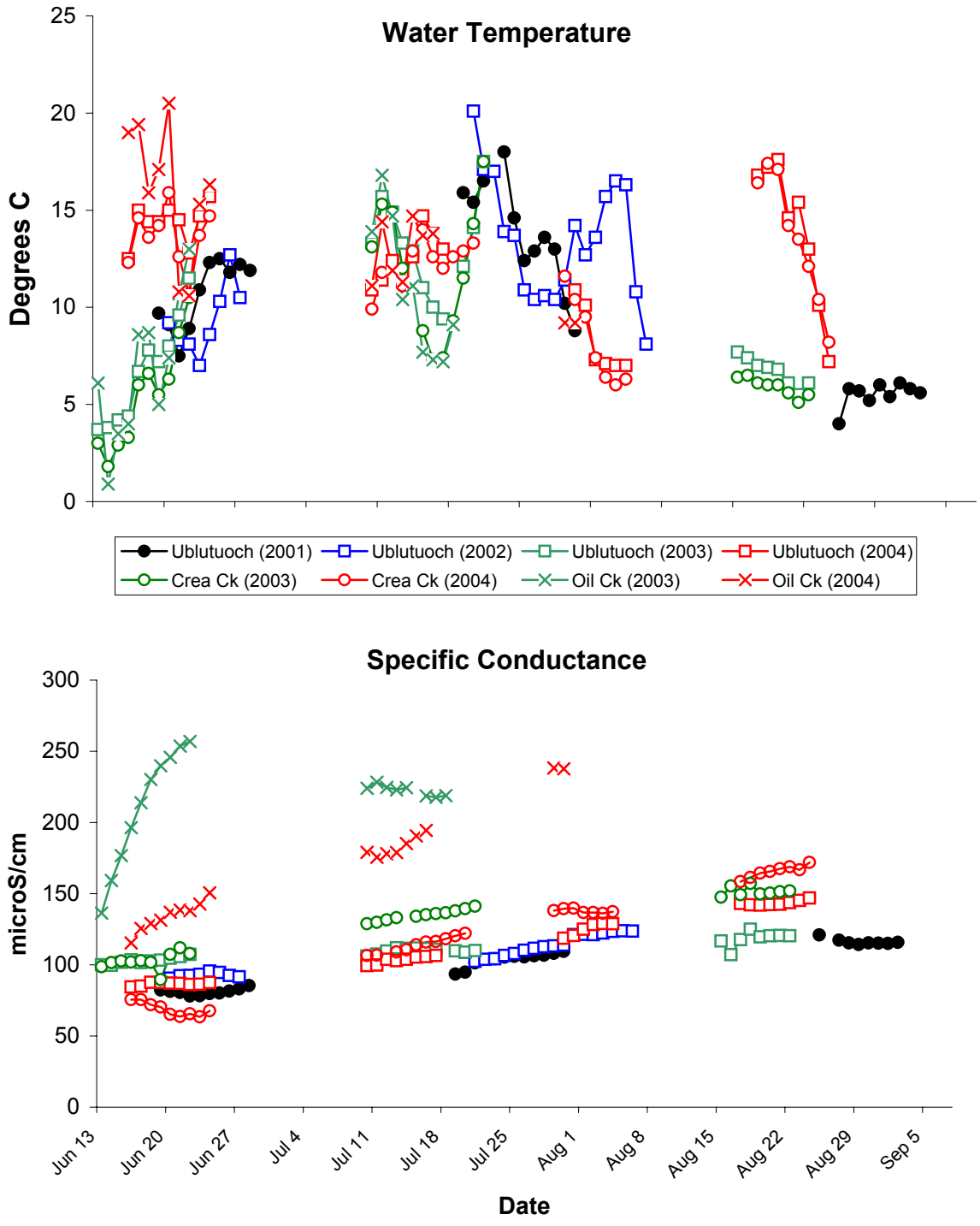


Figure 4. Water temperature and specific conductance at selected stations sampled in the eastern NPR-A study area, 2001-2004 (black = 2001, blue = 2002, green = 2003, red = 2004).

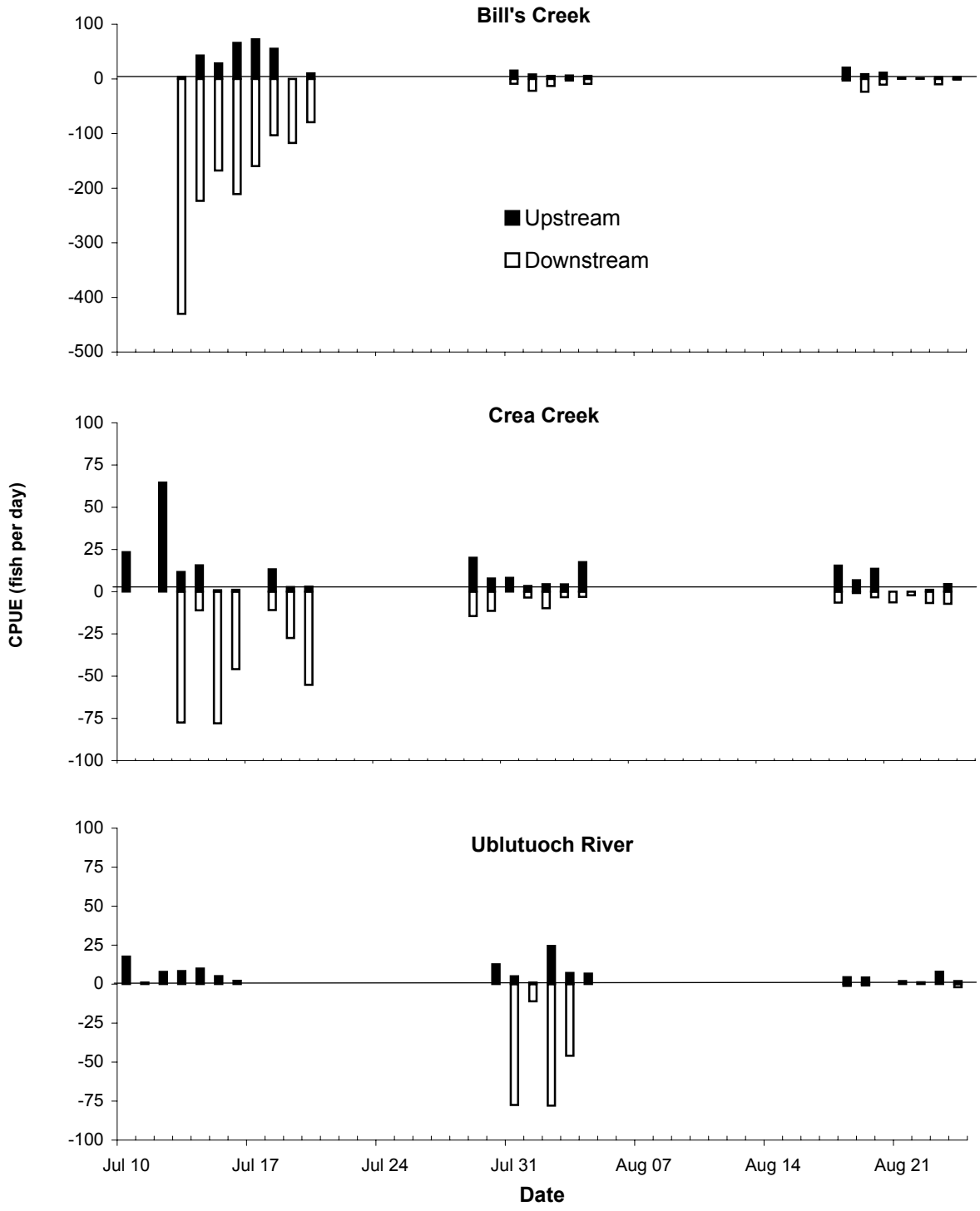


Figure 5. Comparison of Arctic grayling catch rates for fish moving in and out of streams of eastern NPR-A during 2004.
(Downstream = fish moving downstream, Upstream = fish moving upstream)

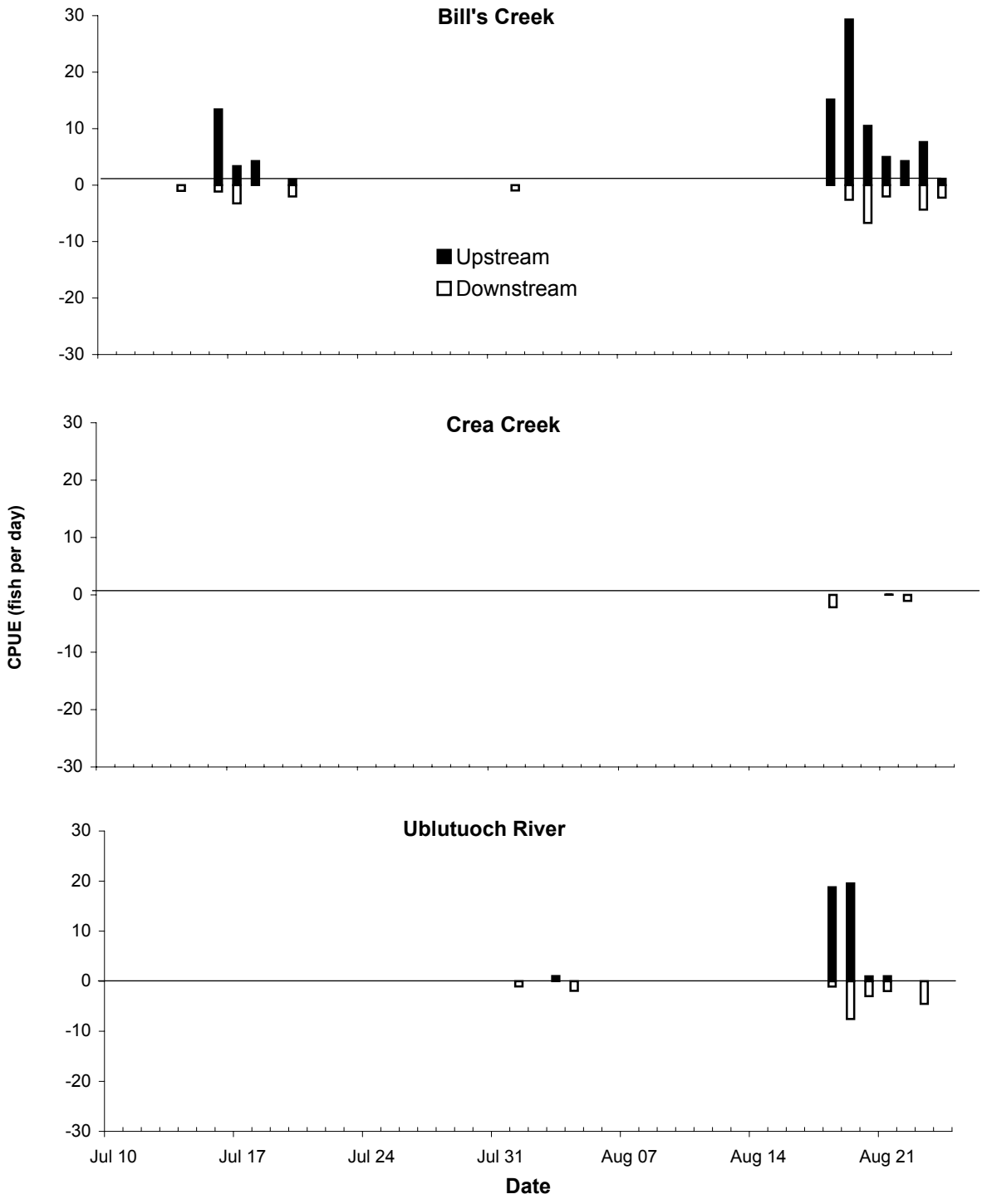


Figure 6. Comparison of broad whitefish catch rates for fish moving in and out of streams of eastern NPR-A during 2004.
(Downstream = fish moving downstream, Upstream = fish moving upstream)

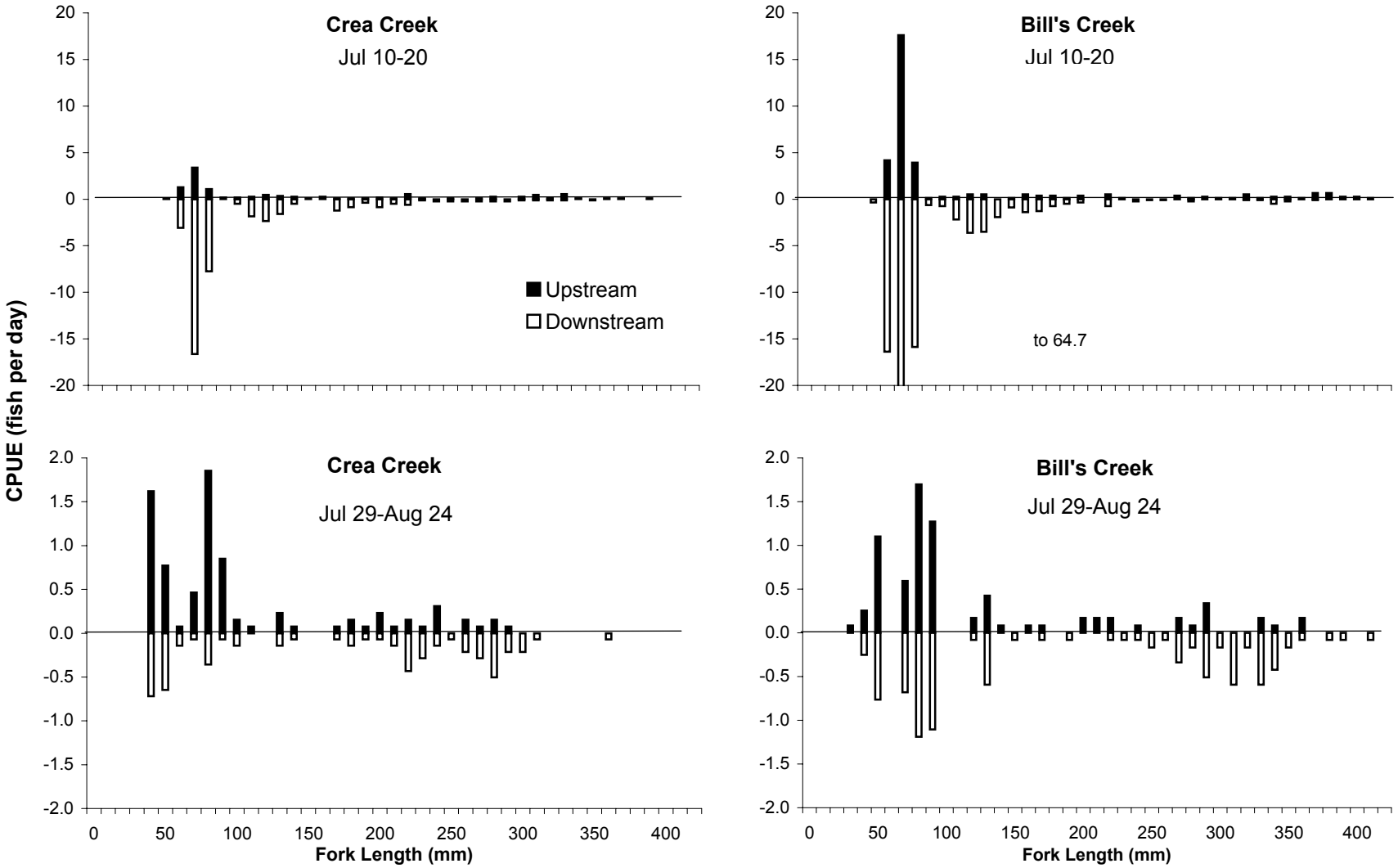


Figure 7. Length frequencies of Arctic grayling moving upstream and downstream in Crea Creek and Bill's Creek, 2004
(note change of scale between July and August sampling periods)

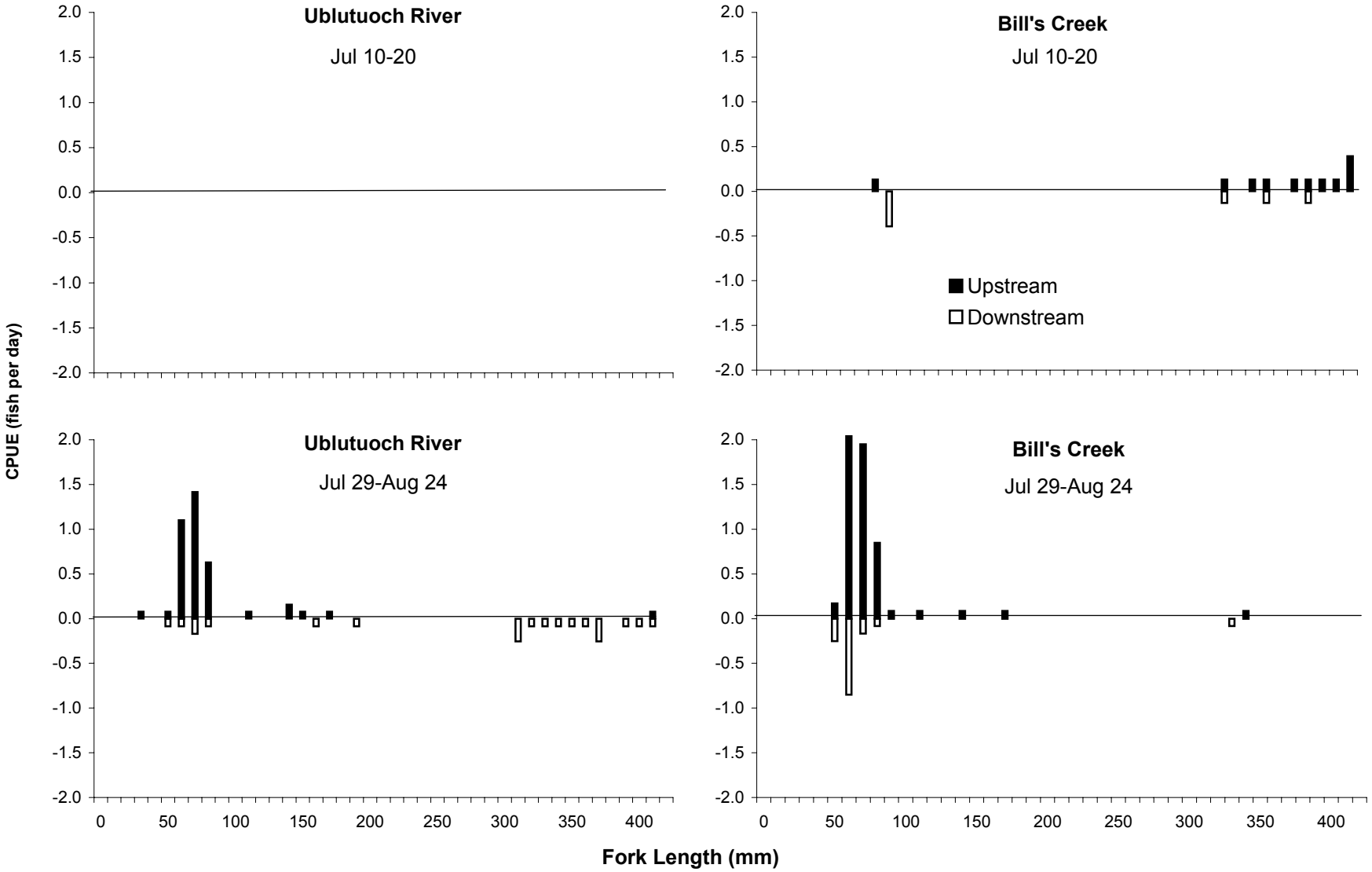


Figure 8. Length frequencies of broad whitefish moving upstream and downstream in Ublutuoch River and Bill's Creek, 2004.

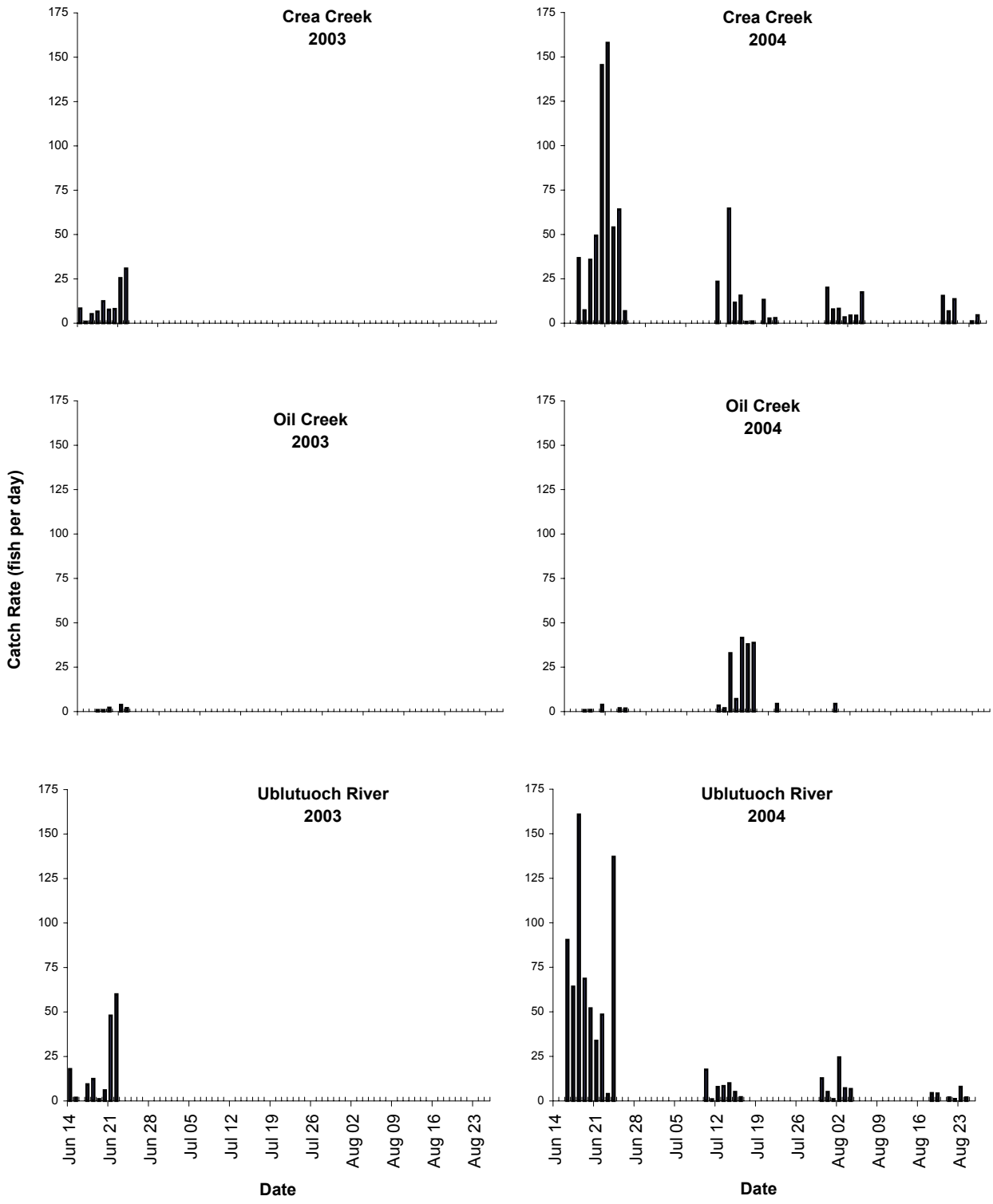


Figure 9. Comparison of Arctic grayling daily catch rates in 3 eastern NPR-A streams sampled in both 2003 and 2004.

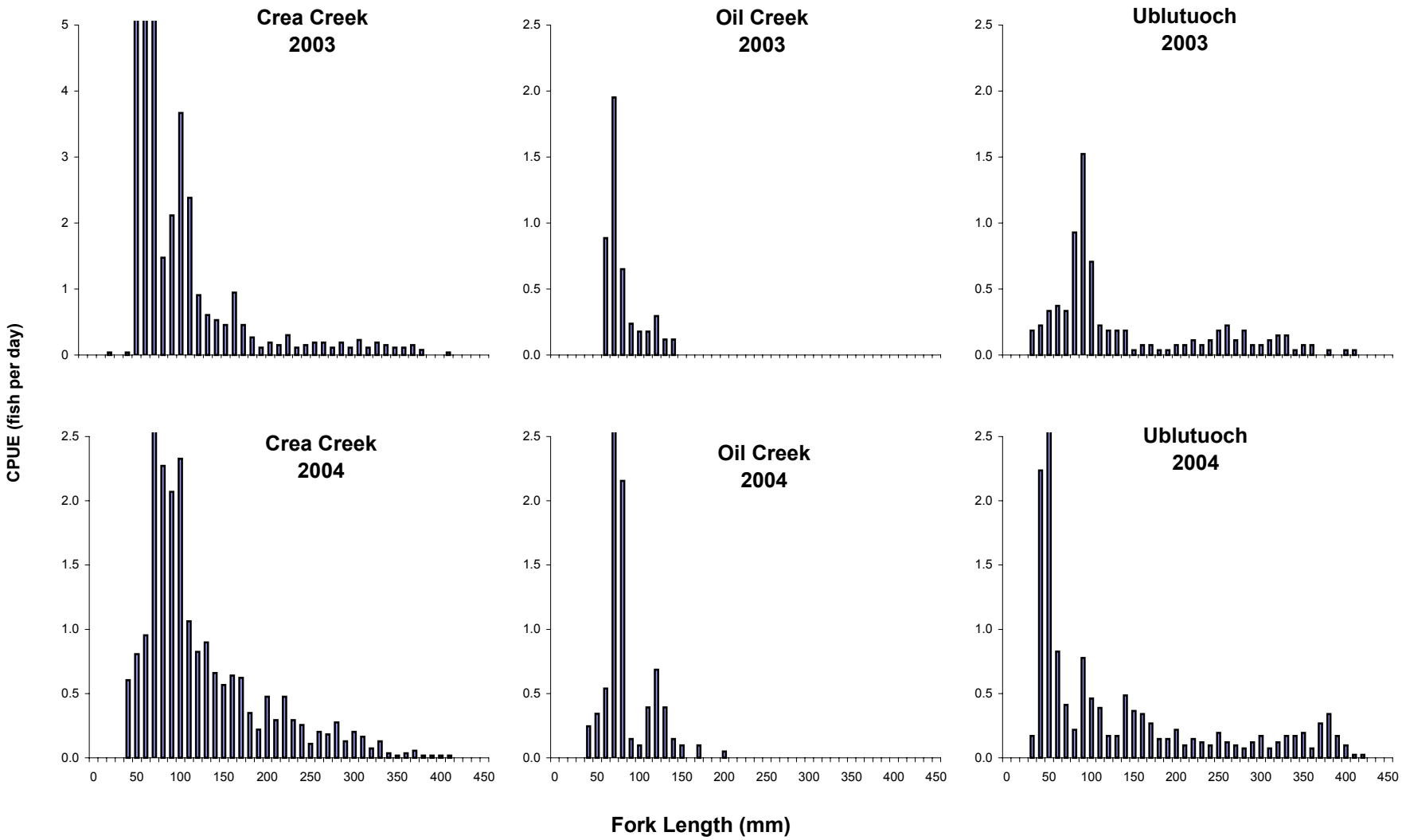


Figure 10. Comparison of Arctic grayling lengths at selected streams in eastern NPR-A sampled in both 2003 and 2004.
(note change of scale for Crea Creek in 2003)

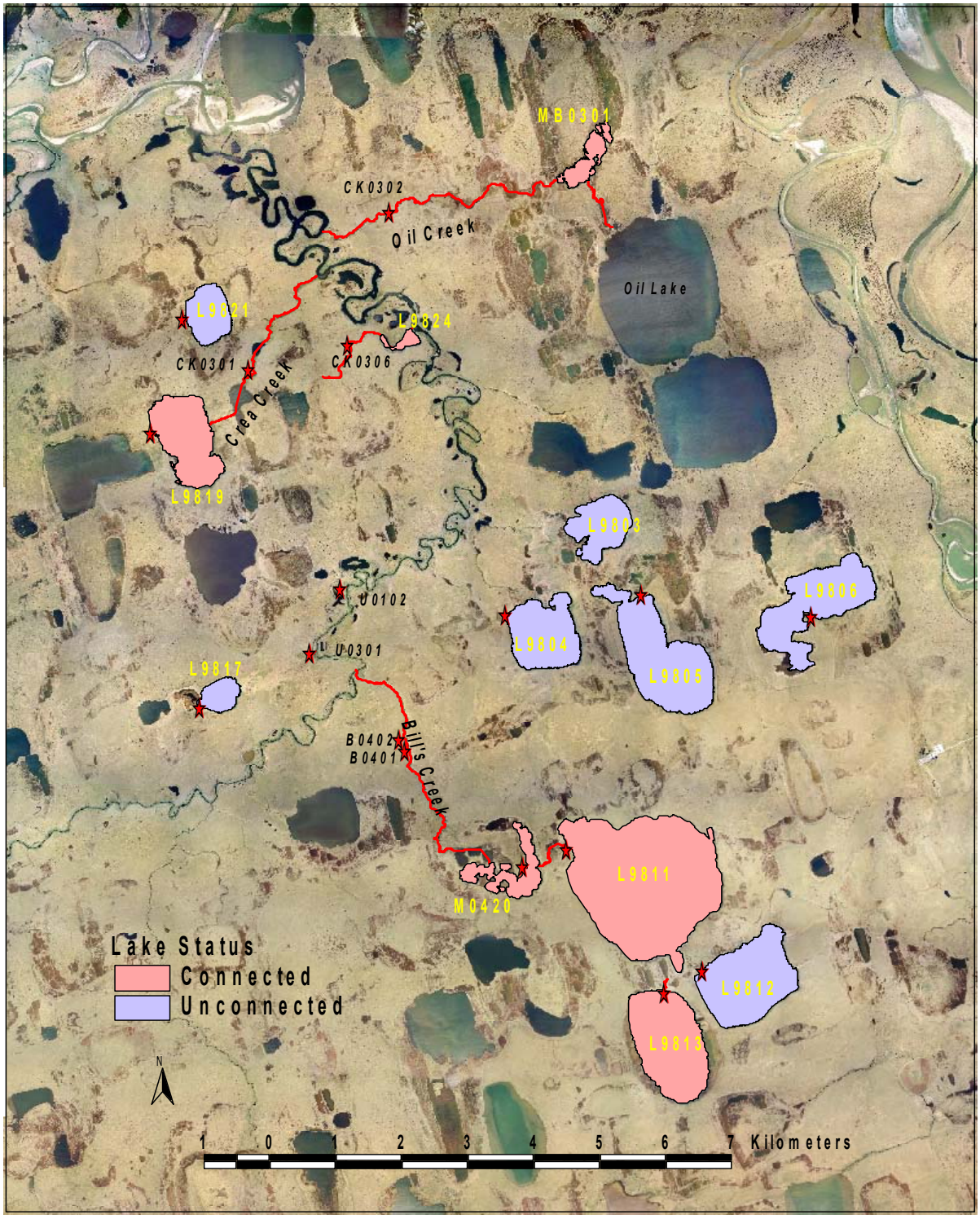


Figure 11. Small streams with connected lake systems investigated in 2003-2004 (red stars indicate fyke net stations).

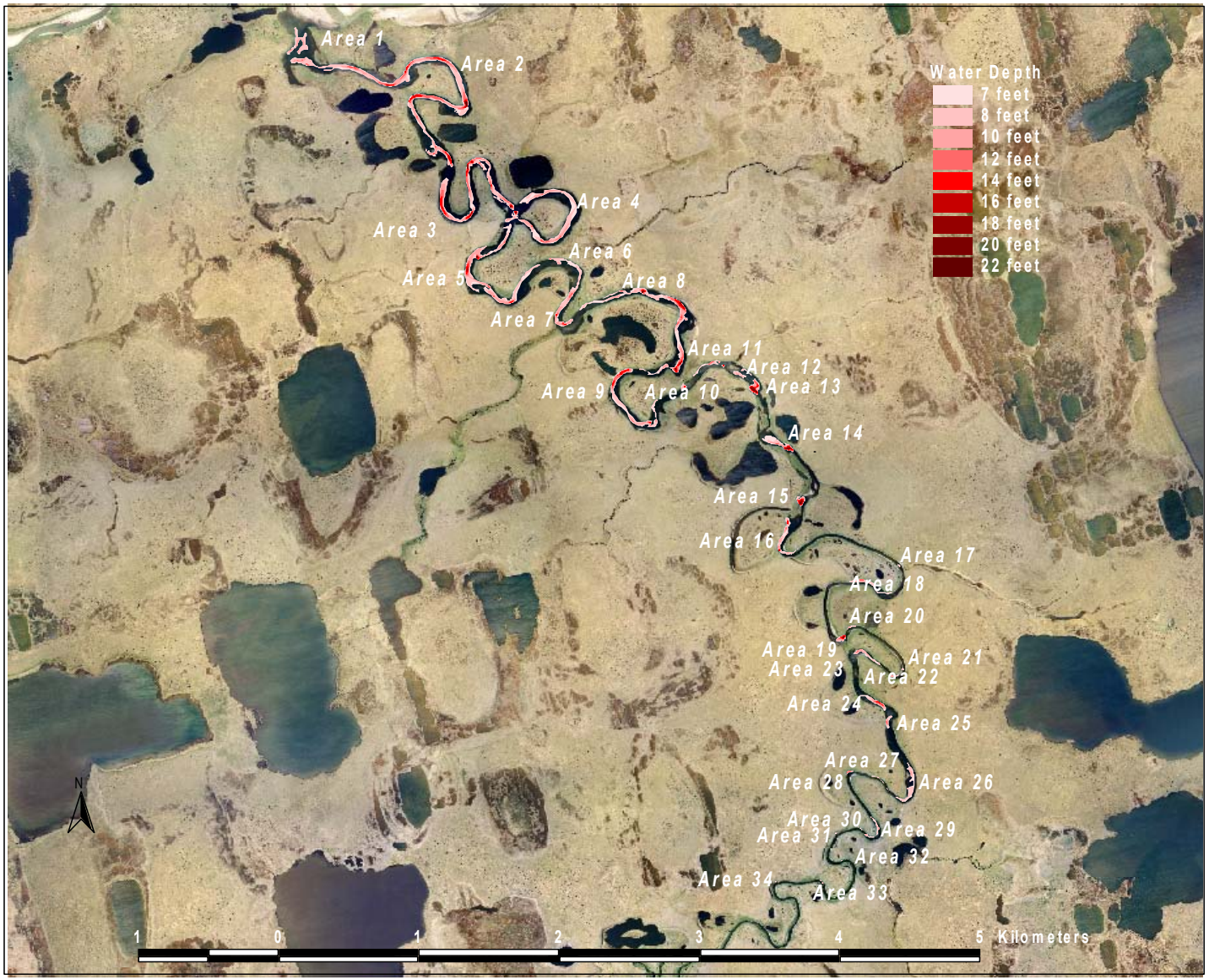


Figure 12. Potential wintering areas in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.

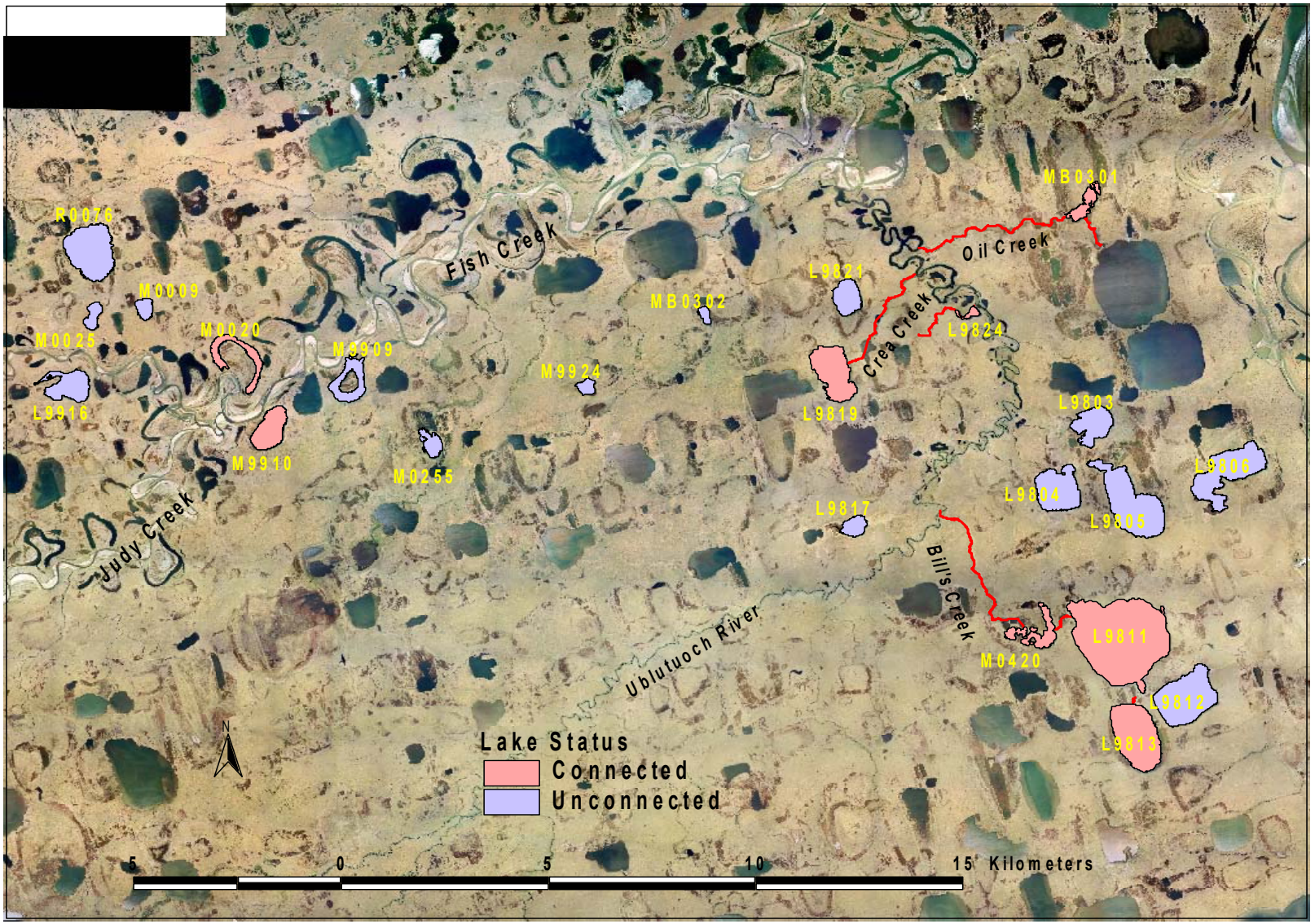
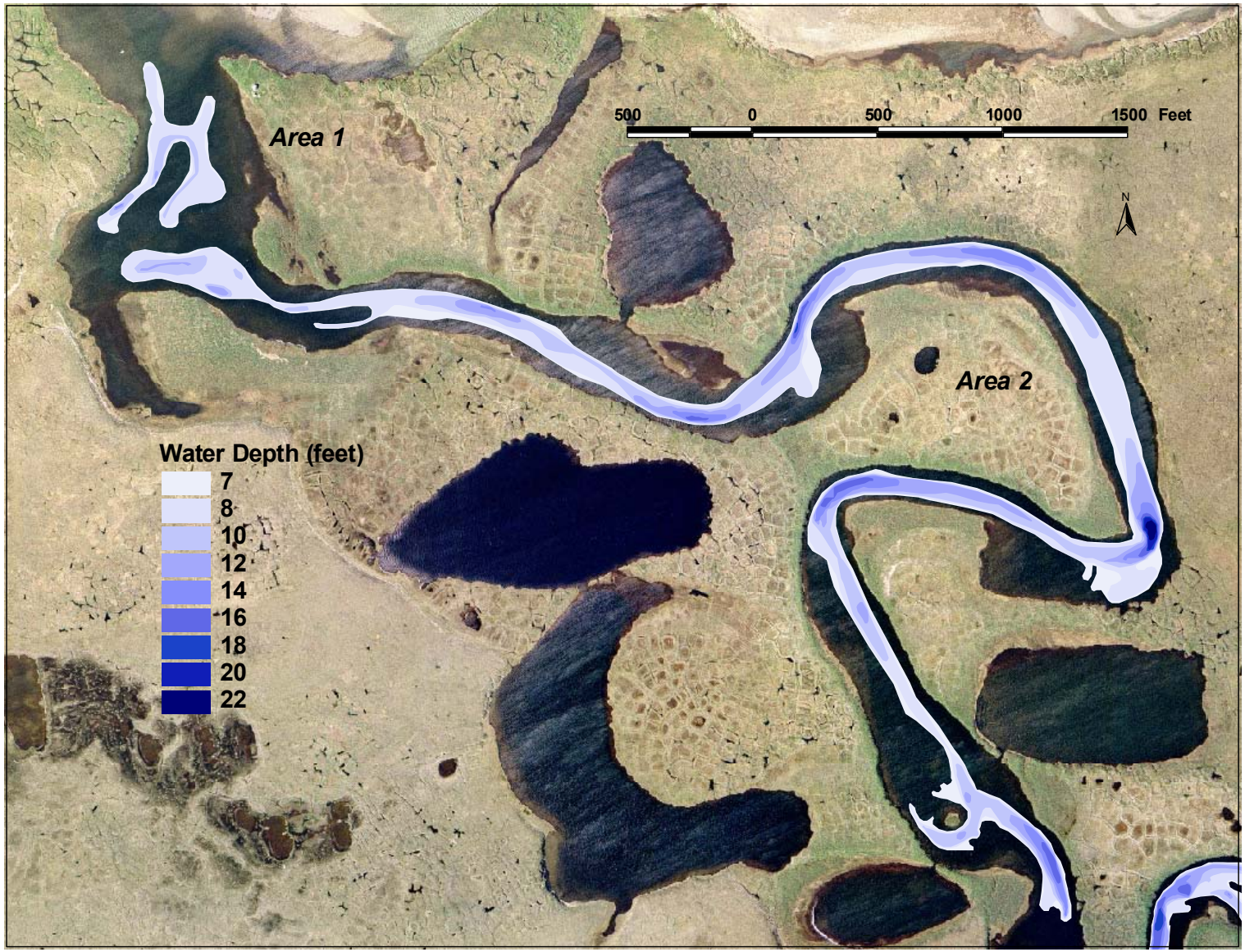


Figure 13 Lakes evaluated as potential water sources in eastern NPR-A study area, 2004 (lakes M0015, M0017, M0029 and M0030 are southwest of this aerial photo and outside the photographic coverage).

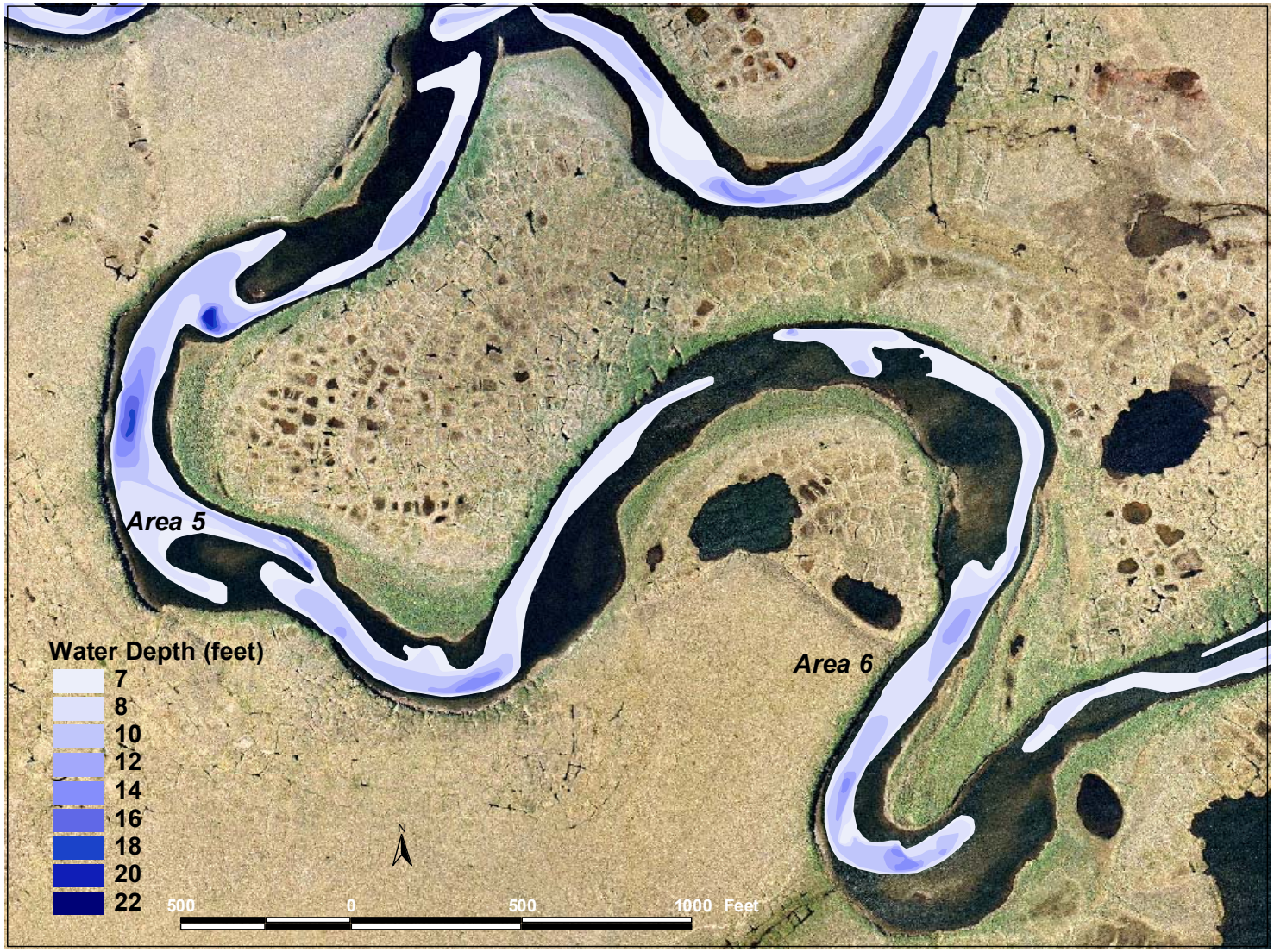
APPENDIX A

Potential wintering sites in the lower Ublutuoch River based on a bathymetric survey on July 19-20, 2004

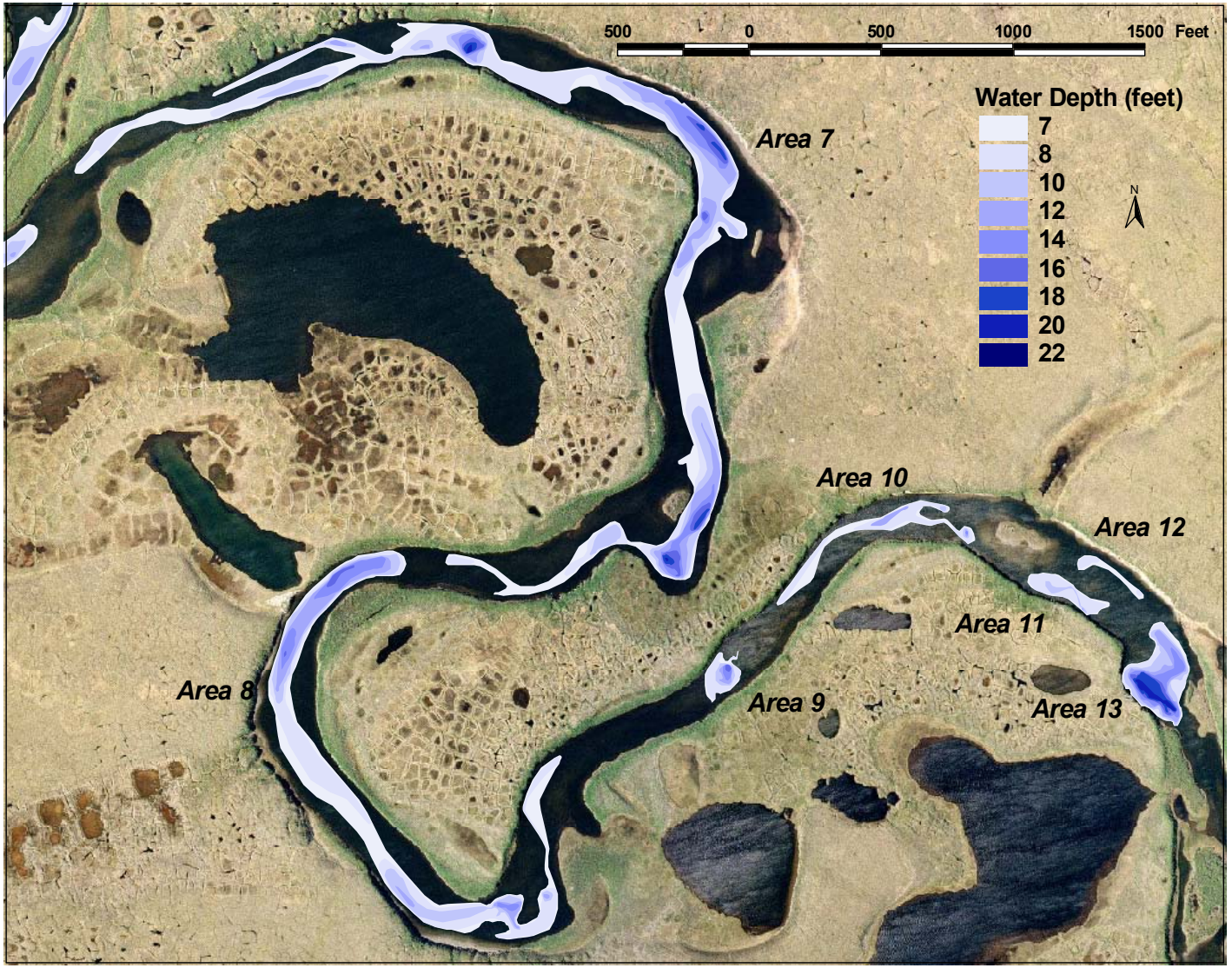


Appendix Figure A-1. Potential wintering areas 1 and 2 in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.

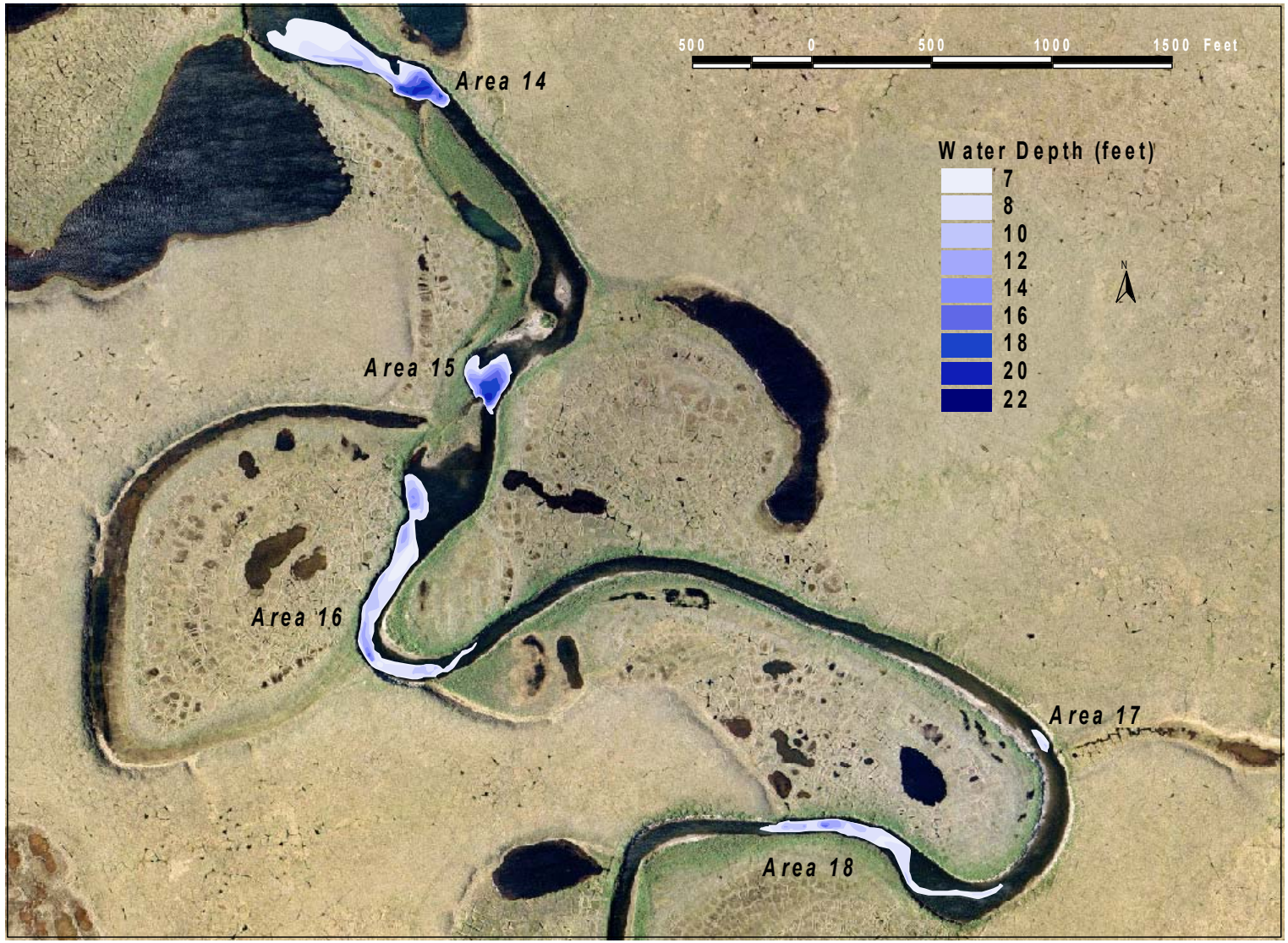
Appendix Figure A-2. Potential wintering areas 3 and 4 in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.



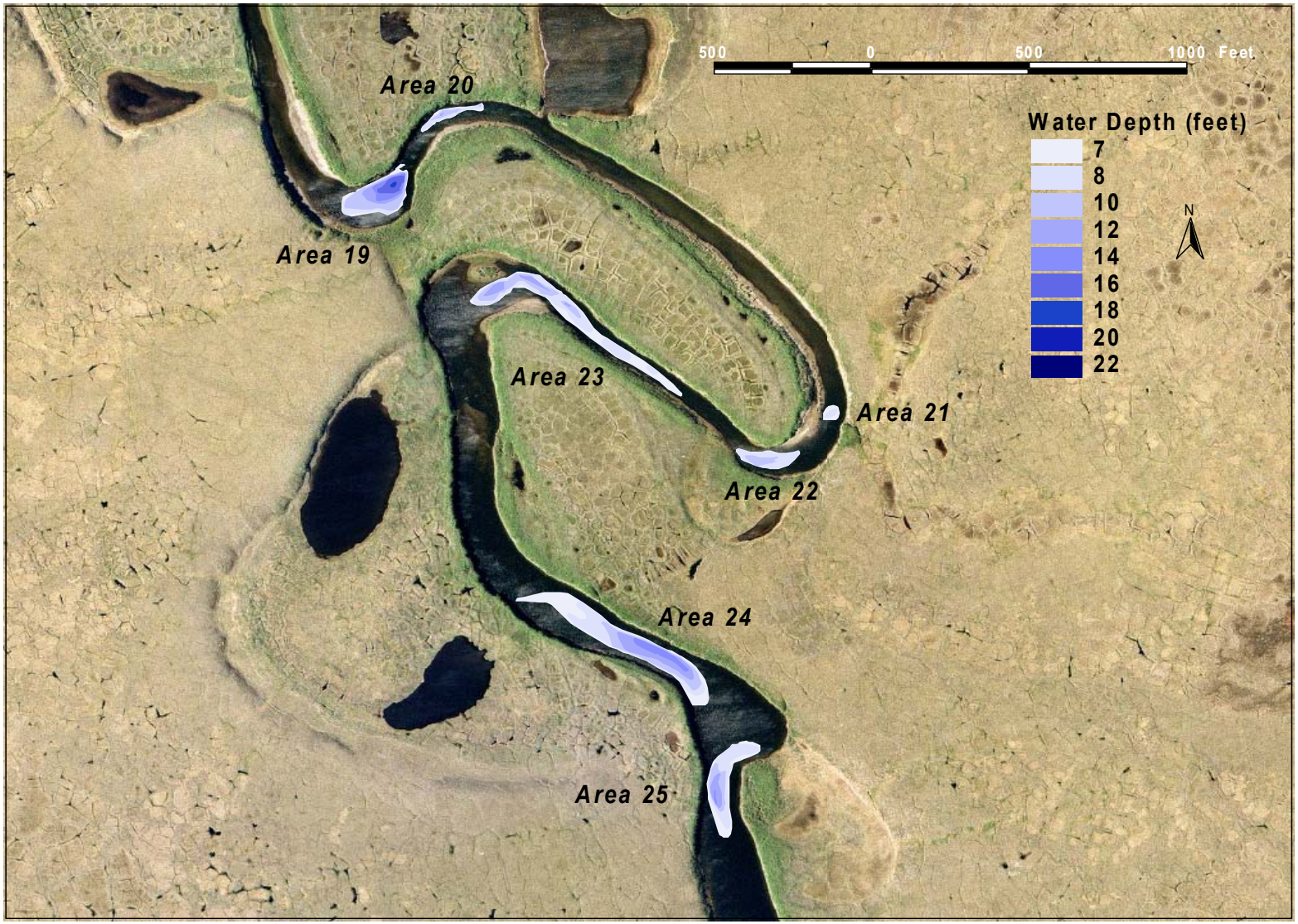
Appendix Figure A-3. Potential wintering areas 5 and 6 in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.



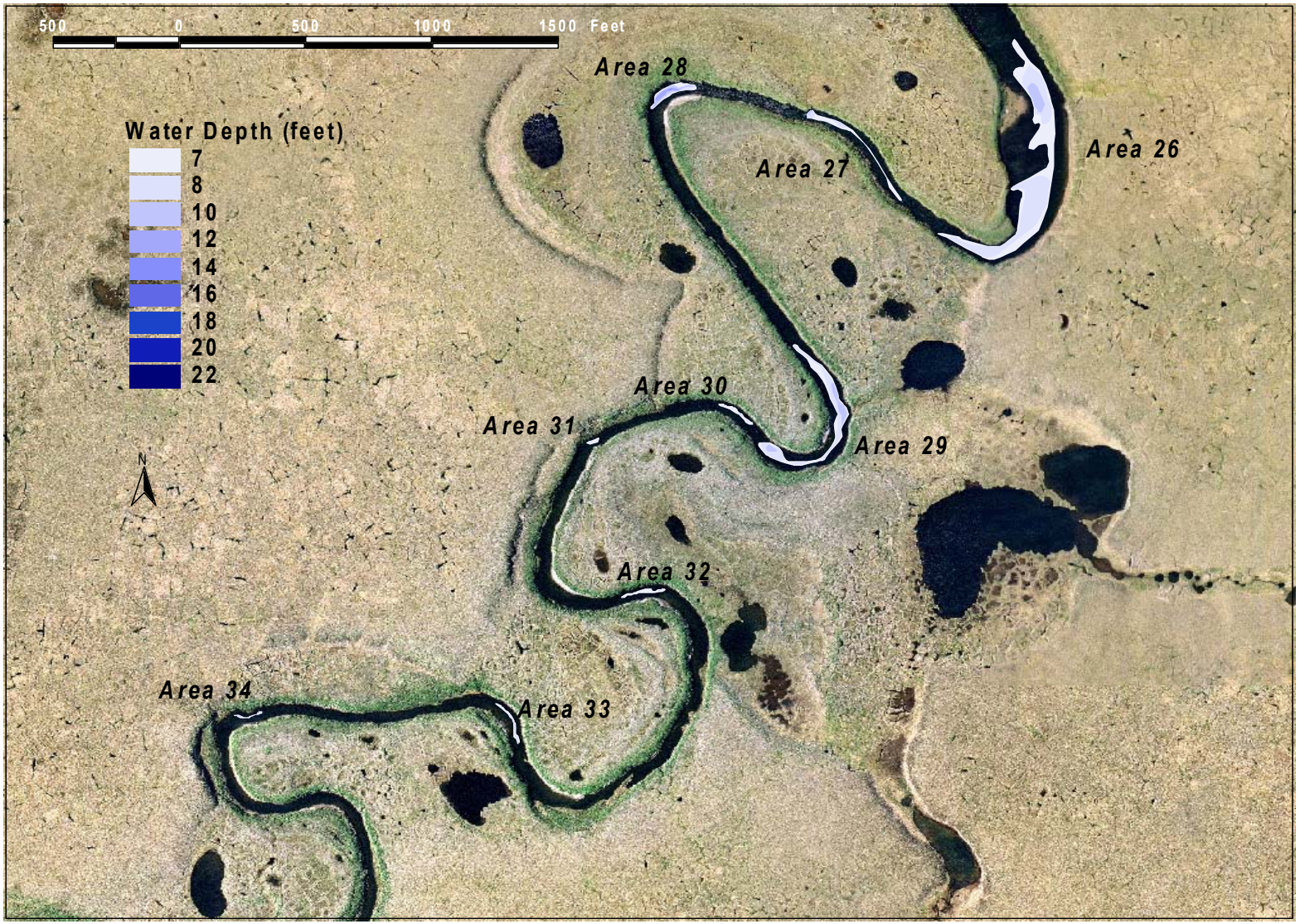
Appendix Figure A-4. Potential wintering areas 7 to 13 in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.



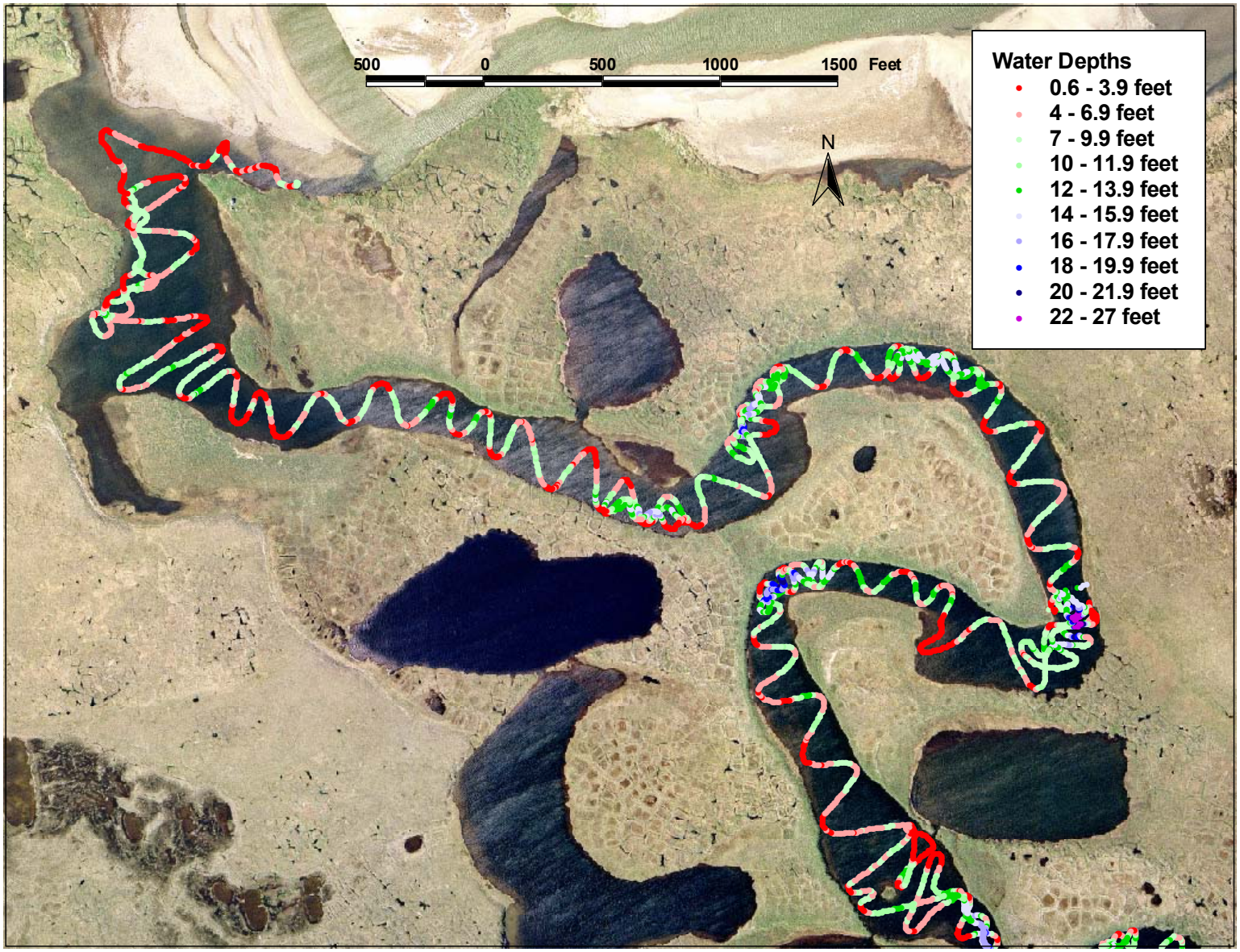
Appendix Figure A-5. Potential wintering areas 14 to 18 in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.



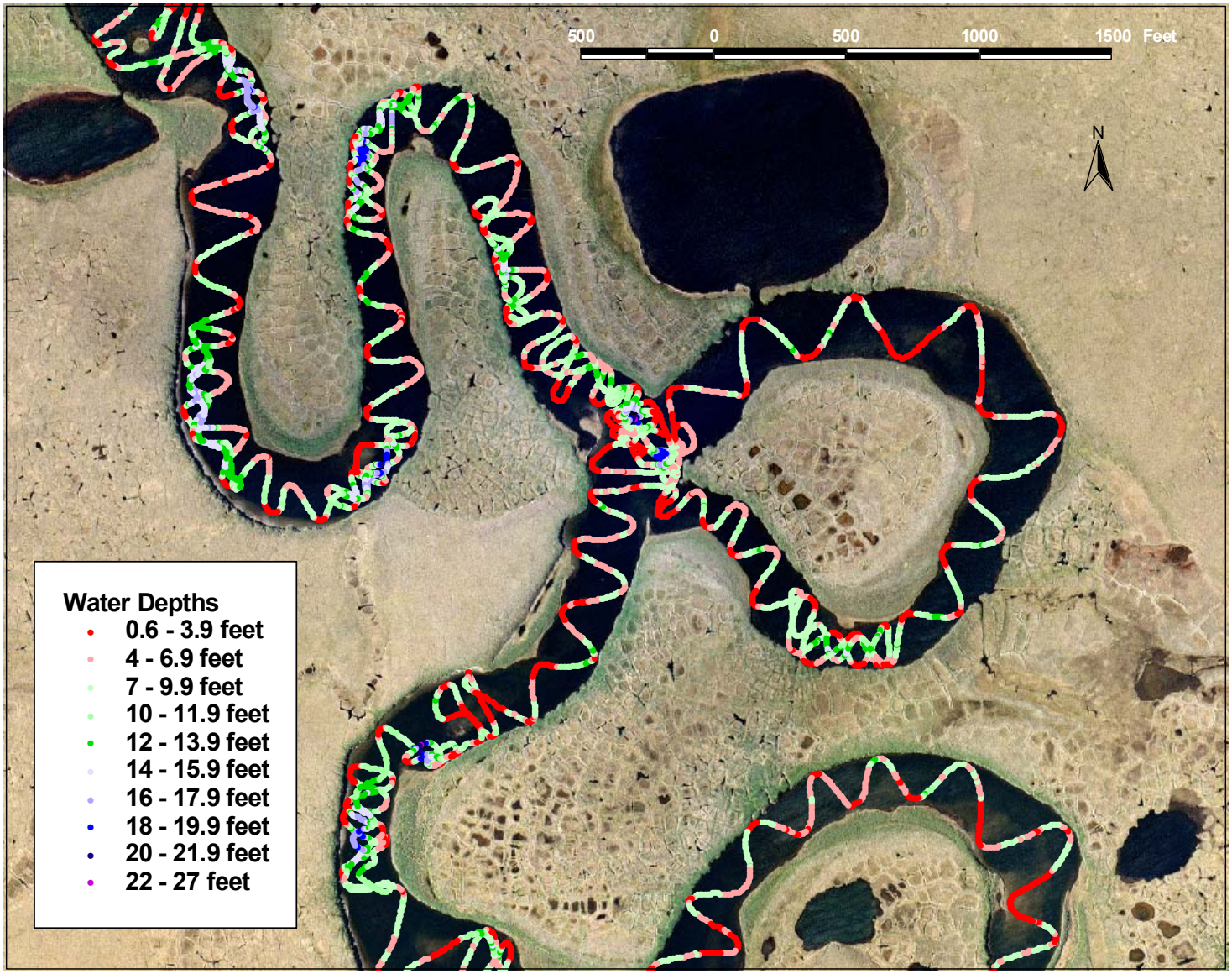
Appendix Figure A-6. Potential wintering areas 19 to 25 in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.



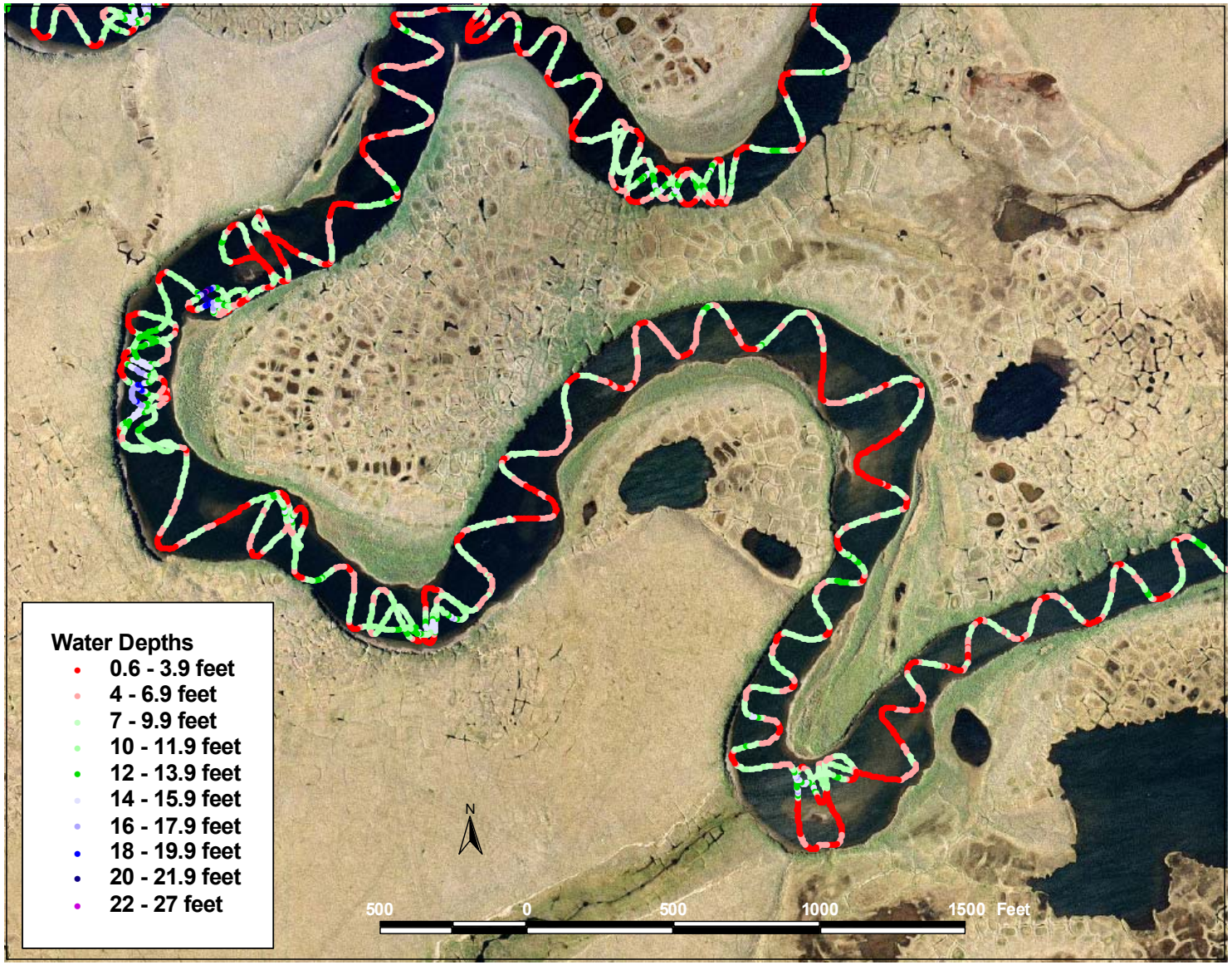
Appendix Figure A-7. Potential wintering areas 26 to 34 in the lower Tingmiaqsiugvik (Ublutuoch River) as identified from bathymetric survey of July 19-20, 2004.



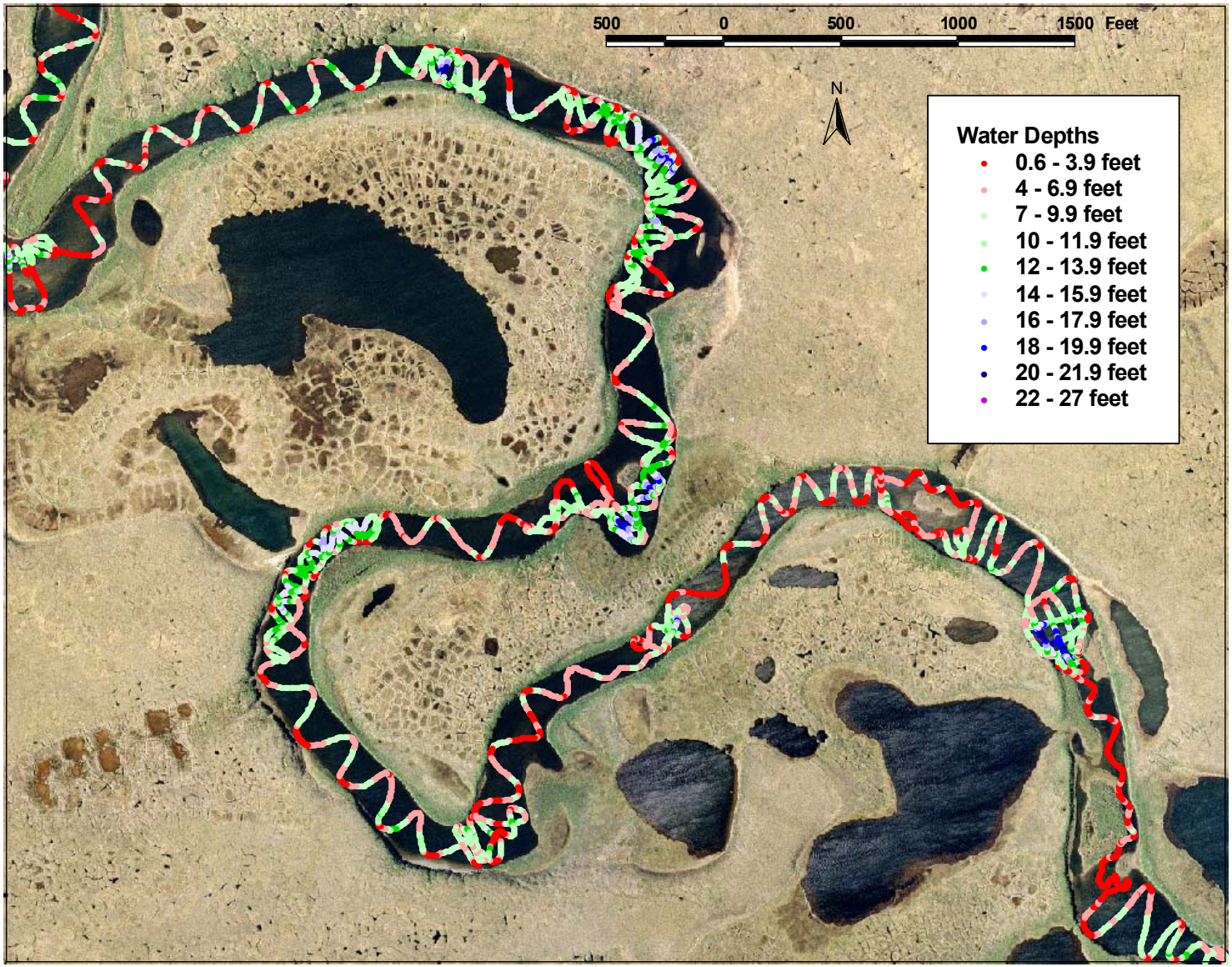
Appendix Figure A-8. Depths measured in the lower Tingmiaqsiugvik (Ublutuoch River) during a bathymetric survey of July 19-20, 2004 near wintering sites 1 and 2.



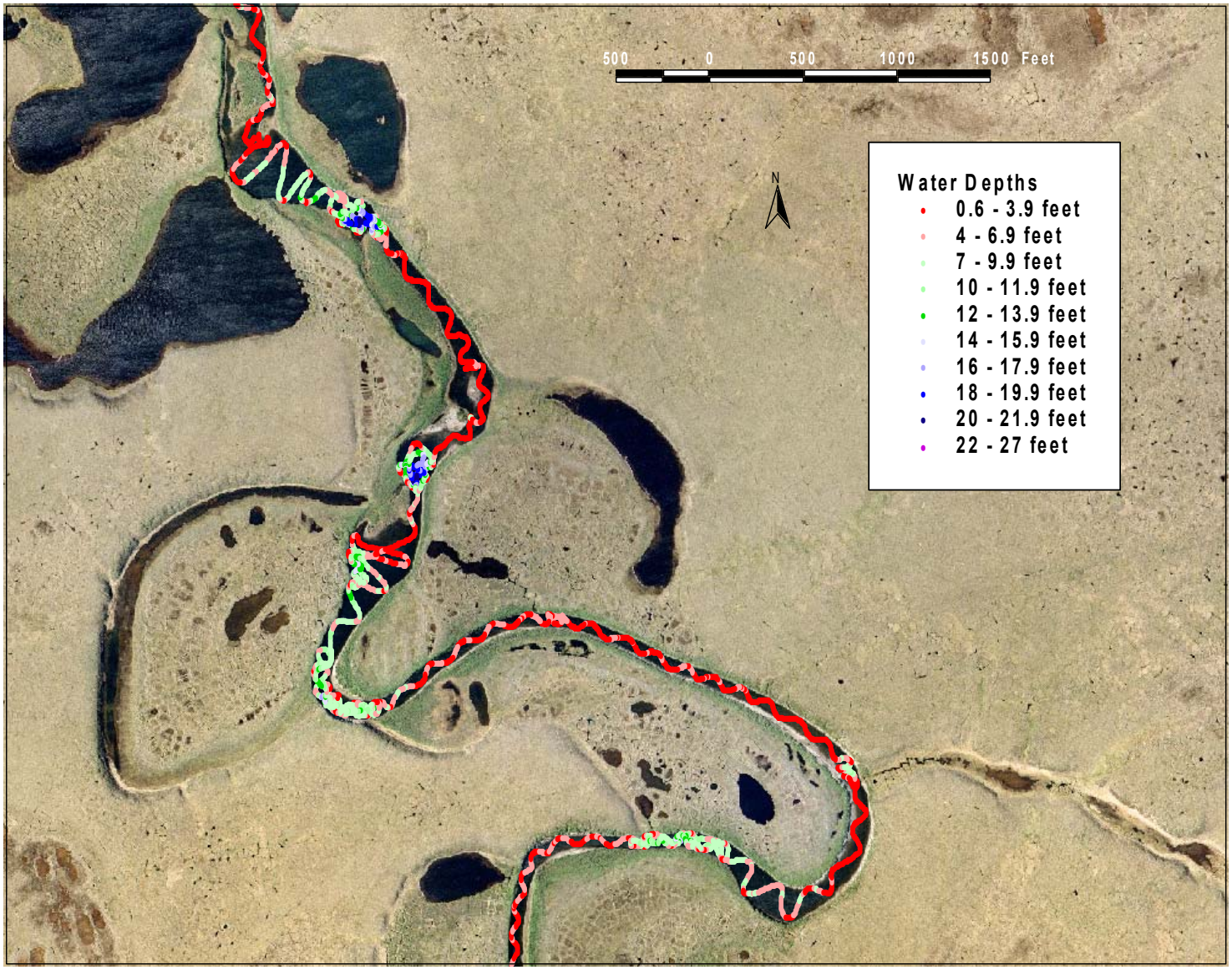
Appendix Figure A-9. Depths measured in the lower Tingmiaqsiugvik (Ublutuoch River) during a bathymetric survey of July 19-20, 2004 near wintering sites 3 and 4.



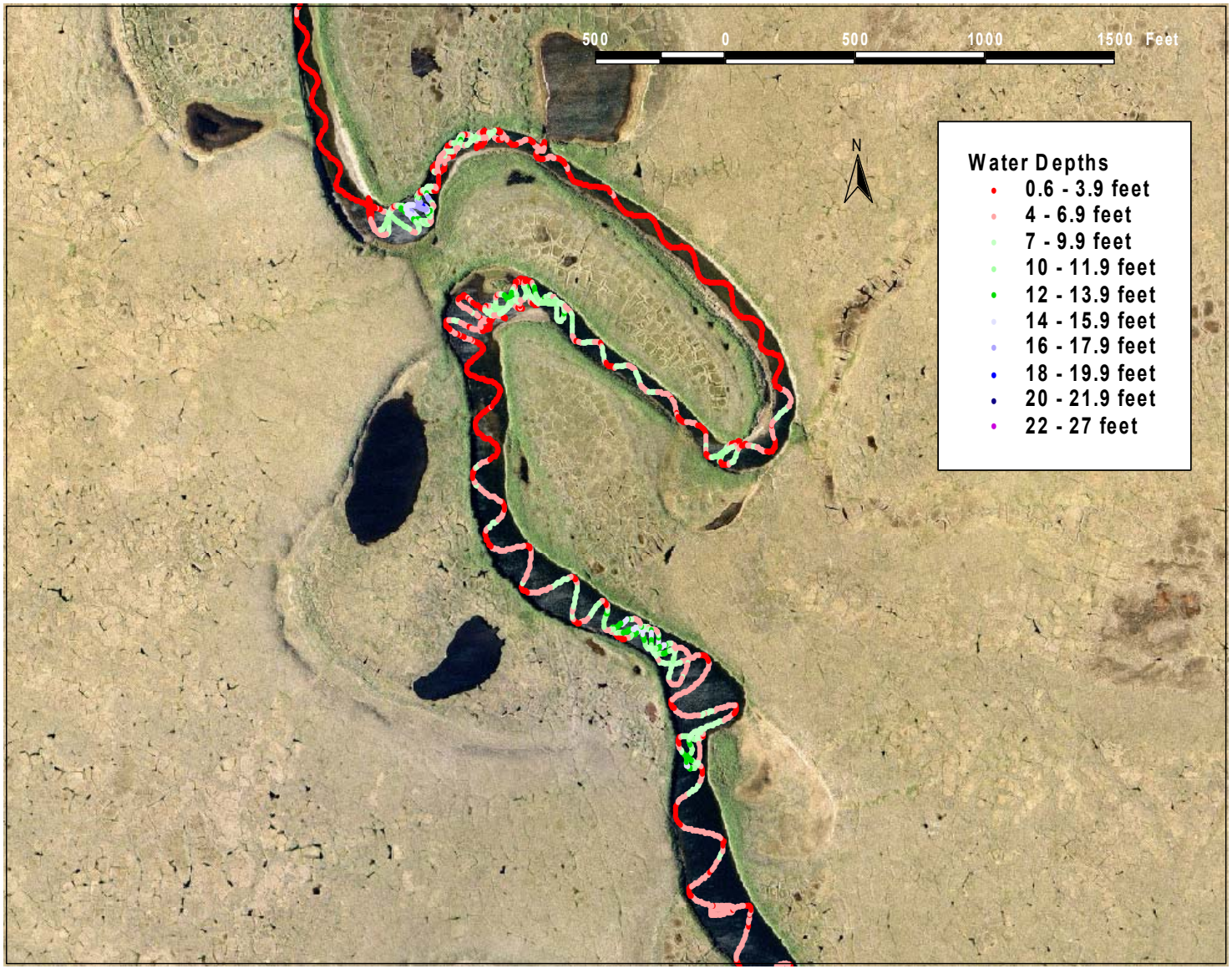
Appendix Figure A-10. Depths measured in the lower Tingmiaqsiugvik (Ublutuoch River) during a bathymetric survey of July 19-20, 2004 near wintering sites 5 and 6.



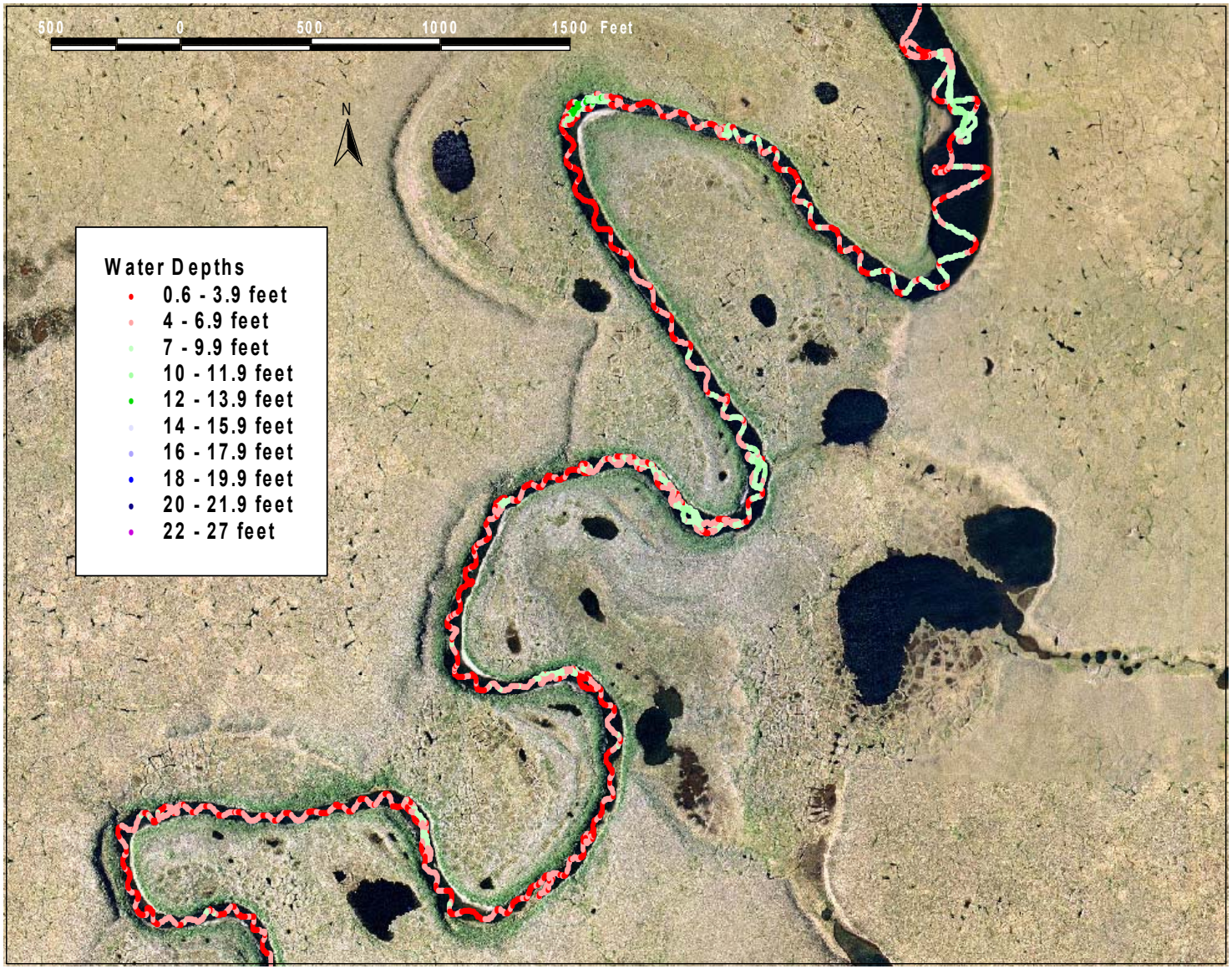
Appendix Figure A-11. Depths measured in the lower Tingmiaqsiugvik (Ublutuoch River) during a bathymetric survey of July 19-20, 2004 near wintering sites 7 to 13.



Appendix Figure A-12. Depths measured in the lower Tingmiaqsiugvik (Ublutuoch River) during a bathymetric survey of July 19-20, 2004 near wintering sites 14 to 18.



Appendix Figure A-13. Depths measured in the lower Tingmiaqsiugvik (Ublutuoch River) during a bathymetric survey of July 19-20, 2004 near wintering sites 19 to 25.



Appendix Figure A-14. Depths measured in the lower Tingmiaqsiugvik (Ublutuoch River) during a bathymetric survey of July 19-20, 2004 near wintering sites 26 to 34.

APPENDIX B

Water chemistry from fyke net stations in eastern NPR-A during 2004

Appendix Table B-1. Means and ranges of water chemistry parameters measured at NPRA fyke net sampling sites, 2004.

Station	Date	Temp (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (%)	Specific Conductance (microS/cm)	pH	Turbidity (NTU)
B0401	7/13/2004	10.9	9.72	87.5	135.6	7.71	0.8
B0401	7/14/2004	12.7	9.34	89.2	138.2	7.38	0.7
B0401	7/15/2004	14.8	9.11	90.1	142.8	7.65	0.8
B0401	7/16/2004	12.5	9.25	87.3	143.3	7.50	0.8
B0402	7/17/2004	12.1	9.74	91.3	145.8	7.57	0.9
B0402	7/18/2004	12.4	9.50	89.5	147.8	7.49	0.8
B0402	7/19/2004	12.7	9.22	86.7	149.9	7.48	0.9
B0402	7/20/2004	12.9	9.51	91.1	150.2	7.69	0.9
B0401	7/31/2004	9.7	10.51	93.3	166.6	7.65	1.4
B0401	8/1/2004	7.0	11.35	93.5	166.6	7.60	2.3
B0401	8/2/2004	6.3	11.55	93.7	164.6	7.59	1.5
B0401	8/3/2004	6.3	12.07	97.8	160.1	7.64	1.9
B0401	8/4/2004	6.8	11.96	97.9	163.7	7.61	2.8
B0401	8/17/2004	16.3	9.80	100.2	184.6	7.44	1.4
B0401	8/18/2004	17.0	8.65	89.2	187.8	7.48	1.8
B0401	8/19/2004	17.2	9.70	101.0	190.4	7.71	1.7
B0401	8/20/2004	14.7	9.58	94.6	191.6	7.65	1.9
B0401	8/21/2004	14.6	10.33	101.2	194.2	7.71	2.0
B0401	8/22/2004	12.6	10.63	100.1	195.6	7.67	1.9
B0401	8/23/2004	9.9	10.13	89.3	196.3	7.59	1.8
B0401	8/24/2004	7.2	11.06	91.6	196.2	7.61	1.7
CK0301	6/16/2004	12.3	11.04	100.0	75.5	7.03	0.8
CK0301	6/17/2004	14.6	9.64	95.3	75.5	7.25	0.6
CK0301	6/18/2004	13.6	9.90	95.8	71.8	7.20	0.7
CK0301	6/19/2004	14.2	9.91	96.7	70.4	7.23	0.6
CK0301	6/20/2004	15.9	9.94	100.5	65.2	7.15	0.5
CK0301	6/21/2004	12.6	9.50	89.6	63.7	7.05	0.5
CK0301	6/22/2004	10.7	10.38	94.1	65.6	7.13	0.5
CK0301	6/23/2004	13.7	10.36	100.5	63.5	7.13	0.5
CK0301	6/24/2004	14.7	9.20	90.2	67.6	7.21	0.6
CK0301	7/10/2004	9.9	10.73	94.8	106.5	7.44	1.2
CK0301	7/11/2004	11.8	10.58	99.5	106.7	7.48	1.1
CK0301	7/13/2004	11.1	10.73	98.1	109.1	7.49	1.1
CK0301	7/14/2004	12.9	9.99	95.5	110.5	7.47	1.0
CK0301	7/15/2004	14.0	9.05	87.5	114.1	7.53	1.1
CK0301	7/16/2004	12.6	9.65	91.2	116.0	7.61	1.0
CK0301	7/17/2004	12.0	9.94	92.5	116.4	7.62	0.9
CK0301	7/18/2004	12.6	9.79	92.2	118.2	7.57	1.1
CK0301	7/19/2004	12.9	9.23	87.5	120.3	7.71	0.9
CK0301	7/20/2004	13.3	9.43	90.7	122.2	7.64	0.9
CK0301	7/29/2004	11.6	9.07	84.2	138.0	7.83	1.0
CK0301	7/30/2004	10.4	9.85	88.7	139.5	7.66	1.1
CK0301	7/31/2004	9.5	9.96	90.5	139.8	7.46	1.0
CK0301	8/1/2004	7.4	10.41	88.7	136.8	7.41	2.7

Appendix Table B-1. Means and ranges of water chemistry parameters measured at NPRA fyke net sampling sites, 2004.

Station	Date	Temp (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (%)	Specific Conductance (microS/cm)	pH	Turbidity (NTU)
CK0301	8/2/2004	6.4	11.59	92.3	136.6	7.48	2.5
CK0301	8/3/2004	6.0	11.76	94.5	136.1	7.54	2.9
CK0301	8/4/2004	6.3	11.74	95.1	137.4	7.50	2.4
CK0301	8/17/2004	16.4	8.75	88.2	158.5	7.29	1.5
CK0301	8/18/2004	17.4	8.17	85.0	161.3	7.39	1.4
CK0301	8/19/2004	17.1	8.89	91.6	164.4	7.55	1.5
CK0301	8/20/2004	14.2	8.53	83.9	165.5	7.48	1.8
CK0301	8/21/2004	13.5	9.77	94.4	167.5	7.42	1.5
CK0301	8/22/2004	12.1	9.50	88.2	168.9	7.38	1.7
CK0301	8/23/2004	10.4	10.10	91.1	166.8	7.46	1.8
CK0301	8/24/2004	8.2	7.48	88.9	172.0	7.64	1.7
CK0302	6/16/2004	19.0	8.30	89.3	115.3	7.08	0.6
CK0302	6/17/2004	19.4	7.83	87.0	125.6	7.22	0.6
CK0302	6/18/2004	15.9	8.88	90.2	129.0	7.20	0.6
CK0302	6/19/2004	17.1	8.89	91.8	131.3	7.22	0.6
CK0302	6/20/2004	20.5	8.23	92.4	137.0	7.16	0.5
CK0302	6/21/2004	10.8	9.07	82.1	138.5	7.12	0.5
CK0302	6/22/2004	10.6	10.40	93.3	138.1	7.15	0.5
CK0302	6/23/2004	15.3	9.09	90.6	142.7	7.12	0.5
CK0302	6/24/2004	16.3	8.82	90.2	150.6	7.29	0.8
CK0302	7/10/2004	11.1	10.96	99.5	179.0	7.44	0.9
CK0302	7/11/2004	14.4	9.60	94.5	175.7	7.44	1.0
CK0302	7/12/2004	11.9	10.95	101.5	178.0	7.36	1.0
CK0302	7/13/2004	11.3	10.44	95.6	178.8	7.42	1.0
CK0302	7/14/2004	14.7	9.70	95.7	185.2	7.39	1.0
CK0302	7/15/2004	13.7	9.34	90.3	190.5	7.55	1.1
CK0302	7/16/2004	13.8	9.75	93.1	194.5	7.48	1.0
CK0302	7/29/2004	9.2	9.28	82.1	238.3	7.75	2.7
CK0302	7/30/2004	9.2	9.76	85.4	237.7	7.47	2.7
CK16C	6/16/2004	17.1			85.5	7.05	0.5
CK16C	6/17/2004	17.6	8.33	87.5	88.0	7.22	0.5
CK16C	6/18/2004	15.0	8.31	81.9	88.4	7.02	1.2
CK16C	6/19/2004	16.1	8.36	84.6	88.4	6.97	1.2
CK16C	6/20/2004	18.2	8.17	86.3	91.5	6.94	0.6
CK16C	6/21/2004	13.8	7.58	73.4	94.3	6.87	0.6
CK16C	6/22/2004	10.8	9.42	84.9	93.0	6.93	0.5
CK16C	6/23/2004	14.8	8.74	86.3	93.0	6.91	0.4
CK16C	6/24/2004	16.5	8.17	83.6	98.0	7.08	0.7
CK16C	7/10/2004	10.1	9.91	87.9	110.4	7.23	0.8
CK16C	7/11/2004	11.9	10.05	94.5	110.6	7.26	0.9
CK16C	7/12/2004	11.9	10.21	94.7	108.4	7.26	1.0
CK16C	7/13/2004	14.0	9.87	95.8	108.7	7.35	0.9

Appendix Table B-1. Means and ranges of water chemistry parameters measured at NPRA fyke net sampling sites, 2004.

Station	Date	Temp (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (%)	Specific Conductance (microS/cm)	pH	Turbidity (NTU)
CK0306	6/18/2004	14.2	9.36	91.5	83.7	7.08	0.5
CK0306	6/19/2004	15.0	8.80	87.3	94.3	7.02	0.6
CK0306	6/20/2004	18.1	7.93	86.3	104.6	6.98	0.5
CK0306	6/21/2004	10.1	8.54	75.8	108.9	6.94	0.5
CK0306	6/22/2004	11.6	9.77	89.6	114.2	6.97	0.5
CK0306	6/23/2004	15.7	7.96	81.4	124.8	6.94	0.5
CK0306	6/24/2004	16.5	7.78	84.0	130.4	7.11	0.7
CK0306	7/10/2004	11.8	10.29	95.0	163.9	7.38	1.2
CK0306	7/11/2004	14.0	9.23	87.5	161.7	7.29	1.0
CK0306	7/12/2004	11.5	94.00	84.4	108.6	7.36	1.1
CK0307	6/16/2004	17.4	7.75	81.4	65.0	6.96	0.3
CK0307	6/17/2004	18.1	7.88	84.3	67.6	6.91	0.3
CK0307	6/18/2004	13.9	8.43	82.4	69.7	6.86	0.5
CK0307	6/19/2004	15.7	7.92	80.3	74.4	6.82	0.3
CK0307	6/20/2004	18.2	7.34	77.8	78.2	6.77	0.3
CK0307	6/21/2004	11.5	7.22	67.1	81.8	6.68	0.5
CK0307	6/22/2004	10.5	8.77	79.2	81.9	6.73	0.4
CK0307	6/23/2004	14.5	8.03	78.8	82.7	6.72	0.4
CK0307	6/24/2004	15.9	7.99	80.7	85.3	6.90	0.7
CK0307	7/11/2004	12.0	9.52	89.3	102.0	7.04	0.8
CK0307	7/12/2004	10.1	9.12	82.3	104.1	7.02	0.8
L9804	7/19/2004	12.9	9.97	94.5	159.1	7.91	2.9
L9804	7/20/2004	12.5	9.82	92.4	160.7	7.99	2.7
L9804	7/21/2004	11.6	9.97		162.4	8.01	2.0
L9805	7/19/2004	12.8	10.02	95.2	143.0	7.88	4.1
L9805	7/20/2004	12.7	9.90	94.0	144.8	8.01	3.5
L9805	7/21/2004	11.6	9.98	92.7	145.8	7.96	2.4
L9806	7/14/2004	15.0	10.98	108.5	162.3	7.85	1.7
L9806	7/15/2004	13.7	9.61	92.7	164.9	7.98	3.2
L9806	7/16/2004	14.3	9.63	93.9	166.8	7.82	3.9
L9806	7/17/2004	13.1	9.86	92.8	166.3	7.95	1.7
L9811	7/21/2004	11.6	10.30	95.4	208.5	8.05	1.0
L9811	7/22/2004	12.2	10.80	99.6	209.1	7.90	12.1
L9811	7/23/2004	14.4	10.08	98.7	211.5	7.93	1.0
L9812	7/30/2004	11.1	9.96	87.0	326.3	8.32	0.8
L9812	7/31/2004	9.8	10.26	89.6	325.5	7.72	0.7
L9812	8/1/2004	7.3	11.53	96.5	326.0	8.13	3.6
L9812	8/2/2004	6.3	11.29	91.8	326.4	8.12	2.6
L9813	7/27/2004	16.7	8.62	89.2	115.4	7.94	1.4
L9813	7/28/2004	12.8	9.75	93.1	115.4	7.90	2.0

Appendix Table B-1. Means and ranges of water chemistry parameters measured at NPRA fyke net sampling sites, 2004.

Station	Date	Temp (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (%)	Specific Conductance (microS/cm)	pH	Turbidity (NTU)
L9813	7/29/2004	12.7	9.73	91.6	116.3	7.94	1.4
L9817	7/16/2004	13.0	9.72	93.9	224.3	7.60	0.8
L9817	7/17/2004	13.4	10.10	97.0	224.0	7.72	0.7
L9817	7/18/2004	12.7	10.08	93.8	226.3	7.70	0.8
L9817	7/19/2004	12.2	9.59	90.2	227.5	7.74	0.8
L9819	7/19/2004	13.1	10.05	97.6	99.5	7.76	3.3
L9819	7/20/2004	12.8	9.68	93.2	100.4	7.66	3.3
L9819	7/21/2004	12.5	9.90	93.4	100.6	7.90	2.9
L9821	7/21/2004	13.0	10.78	102.0	154.8	8.00	1.4
L9821	7/22/2004	13.0	10.72	100.5	155.8	7.83	1.3
L9821	7/23/2004	15.9	10.96	111.5	158.1	7.74	1.0
L9911	7/23/2004	16.7	10.36	107.2	163.4	7.91	0.7
L9911	7/24/2004	16.6	10.18	102.3	165.3	8.01	0.7
L9911	7/25/2004	17.3	8.87	93.3	166.3	7.91	1.0
M0009	7/26/2004	16.8	8.71	88.5	61.2	7.26	1.6
M0009	7/27/2004	15.4	8.64	91.5	62.6	7.47	3.3
M0009	7/28/2004	12.7	9.21	86.9	62.9	7.53	2.2
M0015	7/24/2004	18.6	9.88	102.2	189.9	8.10	0.8
M0015	7/25/2004	18.3	9.01	95.9	191.0	8.00	1.6
M0015	7/26/2004	18.2	8.23	86.2	192.6	7.76	1.7
M0017	7/24/2004	19.1	9.89	108.0	217.5	7.96	1.6
M0017	7/25/2004	18.3	9.88	105.4	217.3	7.89	2.6
M0017	7/26/2004	18.8	8.97	96.9	220.1	7.85	2.6
M0025	7/24/2004	16.0	10.13	103.1	82.6	7.68	1.4
M0025	7/25/2004	15.8	9.67	97.0	83.1	7.60	1.5
M0025	7/26/2004	16.3	8.79	87.5	83.6	7.37	1.5
M0025	7/27/2004	14.9	9.32	93.6	84.4	7.56	1.3
M0029	7/26/2004	17.9	9.83	104.5	425.4	8.18	0.7
M0029	7/27/2004	17.1	8.83	90.6	426.3	8.42	0.7
M0029	7/28/2004	15.2	8.89	88.4	427.6	8.41	1.3
M0030	7/27/2004	17.1	9.06	92.3	202.9	8.26	0.4
M0030	7/28/2004	14.3	9.59	93.2	203.9	8.15	0.5
M0030	7/29/2004	13.2	9.53	90.6	203.8	8.13	0.5
M9907	7/28/2004	12.6	9.57	90.0	184.6	8.16	0.6
M9907	7/29/2004	12.1	9.53	92.5	184.6	8.02	0.8
M9907	7/30/2004	11.5	9.85	94.3	184.3	8.13	0.5
M0420	7/20/2004	12.8	9.80	93.5	187.5	8.10	0.8

Appendix Table B-1. Means and ranges of water chemistry parameters measured at NPRA fyke net sampling sites, 2004.

Station	Date	Temp (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (%)	Specific Conductance (microS/cm)	pH	Turbidity (NTU)
M0420	7/21/2004					8.18	0.6
M0420	7/22/2004	13.4	10.83	102.7	192.1	8.03	1.0
MB0302	7/22/2004	12.5	10.42	96.5	114.3	7.67	1.0
MB0302	7/23/2004	15.8	10.35	106.0	95.6	7.53	0.5
MB0302	7/24/2004	16.1	9.90	101.0	96.1	7.55	0.4
MB0302	7/25/2004	16.1	9.20	93.8	97.0	7.39	0.6
U0102	7/14/2004	12.6	9.78	92.5	103.9	7.56	1.3
U0102	7/15/2004	14.7			105.4	7.66	1.8
U0102	7/16/2004	13.8	10.02	97.1	105.7	7.61	1.4
U0102	7/17/2004	13.0	10.15	96.3	106.5	7.74	1.3
U0102	7/30/2004	10.9	9.98	90.9	118.7	7.84	1.6
U0102	7/31/2004	10.1	10.45	92.8	120.5	7.57	1.6
U0102	8/1/2004	7.3	11.11	92.4	124.9	7.61	3.4
U0102	8/2/2004	7.1	11.43	94.3	128.2	7.65	2.1
U0102	8/3/2004	7.0	11.09	91.7	129.1	7.69	1.9
U0102	8/4/2004	7.0	11.36	93.1	128.9	7.60	2.1
U0102	8/17/2004	16.8	10.80	111.2	143.1	7.63	2.1
U0102	8/18/2004	17.2	10.00	104.1	142.1	7.61	2.2
U0102	8/19/2004	17.6	10.18	107.3	141.8	7.91	2.6
U0102	8/20/2004	14.6	10.19	100.4	142.3	7.85	2.1
U0102	8/21/2004	15.4	10.76	108.0	142.5	7.88	2.2
U0102	8/22/2004	13.0	10.39	98.7	143.7	7.78	2.3
U0102	8/23/2004	10.1	10.40	91.9	145.2	7.64	2.8
U0102	8/24/2004	7.2	11.19	92.8	147.0	7.72	2.5
U0301	6/16/2004	12.5	10.05	94.2	84.5	7.09	2.1
U0301	6/17/2004	15.0	9.68	96.3	85.0	7.31	1.9
U0301	6/18/2004	14.4	9.18	90.0	87.6	7.26	2.0
U0301	6/19/2004	14.4	9.51	93.4	87.8	7.24	1.7
U0301	6/20/2004	15.0	9.40	92.5	87.0	7.67	1.6
U0301	6/21/2004	14.5	9.03	89.4	86.9	7.17	1.5
U0301	6/22/2004	12.8	9.76	92.6	86.2	7.25	1.4
U0301	6/23/2004	14.7	9.82	97.2	86.3	7.30	1.2
U0301	6/24/2004	15.7	9.15	92.2	87.4	7.43	1.5
U0301	7/10/2004	10.9	10.95	100.3	99.4	7.40	1.5
U0301	7/11/2004	11.4	10.84	98.8	99.8	7.63	1.5
U0301	7/12/2004	12.4	10.50	98.6	103.9	7.58	1.7
U0301	7/13/2004	11.9	10.70	99.1	103.0	7.60	1.3

APPENDIX C

Fish caught by fyke net in eastern NPR-A during 2004.

Appendix Table C-1. Daily catches of fish and effort at fyke net stations in eastern NPRA streams during 2004.

Bill's Creek

	Jul 13		Jul 14		Jul 15		Jul 16		Jul 17		Jul 18		Jul 19		Jul 20		Jul 31		Aug 01		Aug 02	
Species	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
Broad whitefish			1				1	12	3	3		4			2	1			1			
Alaska blackfish																						
Arctic grayling	342	3	217	41	195	33	183	59	148	65	97	52	119		79	10	7	12	23	9	12	5
Humpback whitefish			1	2			3	5	2	3		5				3						
Least cisco							2						1			3						
Ninespine stickleback	2					1					3						1	4				1
Round whitefish					1		1								1							
Slimy sculpin					1		1		3		5		1		1					1		
Effort (hrs)	19.1	18.9	23.3	23.0	27.9	27.8	20.8	21.5	22.2	21.5	22.6	22.6	24.3	25.0	23.9	23.8	18.8	19.0	25.3	26.8	22.1	21.8

Bill's Creek (continued)

	Aug 03		Aug 04		Aug 18		Aug 19		Aug 20		Aug 21		Aug 22		Aug 23		Aug 24	
Species	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
Broad whitefish						14	3	34	7	11	2	5		4	4	7	2	1
Alaska blackfish														2				
Arctic grayling	3	6	10	6	3	19	27	10	11	12		2		1	9	3	1	3
Humpback whitefish																		
Least cisco								4	2									
Ninespine stickleback				1	72	173	81	240	33	172	23	13	14	47	13	13	3	28
Round whitefish																		
Slimy sculpin					1		1	1		1								
Effort (hrs)	23.3	23.1	26.6	26.8	22.9	22.2	27.7	27.8	25.1	25.2	23.9	24.1	22.4	22.6	22.1	22.1	21.6	21.6

Crea Creek

	Jun 16	Jun 17	Jun 18	Jun 19	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 10	Jul 11	Jul 12	Jul 13	Jul 13	Jul 14		Jul 15		Jul 16		Jul 17	
Species	US	US	US	US	US	US	US	US	US	US	US	US	DS	US	DS	US	DS	US	DS	US	DS	US
Broad whitefish				1	2			1														
Alaska blackfish					1		1								1		1					
Burbot					1																	
Arctic grayling	31	7	36	47	149	147	51	65	7	24		57	89	13	10	14	92	1	43	1		
Ninespine stickleback							1						191	12	12	1	34	183	5	6	2	7
Slimy sculpin	2	13		4		1	4				4	23	1				1					
Effort (hrs)	20.3	22.8	24.2	22.8	24.6	22.3	22.7	24.3	24.7	24.6	24.5	21.2	27.6	26.7	21.8	21.5	28.3	28.8	22.5	22.3	22.1	21.3

Appendix Table C-1. Daily catches of fish and effort at fyke net stations in eastern NPRA streams during 2004.

Crea Creek (continued)

	Jul 18		Jul 19		Jul 20		Jul 29		Jul 30		Jul 31		Aug 01		Aug 02		Aug 03		Aug 04		Aug 18	
Species	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
Broad whitefish																					2	
Alaska blackfish																						1
Burbot														1		1						
Arctic grayling	10	12	31	3	54	3	11	15	13	9		8	3	3	11	5	3	4	3	17	6	14
Ninespine stickleback		22	4	17	23	52	11	5	5	40	3	3	3	4	1			2	2	1	39	51
Slimy sculpin						1					1				1							
Effort (hrs)	22.0	21.8	27.2	26.3	23.5	24.2	18.3	17.9	27.6	27.7	23.3	23.4	20.8	21.2	27.1	27.3	22.4	22.2	23.3	23.3	22.2	21.8

CK0301 (continued)

	Aug 19		Aug 20		Aug 21		Aug 22		Aug 23		Aug 24	
Species	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
Broad whitefish						1	1					
Alaska blackfish												
Burbot												
Arctic grayling	1	9	3	12	6		2		6	1	8	5
Ninespine stickleback	157		111	38	8	41	26	8	8	17	5	2
Slimy sculpin												
Effort (hrs)	31.7	32.0	21.8	21.2	22.9	23.3	22.8	23.0	21.4	21.4	26.7	26.7

Oil Creek

	Jun 16	Jun 17	Jun 18	Jun 19	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 10	Jul 11	Jul 12	Jul 13	Jul 14	Jul 15	Jul 16	Jul 29		Jul 30	
Species	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	DS	US	DS	US
Broad whitefish	5	4	3	1	2														1	2
Alaska blackfish	10	3	8	17	3	7		4	3				1							
Arctic grayling		1	1		4			2	2	4	2	35	6	43	44	37				5
Ninespine stickleback	67	36	844	2278	394	272	82	125	67	27	30	134	49	173	395	16	43	7	44	7
Slimy sculpin									1	1		6	4	9	6	9		3	2	5
Effort (hrs)	20.7	26.6	23.8	23.4	24.7	22.2	22.1	24.5	27.1	28.0	25.2	25.5	20.3	24.8	27.8	22.9	22.8	22.9	27.2	27.3

CK16C/US

Species	Jun 16	Jun 17	Jun 18	Jun 19	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 10	Jul 11	Jul 12	Jul 13
Alaska blackfish	3	1	6	2	6	2	1	8	3	7		5	9
Arctic grayling			1	1	3			1		1			4
Ninespine stickleback	68	9	172	4	300	182	74		77	62	46	46	34
Effort (hrs)	20.5	27.2	19.2	23.3	24.3	22.6	22.8	24.7	27.4	23.1	24.4	28.5	23.3

Appendix Table C-1. Daily catches of fish and effort at fyke net stations in eastern NPRA streams during 2004.

CK0306/US

Species	Jun 18	Jun 19	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 10	Jul 11
Alaska blackfish	2		3	4	3	1	6	7	3
Arctic grayling				2					
Ninespine stickleback	21	26	108	92	5	16	63	49	64
Effort (hrs)	20.3	23.6	24.6	22.1	22.2	24.5	26.9	26.3	24.8

F0307A/US

Species	Jun 16	Jun 17	Jun 18	Jun 19	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 11	Jul 12
Alaska blackfish					1	1	1				1
Ninespine stickleback	26	53	14	129	325	385	510	634	540	68	29
Effort (hrs)	20.7	27.0	19.5	23.4	23.9	22.6	23.0	24.7	27.3	24.1	23.5

Ublutuoch

	Jun 16	Jun 17	Jun 18	Jun 19	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 10	Jul 11	Jul 12	Jul 13	Jul 14	Jul 15	Jul 16	Jul 17	Jul 30	Jul 31		Aug 01	
Species	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	DS	US	DS	US
Broad whitefish		6	2						3												1	
Chinook salmon																						
Arctic grayling	76	72	129	66	52	33	47	4	139	15	1	10	7	9	6	2		11		5		1
Least cisco		1																				
Ninespine stickleback							22	40		2		1	6	9	6	2						
Slimy sculpin								1	2			1		9	6	2						
Effort (hrs)	20.2	26.9	19.2	23.1	24.0	23.4	23.3	24.5	24.3	20.4	23.3	30.6	20.0	21.7	28.2	22.1	22.9	20.8	23.1	23.8	22.9	23.0

Ublutuoch (continued)

	Aug 02		Aug 03		Aug 04		Aug 18		Aug 19		Aug 20		Aug 21		Aug 22		Aug 23		Aug 24	
Species	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
Broad whitefish				1	2		1	17	9	23	3	1	2	1			4			
Chinook salmon				3													1			
Arctic grayling		25		7		7	1	4	1	5				2		1		7	2	2
Least cisco	1							1		3				4	2				1	
Ninespine stickleback								146		4		63				2		5		
Slimy sculpin																				
Effort (hrs)	24.5	24.5	23.4	23.3	24.8	24.9	22.2	21.8	28.6	28.2	24.2	24.7	24.2	24.2	20.7	20.8	21.3	21.2	24.2	24.2

Appendix Table C-2. Daily catches of fish and effort at fyke net stations in eastern NPRA lakes during 2004.

M0420

Species	Jul 20 04	Jul 21 04	Jul 22 04	Total
Broad whitefish		2		2
Arctic grayling	36	22	22	80
Ninespine stickleback		16	11	27
Effort (hrs)	23.5	28.2	22.8	74.4

L9804

Species	Jul 19 04	Jul 20 04	Jul 21 04	Total
Ninespine stickleback	124	275	212	611
Effort (hrs)	25.9	23.7	18.2	67.8

L9805

Species	Jul 19 04	Jul 20 04	Jul 21 04	Total
Ninespine stickleback	246	155	191	592
Effort (hrs)	27.4	23.6	18.7	69.7

L9806

Species	Jul 14 04	Jul 15 04	Jul 16 04	Jul 17 04	Total
Ninespine stickleback	1		2		3
Effort (hrs)	21.9	27.8	23.7	18.2	91.6

L9811

Species	Jul 21 04	Jul 22 04	Jul 23 04	Total
Broad whitefish		4		4
Arctic grayling	23	22	145	190
Ninespine stickleback	33	64	227	324
Effort (hrs)	21.6	29.0	20.4	71.0

L9812

Species	Jul 30 04	Jul 31 04	Aug 01 04	Aug 02 04	Total
Ninespine stickleback	42	367	110	76	595
Effort (hrs)	23.3	17.1	27.5	19.9	87.8

L9813

Species	Jul 27 04	Jul 28 04	Jul 29 04	Total
Arctic grayling	11	14	4	29
Ninespine stickleback	17	18	19	54
Effort (hrs)	23.0	25.7	23.3	71.9

L9817

Species	Jul 16 04	Jul 17 04	Jul 18 04	Jul 19 04	Total
Ninespine stickleback		1			1
Effort (hrs)	26.7	24.4	20.3	24.5	95.8

L9819

Species	Jul 19 04	Jul 20 04	Jul 21 04	Total
Arctic grayling	22	40	26	88
Least cisco		1		1
Ninespine stickleback	674	37	146	857
Effort (hrs)	24.2	21.3	24.6	70.2

Appendix Table C-2. Daily catches of fish and effort at fyke net stations in eastern NPRA lakes during 2004.

L9821

Species	Jul 21 04	Jul 22 04	Jul 23 04	Total
Ninespine stickleback	3	14	60	77
Effort (hrs)	24.2	21.8	25.1	71.2

L9911

Species	Jul 23 04	Jul 24 04	Jul 25 04	Total
Ninespine stickleback	135	3149	532	3816
Effort (hrs)	21.8	22.2	25.0	69.1

M0009

Species	Jul 26 04	Jul 27 04	Jul 28 04	Total
Ninespine stickleback	28	7	60	95
Effort (hrs)	23.7	23.5	26.1	73.2

M0015

Species	Jul 24 04	Jul 25 04	Jul 26 04	Total
Ninespine stickleback	750	1712	796	3258
Effort (hrs)	25.5	25.4	21.7	72.6

M0017

Species	Jul 24 04	Jul 25 04	Jul 26 04	Total
Ninespine stickleback	14	112	114	240
Effort (hrs)	25.5	24.4	24.1	74.0

M0025

Species	Jul 24 04	Jul 25 04	Jul 26 04	Jul 27 04	Total
Ninespine stickleback	430	303	850	560	2143
Effort (hrs)	20.2	24.6	22.9	24.4	92.1

M0029

Species	Jul 26 04	Jul 27 04	Jul 28 04	Total
Ninespine stickleback	21	206	134	361
Effort (hrs)	23.9	23.7	24.5	72.1

M0030

Species	Jul 27 04	Jul 28 04	Jul 29 04	Total
Alaska blackfish	1	1	1	3
Ninespine stickleback	115	100	66	281
Effort (hrs)	23.8	25.2	23.2	72.2

M9907

Species	Jul 28 04	Jul 29 04	Jul 30 04	Total
Ninespine stickleback	169	131	141	441
Effort (hrs)	25.5	23.3	22.2	70.9

MB0302

Species	Jul 23 04	Jul 24 04	Jul 25 04	Total
Alaska blackfish		1		1
Ninespine stickleback	62	370	462	904
Effort (hrs)	26.7	20.8	23.7	71.3

APPENDIX D

Length frequencies of fish caught by fyke net in eastern NPR-A, 2004

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Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Bill's Creek** Jul 13		Jul 14		Jul 15		Jul 16		Jul 17		Jul 18		Jul 19		Jul 20		Jul 31		Aug 01	
	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
0																				
10																				
20																				
30																		1		
40																				
50	1				1						1									
60	65		11	10	14	4	13	2	5	11	8	4	5		5	1				
70	230		50	28	42	21	37	26	36	30	33	26	37		32	4	1	1	3	2
80	30		3	1	10	3	9	8	8	4	14	11	19		29	3	4	6	4	3
90	1				1		1		1			1	1				1	3	3	2
100	3						1	1	1	1			1							
110	2		4		1		1	1	3		3	1	1		2					
120	4		7	1		1		1	5		4	1	7		1					
130	1		9		1	1	2	1	4	1	1	1	8		1		1		1	
140			7				2		1				1		4					
150			1				1	1	3		1				1					
160	1		2				4		3	1		3			1					
170	2		2			1	5		1	1		1								
180		1	2				2			2			1		1					
190	1								2	1					1					
200		1					2		1	1		1								
210																				
220							1	1	3	2		1	2						1	
230						1														
240			1										1							
250													1							
260			1																	
270						1		2										1	1	1
280								1	1				1							
290								2											1	
300										1										
310								1											2	
320								2		1			1			1			1	
330									1	1									2	
340	1						1	2					1		1				2	1
350			1							1	1					1			1	
360								1											1	
370								2	1	3										
380		1						2		2										
390								2												
400				1								1								
410										1										
420																				
430																				
440																				
450																				
460																				
470																				
480																				
490																				
500																				
Total:	342	3	101	41	70	33	82	59	80	65	66	52	88	0	79	10	7	12	23	9

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Bill's Creek** Aug 02		Aug 03		Aug 04		Aug 18		Aug 19		Aug 20		Aug 21		Aug 22		Aug 23		Aug 24	
	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
0																				
10																				
20																				
30																				
40								2	2		1							1		
50							1	4	5	1		4				1	3	1		2
60																				
70	2	1		2				1	2											
80	2	1				1	1	4	1	3	1	1		1			1			
90	2	2	1		1	1		3	2	3	2								1	1
100																				
110																				
120										1	1	1								
130		1			1		1	2	2	1	1							1		
140				1																
150					1															
160				1																
170											1	1								
180																				
190									1											
200				1								1								
210												2								
220						2														
230									1											
240									1			1								
250									1								1			
260											1									
270	2										1									
280									2			1								
290			1			2		1	3		1			1						
300					1				1											
310	1								1		1						2			
320					1															
330	1				1			1	1	1							2			
340			1		1				1											
350	1																			
360				1				1												
370																				
380					1															
390	1																			
400																				
410					1															
420																				
430																				
440																				
450																				
460																				
470																				
480																				
490																				
500																				
Total:	12	5	3	6	9	6	3	19	27	10	11	12	0	2	0	1	9	3	1	3

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Crea Creek** Jun 16 US	Jun 17 US	Jun 18 US	Jun 19 US	Jun 20 US	Jun 21 US	Jun 22 US	Jun 23 US	Jun 24 US	Jul 10 US	Jul 11 US	Jul 12 DS	Jul 12 US	Jul 13 DS	Jul 13 US	Jul 14 DS	Jul 14 US
0																	
10																	
20																	
30																	
40						2											
50					4	4	7	8	1				1				
60					2	2	4	2					13	17	1	1	
70								2		11			18	54		1	5
80					4	13	2	1		1			6	11		1	3
90	1		6	3	30	35	9	15					1				
100			5	2	42	40	12	16				1			2		
110	2		2	3	13	7	3	8	1	1			2	2			
120			2	5	4	6	3	1		1		1	3	1	1		
130	2		3	2	7	8	2	3		1			1			1	
140	4	1	4	3	8	5		2		1			2				
150	3	2	2	8	4	7	3	1							1		
160	5	1	1	3	14	3	4	1		2							
170	2		2	4	6	4	1	1	1					1		1	
180	2		1	1	1			2								1	
190	1		1	2	1				1				1	1			
200	2	1		3	2	4			1						2	2	
210	1	1	1		1	2		1	1			1					1
220	2		1		2	2							2	1	1		1
230			1	6	1				1								
240	3		1	1		1										1	
250		1			1										1		
260	1		1	1	1											1	
270				1	1					1							
280				1											1		
290						1											
300				2		1	1						1		1		1
310			1	1						3					1		
320			1												1		
330										1			1	1			3
340								1		1							
350																	
360													1				
370				2									1				
380				1													
390																	
400				1													
410				1													
420																	
430																	
440																	
450																	
460																	
470																	
480																	
490																	
500																	
Total:	31	7	36	57	149	147	51	65	7	24	0	3	54	89	13	10	14

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Crea Creek** Jul 15 DS	Jul 15 US	Jul 16 DS	Jul 16 US	Jul 18 DS	Jul 18 US	Jul 19 DS	Jul 19 US	Jul 20 DS	Jul 20 US	Jul 29 DS	Jul 29 US	Jul 30 DS	Jul 30 US	Jul 31 DS	Jul 31 US	Aug 01 DS	Aug 01 US	Aug 02 DS	Aug 02 US
0																				
10																				
20																				
30																				
40														4		2				2
50																				
60	3		2				1		1				1	1						
70	41		9		4	2	12	1	14		1	2				3				
80	14	1	9		2	1	13		13		1	5	2	3		2	2	1		1
90						1						5	1	1		1				
100	3																			
110	7		4				1		1											
120	5		4				2		6											
130	1		2			2	2		7		1									1
140	3								1		1									
150																				
160						1														
170	3		1		2			1	2											
180	3		1			1			2			1	1						1	
190			2																	
200	2		1						2											
210			1						2											
220			1	1	1	1			2		2	1	2							1
230	1					1							1					1	3	
240	1																	1	1	
250			1						1										1	
260	1										1								1	
270			2								1									
280	2					1				1	2		2						2	
290			2								1	1	1				1			
300			1										2							
310					1			1											1	
320	1									1										
330										1										
340																				
350	1																			
360																				
370																				
380																				
390						1														
400																				
410																				
420																				
430																				
440																				
450																				
460																				
470																				
480																				
490																				
500																				
Total:	92	1	43	1	10	12	31	3	54	3	11	15	13	9	0	8	3	3	10	5

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Crea Creek** Aug 03 DS	Aug 03 US	Aug 04 DS	Aug 04 US	Aug 18 DS	Aug 18 US	Aug 19 DS	Aug 19 US	Aug 20 DS	Aug 20 US	Aug 21 DS	Aug 21 US	Aug 22 DS	Aug 22 US	Aug 23 DS	Aug 23 US	Aug 24 DS	Aug 24 US
0																		
10																		
20																		
30																		
40	1			2	2	5				4	1				2		4	2
50					1	4	1	1		1	1		1		2	1	3	3
60																	1	
70				1														
80		3		6		2		1										
90		1		3														
100								2	2									
110				1														
120																		
130				1	1	1												
140								1										
150																		
160																		
170			1	1														
180				1														
190								1	1									
200								2		1	1							
210										1	1				1			
220	1				1													
230																		
240						1				2	1							
250																		
260						1				1			1					
270			1		1			1			1							
280			1							2								
290																		
300	1																	
310																		
320																		
330																		
340																		
350																		
360															1			
370																		
380																		
390																		
400																		
410																		
420																		
430																		
440																		
450																		
460																		
470																		
480																		
490																		
500																		
Total:	3	4	3	16	6	14	1	9	3	12	6	0	2	0	6	1	8	5

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Ublutuoch River**															
	Jun 16	Jun 17	Jun 18	Jun 19	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 10	Jul 11	Jul 12	Jul 13	Jul 14	Jul 15	Jul 16
	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US
0																
10																
20																
30			1													
40		3	23	7	10	13	15	2	11							
50	1	40	85	20	15	18	26	1	91	2		1	1			
60		1	2		1				16	5		5	4			
70										5		4	2	3	1	
80		1							1					1		1
90	3	5	5	3	4		3		6							
100	10	2	3		2				2							
110	4	3		1			2		5	1						
120	1		1	2	1				1						1	
130	4	1							1							
140	9	3	1	3	3											
150	9	2	2		1										1	
160	4	2	1	4			1									
170	2	3		1	2				2						1	
180	5				1											
190	3	1		1					1							
200	4	2							1					1	1	
210		1		1	1					1						
220	3		1	1	1											
230	1				2					1						
240	2	1														
250	1			2	2									1		
260					1	1					1				1	
270	1			1	1											
280	1			1												
290	1			1												
300	1		1		1											1
310	1	1														
320	1			2										1		
330	1			2					1							
340	1			2												
350	1		1	1		1								1		
360					1											
370				4												
380			2	5	1											
390					1											
400	1			1												
410																
420														1		
430																
440																
450																
460																
470																
480																
490																
500																
Total:	76	72	129	66	52	33	47	3	139	15	1	10	7	9	6	2

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Ublutuoch River**																	
	Jul 30	Jul 31	Aug 01	Aug 02	Aug 03	Aug 04	Aug 18		Aug 19		Aug 21		Aug 22		Aug 23		Aug 24	
	US	US	US	US	US	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US
0																		
10																		
20																		
30																5		1
40							1			2		1		1		2		1
50								2		2								
60																		
70	2				1													
80	2			1				1										
90	1									1		1						
100																		
110																		
120																		
130	1																	
140								1										
150																		
160	1	1																
170																		
180																		
190																		
200																		
210																		
220					1													
230																		
240				1														
250				1		1												
260						1												
270									1									
280					1	1												
290				1		1												
300		1		1		1												
310				1	1													
320																		
330		1		1	1	1												
340				3														
350				3														
360		1		1														
370		1	1	4													1	
380	1			4	2												1	
390	1			2		1												
400	2																	
410				1														
420																		
430																		
440																		
450																		
460																		
470																		
480																		
490																		
500																		
Total:	11	5	1	25	7	7	1	4	1	5	0	2	0	1	0	7	2	2

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Oil Creek**													**CK16C**		
	Jun 17	Jun 18	Jun 20	Jun 23	Jun 24	Jul 10	Jul 11	Jul 12	Jul 13	Jul 14	Jul 15	Jul 16	Jul 30	Jun 18	Jun 19	Jun 20
	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US
0																
10																
20																
30																
40		1	1										3			
50	1		3	1	1							1				
60				1				1		5	3	1				
70							1	22	2	16	18	15				
80							1	3		16	13	10	1			2
90								1				1	1			1
100					1				1					1		
110						1		2	1	1	3					
120						2		1	1	3	4	3				
130						1		4			1	2				
140										1	1	1				
150									1			1				
160																
170								1			1					
180																
190																
200										1					1	
210																
220																
230																
240																
250																
260																
270																
280																
290																
300																
310																
320																
330																
340																
350																
360																
370																
380																
390																
400																
410																
420																
430																
440																
450																
460																
470																
480																
490																
500																
Total:	1	1	4	2	2	4	2	35	6	43	44	35	5	1	4	2

Appendix Table D-1. Length frequencies of Arctic grayling caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**CK16C** Jun 23 US	Jul 10 US	Jul 13 US	**CK0306** Jun 21 US
0				
10				
20				
30				
40				
50				1
60				
70				
80			1	
90	1		1	
100				
110				
120				
130			2	1
140				
150				
160				
170		1		
180				
190				
200				
210				
220				
230				
240				
250				
260				
270				
280				
290				
300				
310				
320				
330				
340				
350				
360				
370				
380				
390				
400				
410				
420				
430				
440				
450				
460				
470				
480				
490				
500				
Total:	2	4	6	2

Appendix Table D-2. Length frequencies of broad whitefish caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Bill's Creek** Jul 14 DS	Jul 14 US	Jul 16 DS	Jul 16 US	Jul 17 DS	Jul 17 US	Jul 18 DS	Jul 18 US	Jul 20 DS	Jul 20 US	Aug 01 DS	Aug 01 US	Aug 18 DS	Aug 18 US	Aug 19 DS	Aug 19 US	Aug 20 DS	Aug 20 US	Aug 21 DS	Aug 21 US
0																				
10																				
20																				
30																				
40																				
50																1	1		1	1
60														5	3	16	4	7		1
70														3		10		4	1	3
80						1		1						3		5	1			
90	1		1		1											1				
100																				
110																1				
120																				
130																				
140														1						
150																				
160																				
170														1						
180																				
190																				
200																				
210																				
220																				
230																				
240																				
250																				
260																				
270																				
280																				
290																				
300																				
310																				
320																				
330					1												1			
340														1						
350						1		1												
360				1					1											
370																				
380				1																
390				1	1															
400																				
410																				
420				2																
430						1		1												
440																				
450																				
460				2						1										
470				1																
480				1								1								
490				2																
500																				
510				1																
520																				
530																				
540									1											
Total:	1	0	1	11	3	3	0	3	1	1	1	0	0	14	3	34	7	11	2	5

Appendix Table D-2. Length frequencies of broad whitefish caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Bill's Creek**						**Crea Creek**								
	Aug 22		Aug 23		Aug 24		Jun 19	Jun 20	Jun 23	Aug 18		Aug 21		Aug 22	
	DS	US	DS	US	DS	US	US	US	US	DS	US	DS	US	DS	US
0															
10															
20															
30															
40															
50			1												
60		4	1	3	2			1	1						
70			1	2		1	1								
80				2									1	1	
90								1							
100															
110															
120															
130															
140										1					
150															
160															
170															
180															
190															
200															
210															
220															
230															
240															
250															
260										1					
270															
280															
290															
300															
310															
320															
330															
340															
350															
360															
370															
380															
390															
400															
410															
420															
430															
440															
450															
460															
470															
480															
490															
500															
510															
520															
530															
540															
Total:	0	4	3	7	2	1	0	1	2	1	2	0	0	1	1	0

Appendix Table D-2. Length frequencies of broad whitefish caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Oil Creek** Jun 16 US	Jun 17 US	Jun 18 US	Jun 19 US	Jun 20 US	Jul 30 DS	Jul 30 US	**L9811** Jul 22	**M0420** Jul 21
0									
10									
20									
30									
40									
50		1				1	1		
60	5	2	2	1	2		1		
70			1						
80									
90		1							
100									
110									
120									
130									
140									
150									
160									
170								1	
180								1	
190								1	
200									
210									
220									
230									
240									
250									
260									
270									
280									
290									
300									
310									
320									
330									
340									
350									
360									
370									
380									
390									
400									
410									
420									
430									
440									
450									
460									
470									1
480									
490									
500								1	1
510									
520									
530									
540									
Total:	5	4	3	1	2	1	2	4	2

Appendix Table D-3. Length frequencies of humpback caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Bill's Creek** Jul 14 DS	Jul 14 US	Jul 16 DS	Jul 16 US	Jul 17 DS	Jul 17 US	Jul 18 DS	Jul 18 US	Jul 20 DS	Jul 20 US
0										
10										
20										
30										
40										
50										
60										
70										
80										
90										
100										
110										
120										
130										
140										
150										
160										
170										
180										
190										
200										
210										
220										
230										
240										
250										
260										
270										
280										
290										
300										
310										
320										
330				1						
340			1					1		
350										
360				1	1	1		1		
370			1	1				1	2	
380										
390				1						
400		1	1		1	1		1	1	
410				1						
420	1	1				1		1		
430										
440										
450										
460										
470										
480										
490										
500										
Total:	1	2	3	5	2	3	0	5	3	0

Appendix Table D-4. Length frequencies of least cisco caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**Bill's Creek** Jul 20 DS	Jul 20 US	Aug 18 DS	Aug 18 US	**Crea Creek** Jun 18 US	**Ublutuoch River** Jun 17 US	Aug 18 US	Aug 19 US	Aug 20 US	Aug 21 US	Aug 22 US	Aug 24 US
0												
10												
20												
30												
40												
50								1				
60								1				
70												
80							1					
90				1								
100					1							
110				2				1				
120				1						1		
130										2	1	
140										1	1	
150												
160												
170												
180												
190												
200												1
210		1										
220						1						
230												
240												
250												
260												
270												
280		1										
290		1										
300												
310												
320												
330												
340												
350												
360												
370												
380												
390												
400												
410												
420												
430												
440												
450												
460												
470												
480												
490												
500												
Total:	0	3	0	4	0	1	0	1	1	3	0	4	2	1

Appendix Table D-5. Length frequencies of round whitefish, burbort and chinook salmon caught by fyke net eastern NPR-A, 2004.

Round Whitefish

Fork Length (mm)	Bill's Creek Jul 15 DS	Jul 16 DS	Jul 20 DS
0			
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			
110			
120			
130	1		
140			
150			
160			
170			
180			
190		1	
200			
210			
220			
230			
240			
250			
260			
270			
280			
290			
300			
310			
320			
330			
340			
350			
360			
370			
380			
390			
400			
410			
420			
430			1
440			
450			
460			
470			
480			
490			
500			
Total:	1	1	1

Burbot

Fork Length (mm)	Crea Creek Jun 20 US	Aug 01 US	Aug 02 US
0			
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			
110			1
120			
130	1		
140		1	
150			
160			
170			
180			
190			
200			
210			
220			
230			
240			
250			
260			
270			
280			
290			
300			
310			
320			
330			
340			
350			
360			
370			
380			
390			
400			
410			
420			
430			
440			
450			
460			
470			
480			
490			
500			
Total:	1	1	1

Chinook Salmon

Fork Length (mm)	Ublutuoch River Aug 03 US	Aug 23 US
500		
510		
520		
530		
540		
550		
560		
570		
580		
590		
600		
610		
620		
630		
640		
650		
660		
670		
680	1	
690		
700		
710		
720		
730		
740		
750		
760		1
770	1	
780		
790		
800		
810		
820		
830		
840		
850		
860		
870		
880		
890		
900	1	
910		
920		
930		
940		
950		
960		
970		
980		
990		
1000		
Total:	3	1

Appendix Table D-6. Length frequencies of slimy sculpin caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	Bill's Creek											Crea Creek		
	Jul 15 DS	Jul 16 DS	Jul 17 DS	Jul 18 DS	Jul 19 DS	Jul 20 DS	Aug 01 US	Aug 18 DS	Aug 19 DS	Aug 19 US	Aug 20 US	Jul 13 DS	Jul 15 DS	Jul 20 US
0														
10														
20														
30														
40														
50														1
60					1				1			1	1	
70	1	1									1			
80			2	2		1	1							
90			1	2				1		1				
100				1										
110														
120														
130														
140														
150														
160														
170														
180														
190														
200														
210														
220														
230														
240														
250														
Total:	1	1	3	5	1	1	1	1	1	1	1	1	1	1

Appendix Table D-6. Length frequencies of slimy sculpin caught by fyke net in eastern NPR-A, 2004.

Fork	**Crea Creek**		**Oil Creek**										**Ublutuoch River**			
Length	Jul 31	Aug 02	Jun 24	Jul 10	Jul 12	Jul 13	Jul 14	Jul 15	Jul 16	Jul 29	Jul 30	Jul 30	Jun 23	Jun 24	Jul 12	Jul 16
(mm)	DS	DS	US	US	US	US	US	US	US	US	DS	US	US	US	US	US
0																
10																
20																
30																
40													1	1		1
50				1	1	1	2		4						1	
60					2	1	4	1	3	1		2				
70					2		2	3	2	2	1	3		1		
80	1	1	1		1	2		2			1					
90							1									
100																
110																
120																
130																
140																
150																
160																
170																
180																
190																
200																
210																
220																
230																
240																
250																
Total:	1	1	1	1	6	4	9	6	9	3	2	5	1	2	1	1

Appendix Table D-7. Length frequencies of Alaska blackfish caught by fyke net in eastern NPR-A, 2004.

Fork	**Bill's Creek**		**Crea Creek**					**Oil Creek**							
Length	Aug 22		Jun 20	Jun 22	Jul 14	Jul 15	Aug 18	Jun 16	Jun 17	Jun 18	Jun 19	Jun 20	Jun 21	Jun 23	Jun 24
(mm)	DS	US	US	US	DS	DS	US	US	US	US	US	US	US	US	US
0															
10															
20															
30														1	
40								3	1	1	2		2	1	1
50								4		3	8	1	1	1	1
60				1	1	1	1	1	1	2	4		2		1
70								1		1	2	1	2		
80			1									1			
90										1	1				
100															
110															
120									1						
130		2													
140								1							
150															
160															
170															
180															
190															
200															
210															
220															
230															
240															
250															
Total:	0	2	1	1	1	1	1	10	3	8	17	3	7	3	3

Appendix Table D-7. Length frequencies of Alaska blackfish caught by fyke net in eastern NPR-A, 2004.

Fork	**CK0306**									**CK0307**				**CK16C**	
Length	Jul 13	Jun 18	Jun 20	Jun 21	Jun 22	Jun 23	Jun 24	Jul 10	Jul 11	Jun 20	Jun 21	Jun 22	Jul 11	Jun 16	Jun 17
(mm)	US	US	US	US	US	US	US	US	US	US	US	US	US	US	US
0															
10															
20															
30					2										
40															
50						1		1				1	1		
60	1						1	2	1		1			1	1
70							2	3	1						
80					1		1			1					
90								1							
100				1					1					1	
110				1			1							1	
120		1	2	1											
130				1											
140							1								
150			1												
160		1													
170															
180															
190															
200															
210															
220															
230															
240															
250															
Total:	1	2	3	4	3	1	6	7	3	1	1	1	1	3	1

Appendix Table D-7. Length frequencies of Alaska blackfish caught by fyke net in eastern NPR-A, 2004.

Fork Length (mm)	**CK16C** Jun 18 US	Jun 19 US	Jun 20 US	Jun 21 US	Jun 22 US	Jun 23 US	Jun 24 US	Jul 10 US	Jul 12 US	Jul 13 US	**M0030** Jul 27	Jul 28	Jul 29	**MB0302** Jul 24
0														
10														
20														
30														
40	1		1								1	1		
50	1		3			4	1	1						
60	1			2		1	1	3	3	3			1	
70	2	1	1			2		1		4				
80	1					1	1	1	1	1				
90			1		1			1	1	1				
100														1
110														
120														
130														
140														
150		1												
160														
170														
180														
190														
200														
210														
220														
230														
240														
250														
Total:	6	2	6	2	1	8	3	7	5	9	1	1	1	1

APPENDIX E

Results of bathymetric surveys in eastern NPR-A Lakes, 2004

Depth contours of lake L9811, based on transects surveyed on August 1, 2004.
(depth intervals in 1 foot increments)

Lake L9811

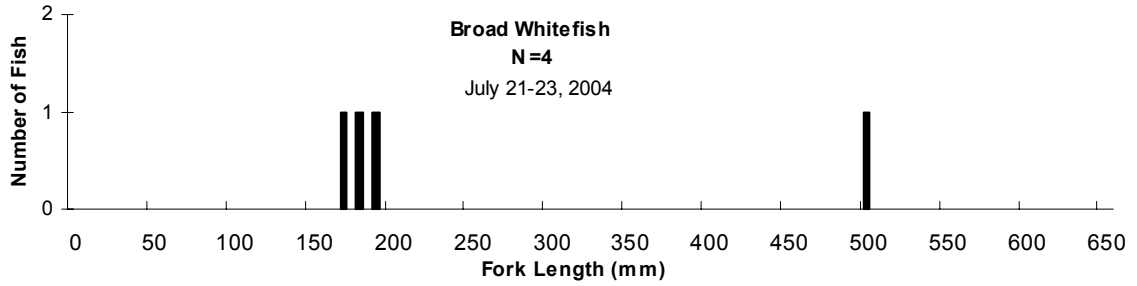
Other Names:
Location: 70.20844°N 151.16652°W
USGS Quad Sheet: Harrison Bay A-2: T10N R4E Sec. 16/17/24/25/29
Habitat: Drainage Lake
Area: 1034 acres
Maximum Depth: 8.0 feet
Active Outlet: Yes
Calculated Volume: 1,414.1 million gallons
Permittable Volume: 0.9 million gallons
Potential Aggregate: 400.6 acres

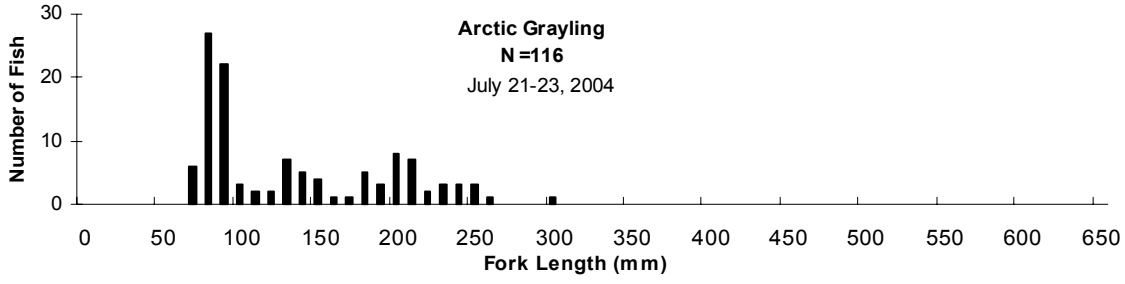
Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 21 04						208	1.0	8.05	This Study
Jul 22 04						209	12.1	7.90	This Study
Jul 23 04						212	1.0	7.93	This Study
Aug 01 04	36	4.8	16.40	5.1	108	212	22.2	7.80	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 21-23, 04	71.0	Arctic grayling	190	75-305
			Broad whitefish	4	176-505
			Ninespine stickleback	324	





Regions of lake L9811 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on August 1, 2004.

Depth transects surveyed at lake L9811 on August 1, 2004.

Lake L9812, sampled for fish July 30 to August 2, 2004.

Lake L9812

Other Names:
Location: 70.19413°N 151.12577°W
USGS Quad Sheet: Harrison Bay A-2: T10N R4E Sec. 21/22/27/28
Habitat: Tundra Lake
Area: 380 acres
Maximum Depth: 8.0 feet
Active Outlet: No
Calculated Volume: 330.5 million gallons
Permittable Volume: 5.2 million gallons
Potential Aggregate: not estimated

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 29 04						326.1	2.0	8.17	This Study
Jul 30 04						326.3	0.8	8.32	
Jul 31 04						325.5	0.7	7.72	
Aug 01 04						326.0	3.6	8.13	
Aug 02 04						326.4	2.6	8.12	

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 30 to Aug 2 04	87.8	Ninespine stickleback	595	

Depth contours of lake L9813, based on transects surveyed on August 5, 2004.
(depth intervals in 1 foot increments)

Lake L9813

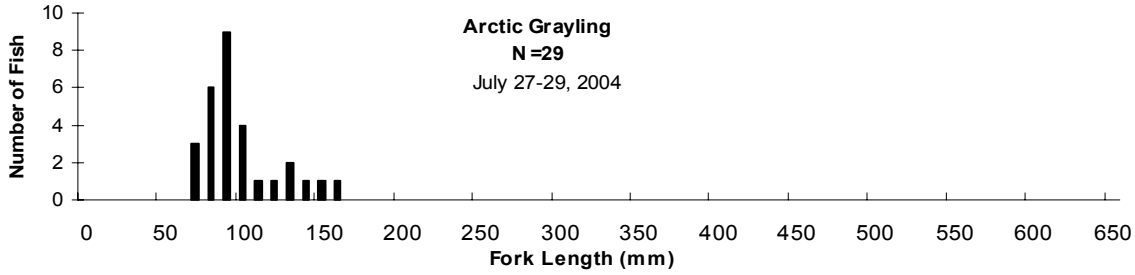
Other Names:
Location: 70.18487°N 151.15671°W
USGS Quad Sheet: Harrison Bay A-2: T10N R4E Sec. 28/29/32/33
Habitat: Drainage Lake
Area: 391 acres
Maximum Depth: 6.3 feet
Active Outlet: Yes
Calculated Volume: 433.9 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 217.4 acres

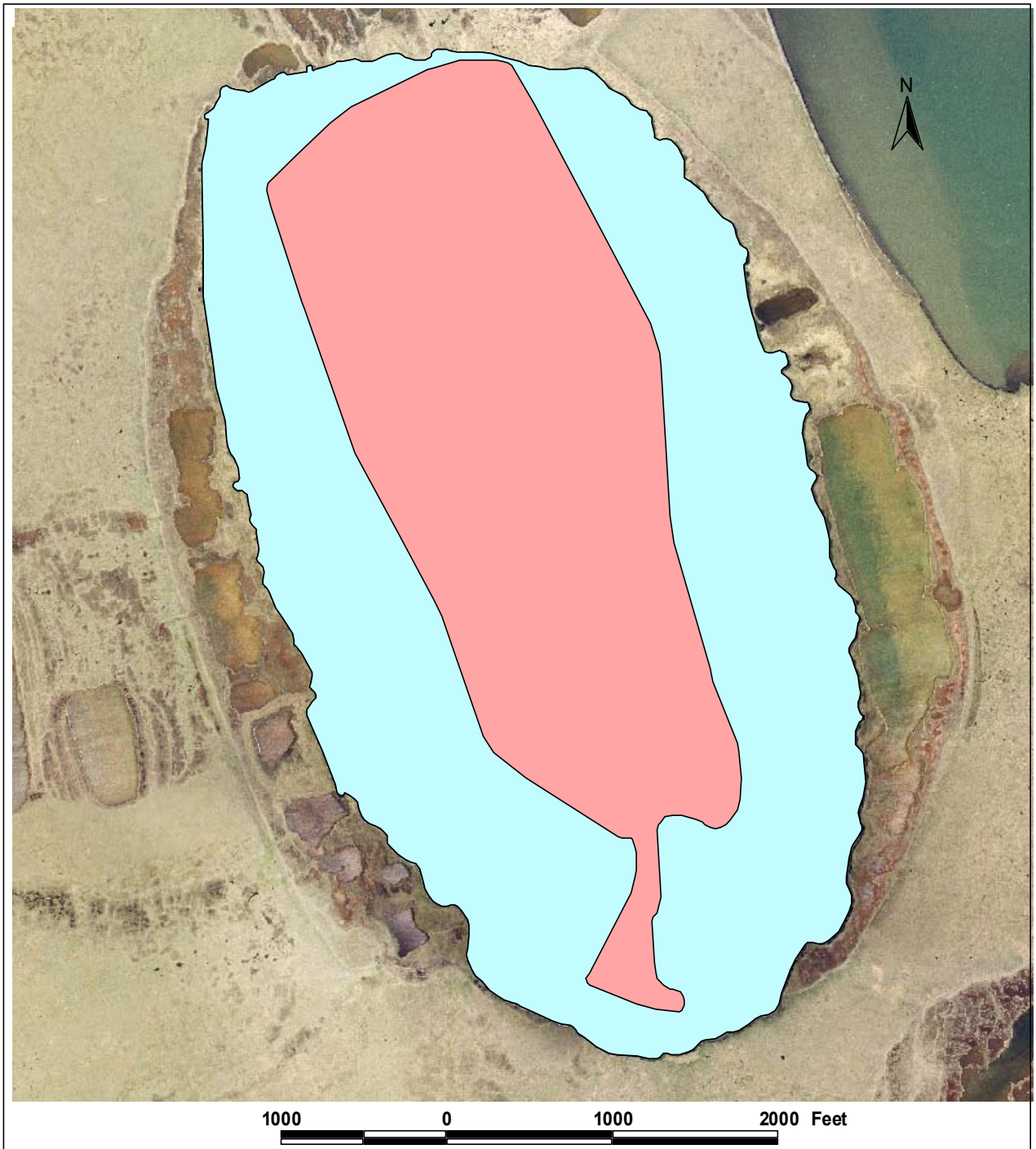
Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 26 04						113.7	0.8	7.57	This Study
Jul 27 04						115.4	1.4	7.94	This Study
Jul 28 04						115.4	2.0	7.90	This Study
Jul 29 04						116.3	1.4	7.94	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 27-29, 04	71.9	Arctic grayling	29	77-161
			Ninespine stickleback	54	





Regions of lake L9813 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on August 5, 2004.

Depth transects surveyed at lake L9813 on August 5, 2004.

Depth contours of lake L9819, based on transects surveyed on August 1, 2004.
(depth intervals in 1 foot increments)

Lake L9819

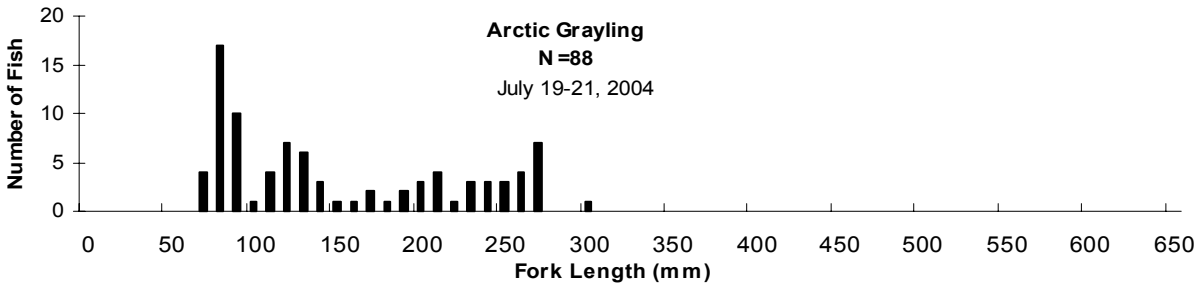
Other Names:
Location: 70.27020°N 151.35573°W
USGS Quad Sheet: Harrison Bay B-3: T10N R3E Sec. 34
Habitat: Drainage Lake
Area: 266 acres
Maximum Depth: 7.9 feet
Active Outlet: Yes
Calculated Volume: 371.4 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 77.7 acres

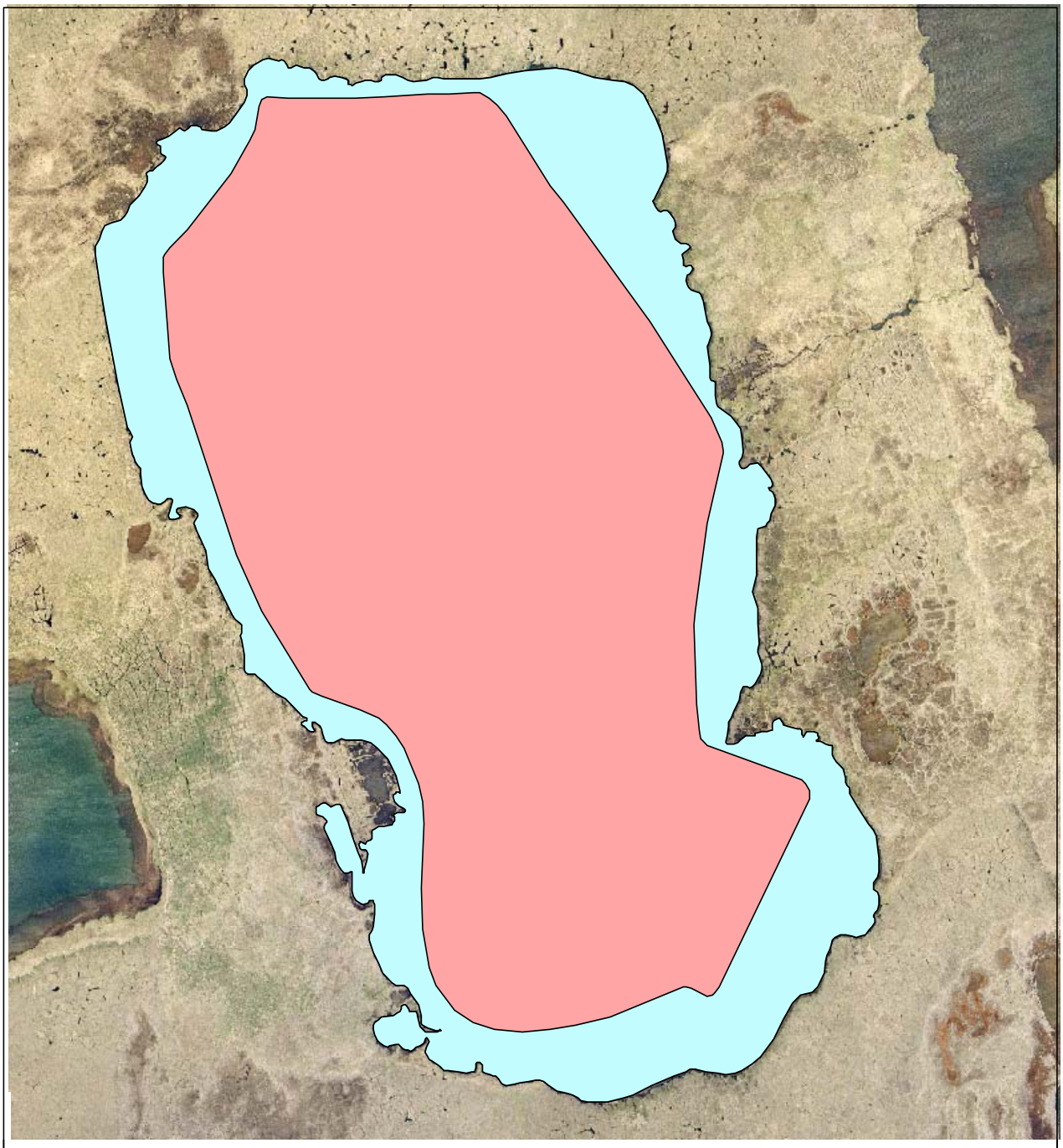
Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 18 04						97.3	2.9	7.85	This Study
Jul 19 04						99.5	3.3	7.76	This Study
Jul 20 04						100.4	3.3	7.66	This Study
Jul 21 04						100.6	2.9	7.90	This Study
Aug 01 04						105.9	16.3	7.49	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 19 99	7.2	None	0	
Fyke Net	Jul 19-21, 04	70.2	Arctic grayling	88	70-302
			Least cisco	1	230
			Ninespine stickleback	857	





Regions of lake L9819 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on August 1, 2004.

Depth transects surveyed at lake L9819 on August 1, 2004.

Depth contours of lake L9821, based on transects surveyed on July 30, 2004.
(depth intervals in 1 foot increments)

Lake L9821

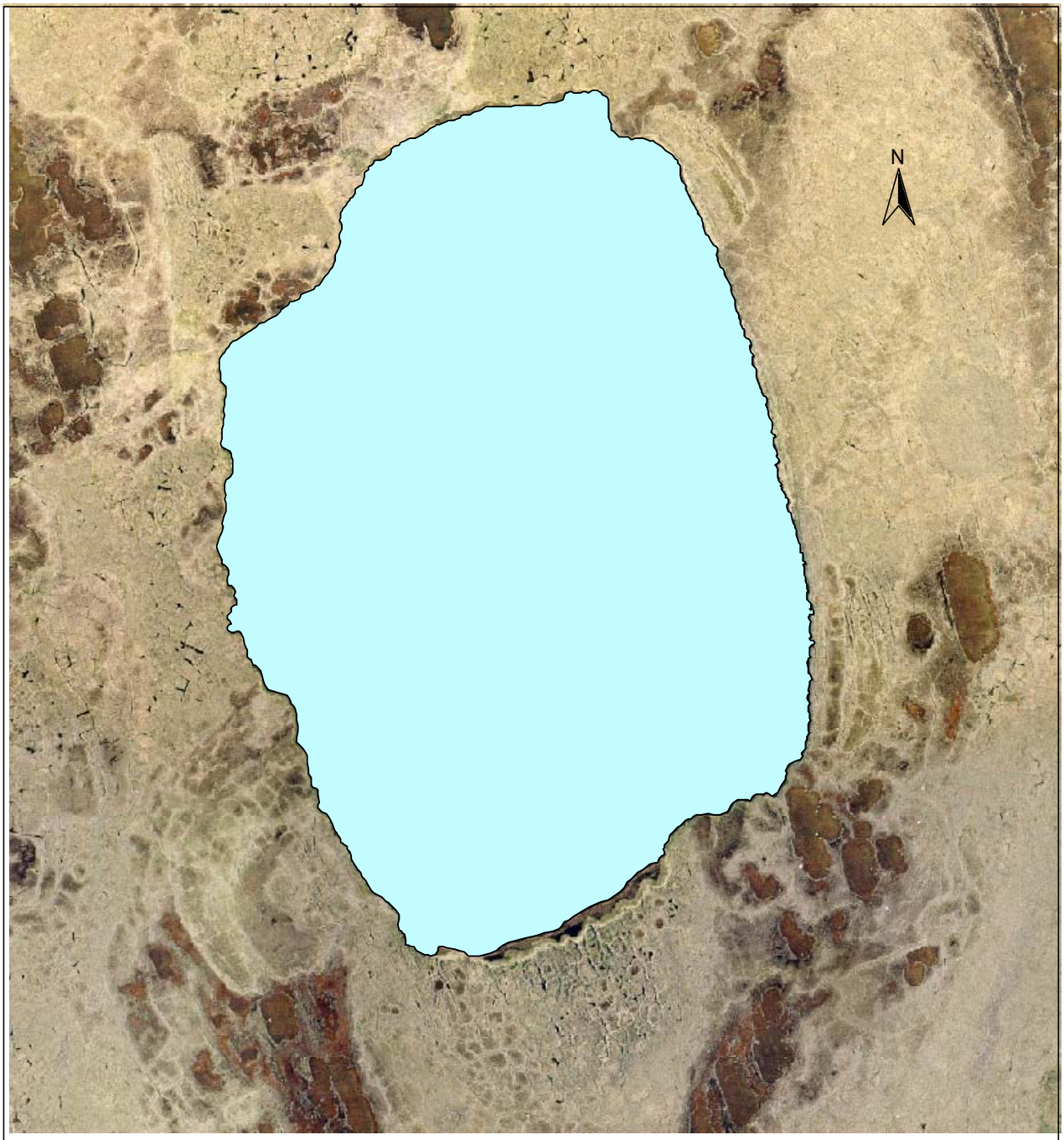
Other Names:
Location: 70.28711°N 151.34823°W
USGS Quad Sheet: Harrison Bay B-3: T11N R3E Sec. 22/27
Habitat: Tundra Lake
Area: 117 acres
Maximum Depth: 4.1 feet
Active Outlet: No
Calculated Volume: 96.9 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 117.1 acres

Water Chemistry:

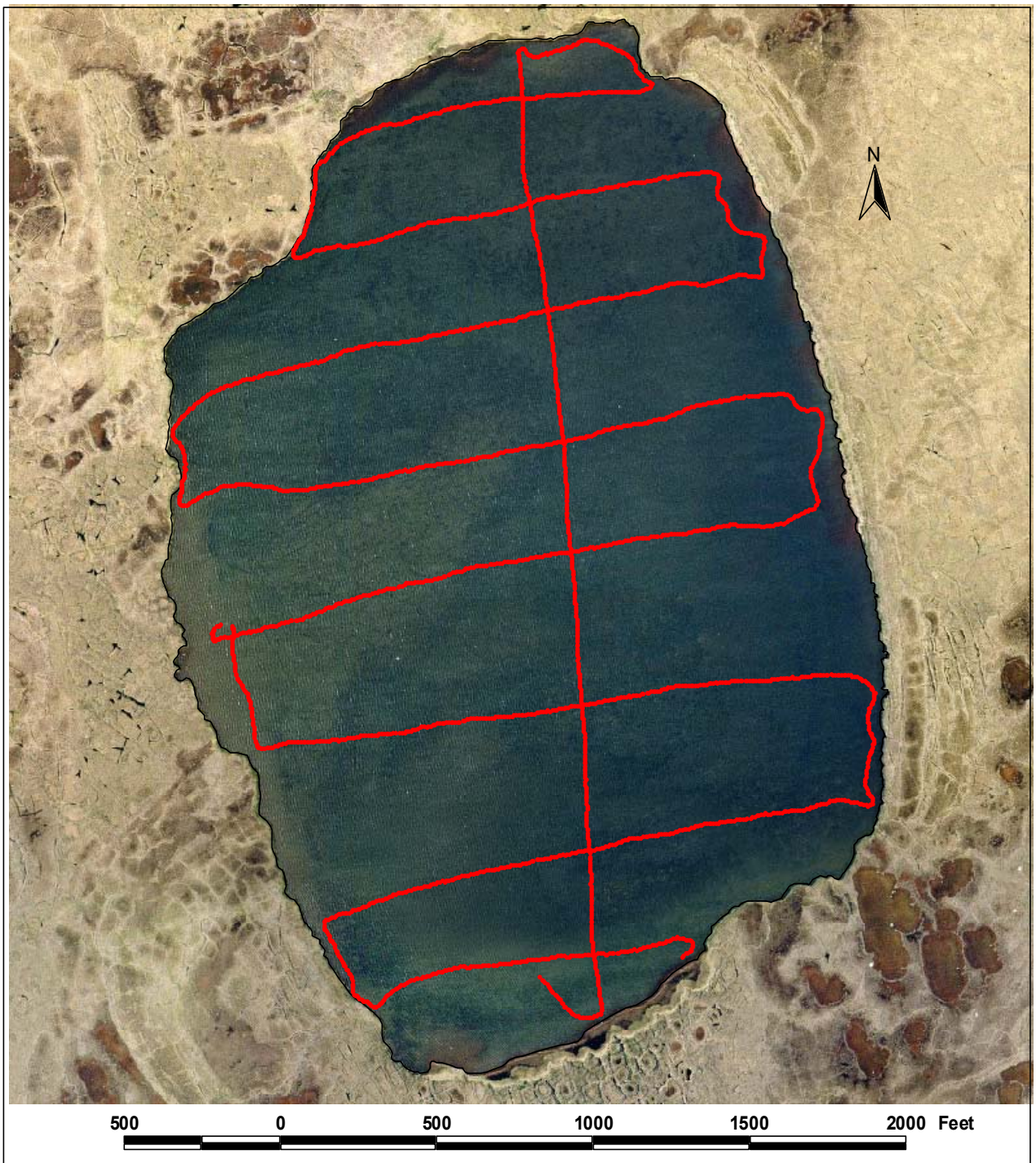
Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 20 04						153.7	1.1	7.92	This Study
Jul 21 04						154.8	1.4	8.05	This Study
Jul 22 04						155.8	1.3	7.83	This Study
Jul 23 04						158.1	1.0	7.74	This Study
Jul 30 04						168.4	1.1	7.96	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 21-23, 04	71.2	Ninespine stickleback	77	



Lake L9821 was less than 4 ft deep and likely to be available for ice chips, based on transects surveyed on July 30, 2004.



Depth transects surveyed at lake L9821 on July 30, 2004.

Depth contours of lake L9824, based on transects surveyed on July 12, 2004.
(depth intervals in 1 foot increments)

Lake L9824

Other Names:
Location: 70.28428°N 151.26772°W
USGS Quad Sheet: Harrison Bay B-3: T11N R3E Sec. 25
Habitat: Oxbow Lake
Area: 21 acres
Maximum Depth: 11.5 feet
Active Outlet: No
Calculated Volume: 37.3 million gallons
Permittable Volume: 0.4 million gallons
Potential Aggregate: 5.9 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 11-18, 03						70.7	0.8	7.53	This Study
Jul 12 04						56.0	1.2	7.29	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 18 99	6.7	None	0	
Fyke Net	Jul 11-18, 03	189.3	Arctic grayling	2	73
			Alaska blackfish	5	35-54
			Ninespine stickleback	1687	

Regions of lake L9824 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 12, 2004.

Depth transects surveyed at lake L9824 on July 12, 2004.

Depth contours of lake L9911, based on transects surveyed on August 31, 2002.
(depth intervals in 1 foot increments)

Lake L9911

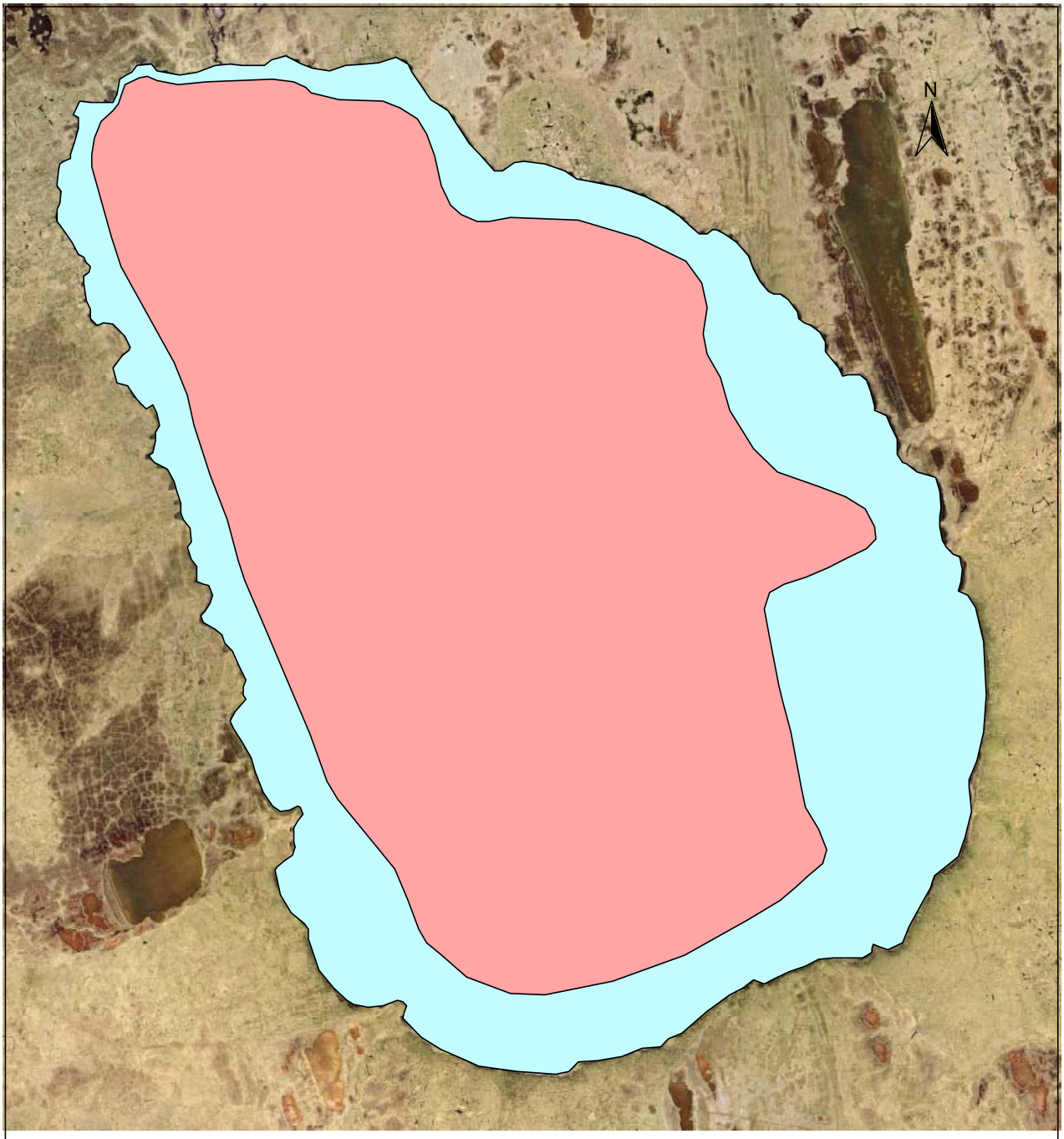
Other Names:
Location: 70.17016°N 151.78795°W
USGS Quad Sheet: Harrison Bay A-3: T9N/10N R1E Sec. 35/36/1/2
Habitat: Tundra Lake
Area: 559 acres
Maximum Depth: 8.0 feet
Active Outlet: No
Calculated Volume: 793 million gallons
Permittable Volume: 29.5 million gallons
Potential Aggregate: 181.8 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
1999	27.5	3.8	11.9	5.0	84.2				J. Lobdell
Jul 25 99						178.9		8.22	1999 Survey
Jul 23 04						163.4	0.7	7.91	This Study
Jul 24 04						165.3	0.7	8.01	This Study
Jul 25 04						166.3	1.0	7.91	This Study

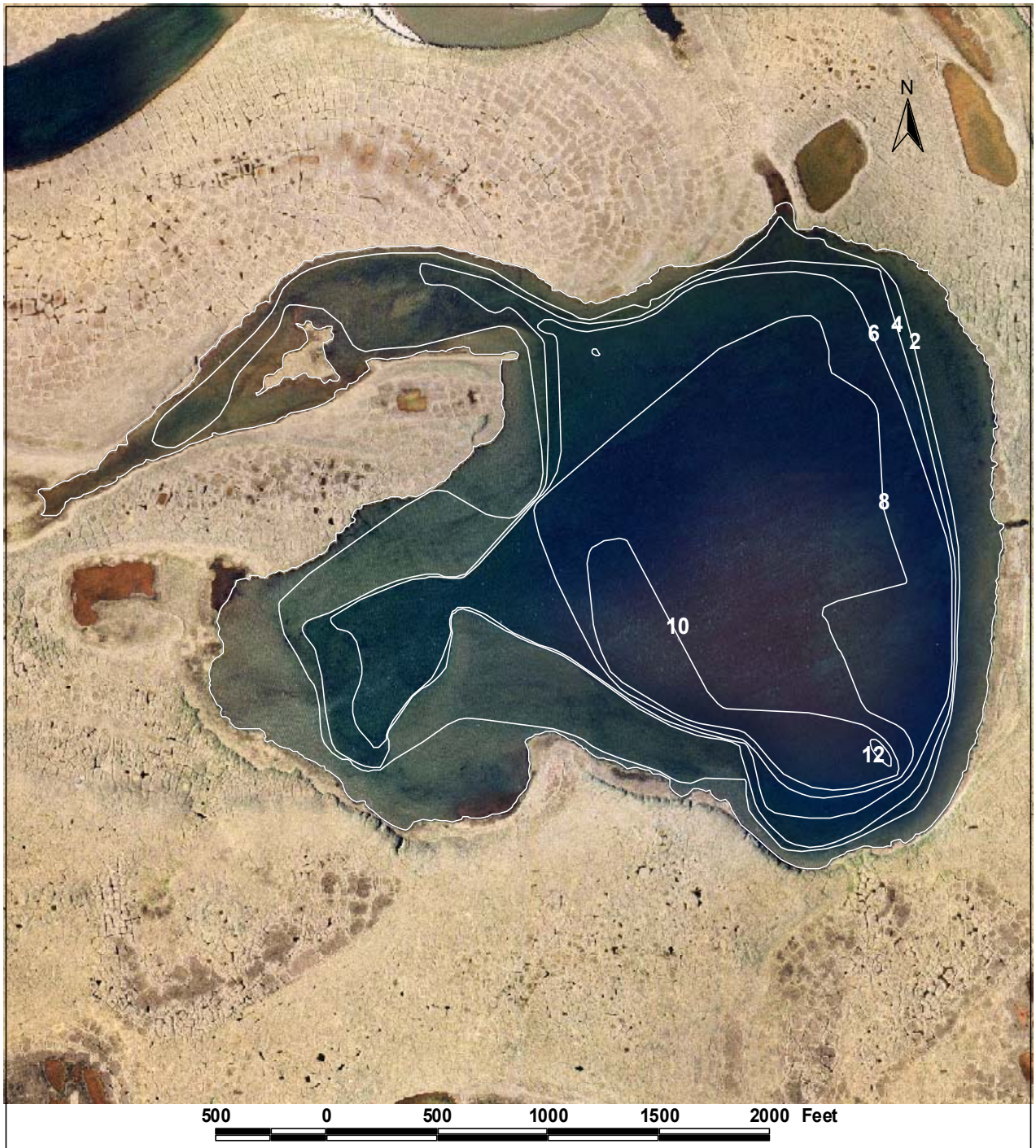
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 25 99	4.1	None	0	
Fyke Net	Jul 23-25, 04	69.1	Ninespine stickleback	3,816	



Regions of lake L9911 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on August 31, 2002.

Depth transects surveyed at lake L9911 on August 31, 2002.



Depth contours of lake L9916, based on transects surveyed on August 2, 2004.
(depth intervals in 2 foot increments)

Lake L9916

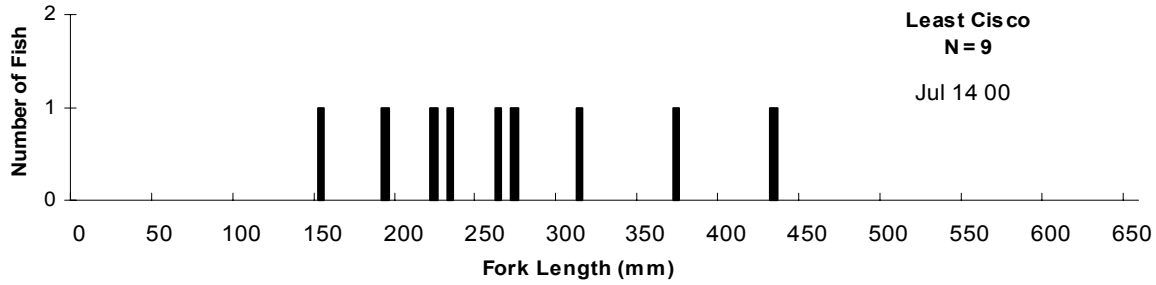
Other Names: M0004
Location: 70.26205°N 151.84226°W
USGS Quad Sheet: Harrison Bay B-4: T11N R1E Sec. 34
Habitat: Perched Lake
Area: 170 acres
Maximum Depth: 14.3 feet
Active Outlet: No
Calculated Volume: 296.6 million gallons
Permittable Volume: 6.2 million gallons
Potential Aggregate: 73.5 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2000	27.3	5.2	14.5	6.9	90				2000 study
Aug 02 04						188.2	1.0	8.00	This Study

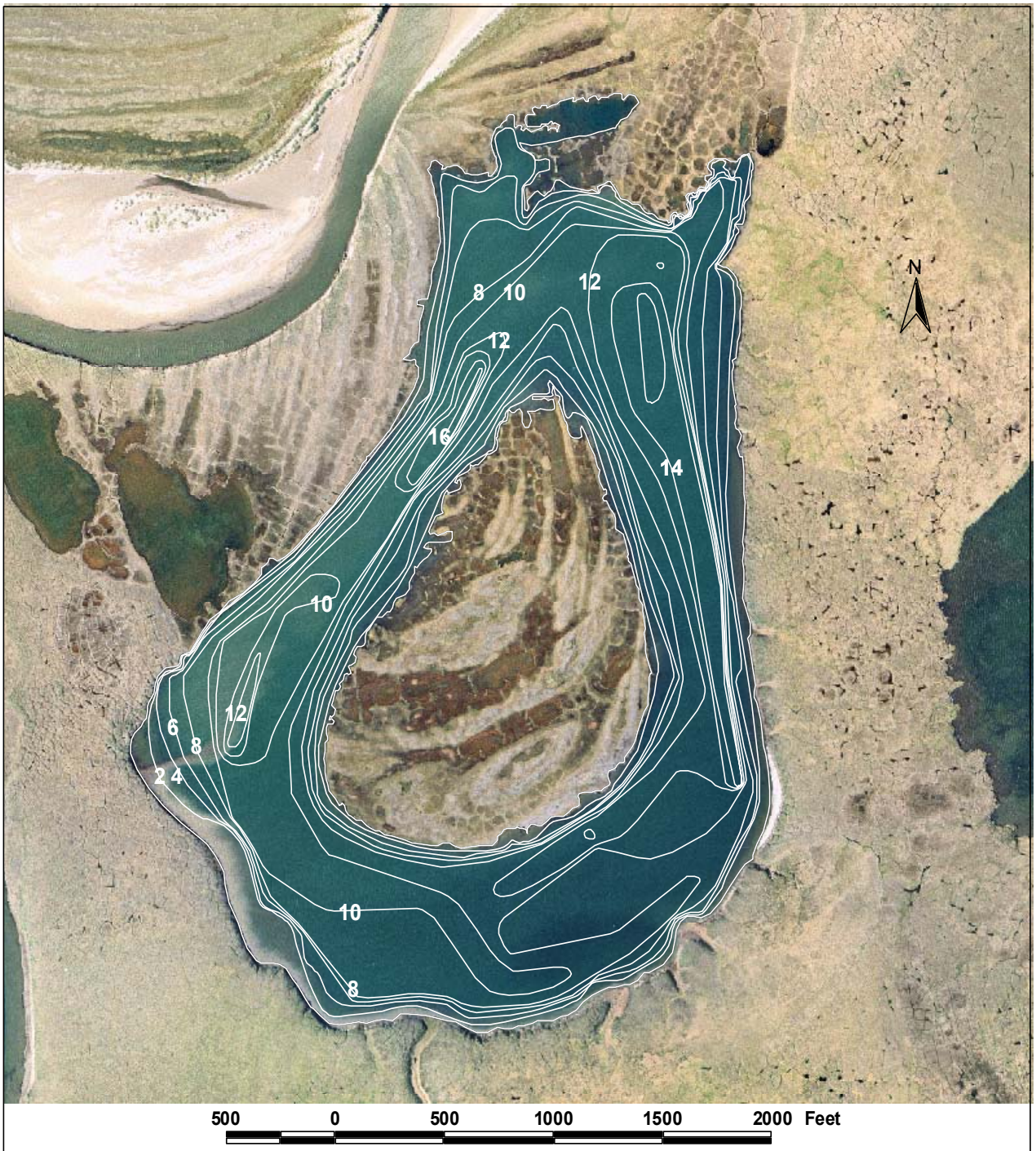
Catch Record:

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



Regions of lake L9916 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on August 2, 2004.

Depth transects surveyed at lake L9916 on August 2, 2004.



Depth contours of lake M9909, based on transects surveyed on July 10, 2004.
(depth intervals in 2 foot increments)

Lake M9909

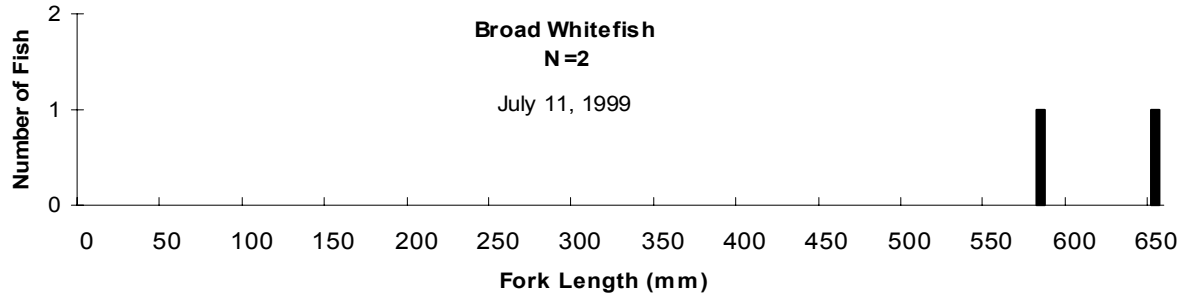
Other Names:
Location: 70.26295°N 151.66464°W
USGS Quad Sheet: Harrison Bay B-3: T11N R2E Sec. 33
Habitat: Oxbow Lake
Area: 130 acres
Maximum Depth: 19.0 feet
Active Outlet: No
Calculated Volume: 342.4 million gallons
Permittable Volume: 15.1 million gallons
Potential Aggregate: 28.0 acres

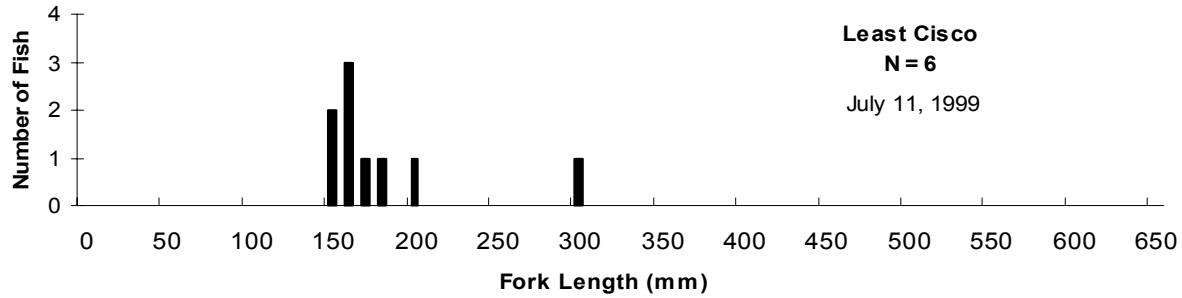
Water Chemistry:

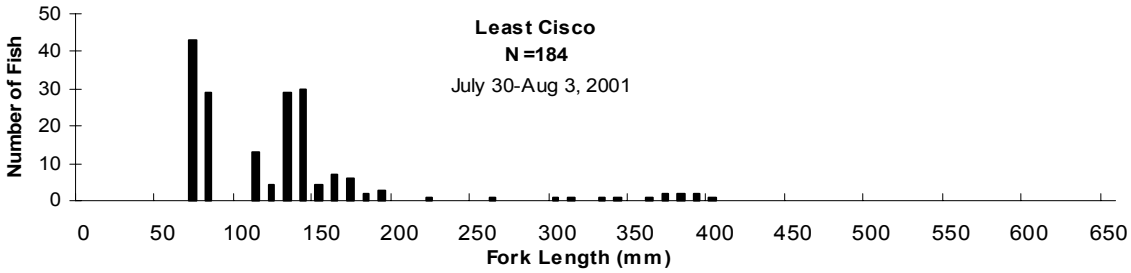
Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
1999	18.8	3.8	20.5	5	65.1				1999 survey
Jul 30-Aug 3, 2001						196.6	3.6	7.95	2001 survey
Jul 10 04						171.9	2.6	7.80	This Study

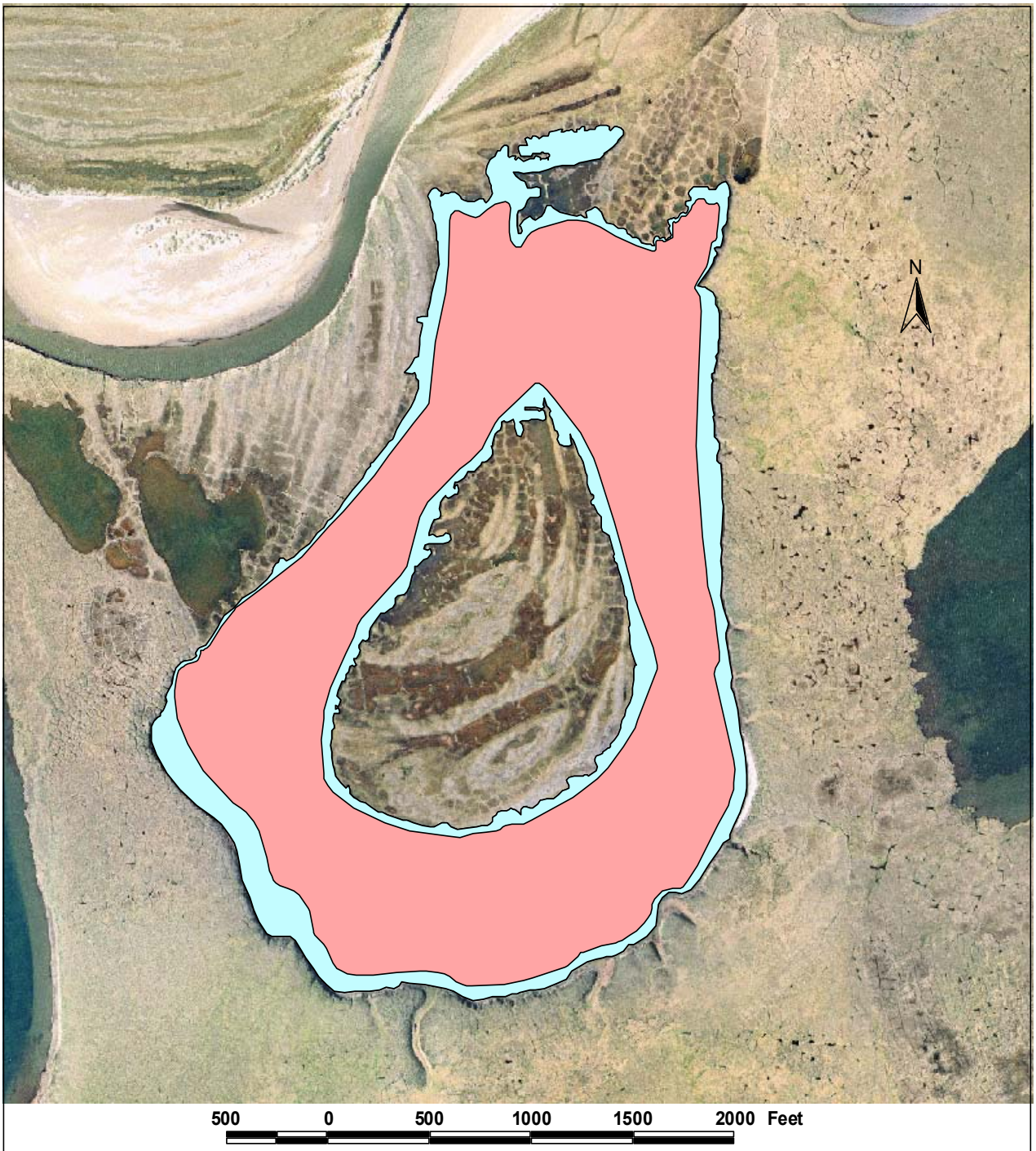
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Jul 11 99	5.0	Broad whitefish	2	570, 655
			Least cisco	6	148-297
Fyke Net	Jul 30 to Aug 3, 01	241.2	Broad whitefish	1	560
			Least cisco	184	70-402
			Burbot	3	690-820
			Alaska blackfish	1	75
			Slimy sculpin	3	40-73
			Ninespine stickleback	71	



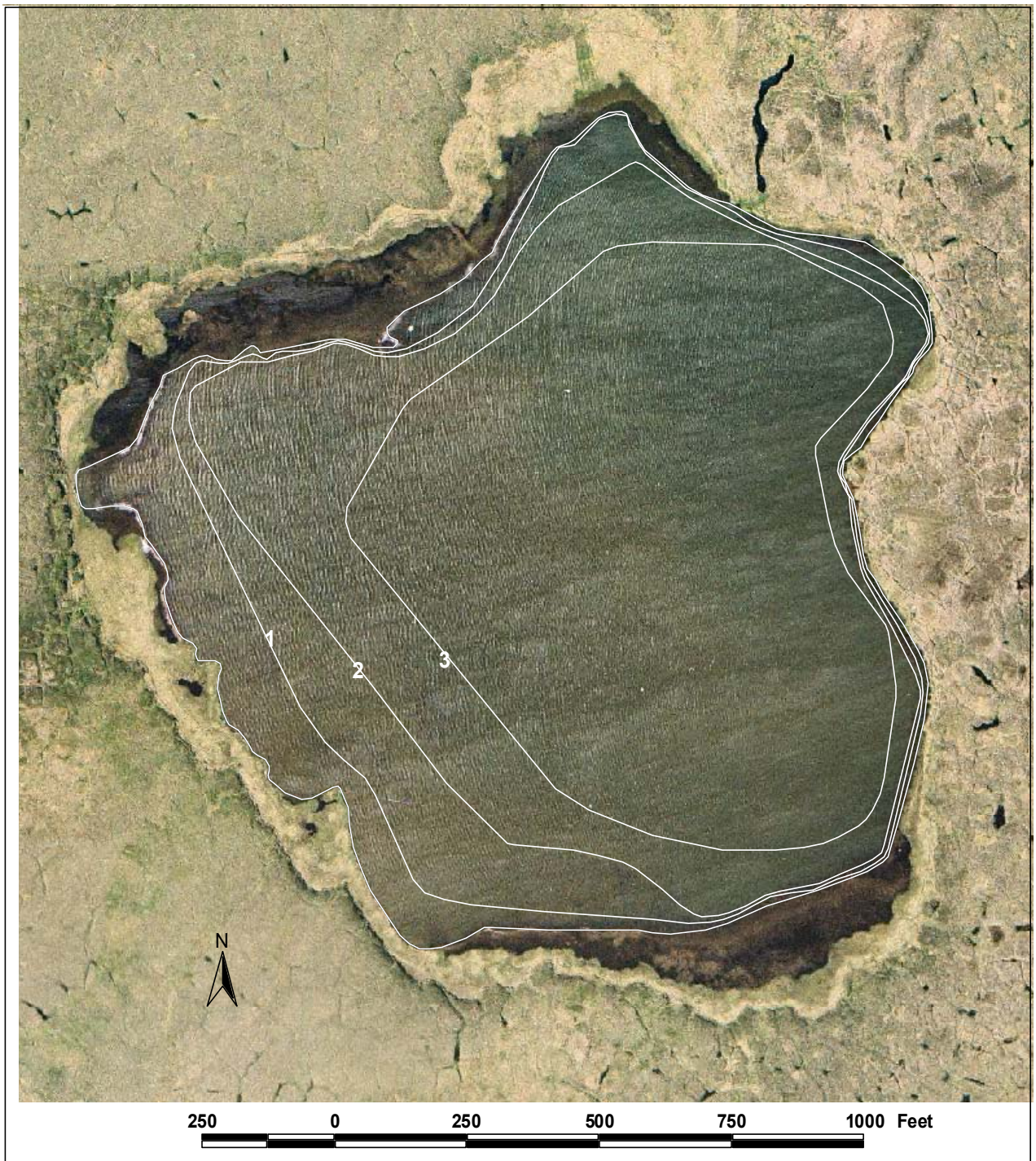



Least Cisco
N =184
July 30-Aug 3, 2001
Number of Fish
0
10
20
30
40
50
0
50
100
150
200
250
300
350
400
450
500
550
600
650
Fork Length (mm)



Regions of lake M9909 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 10, 2004.

Depth transects surveyed at lake M9909 on July 10, 2004.



Depth contours of lake M9924, based on transects surveyed on July 12, 2004.
(depth intervals in 1 foot increments)

Lake M9924

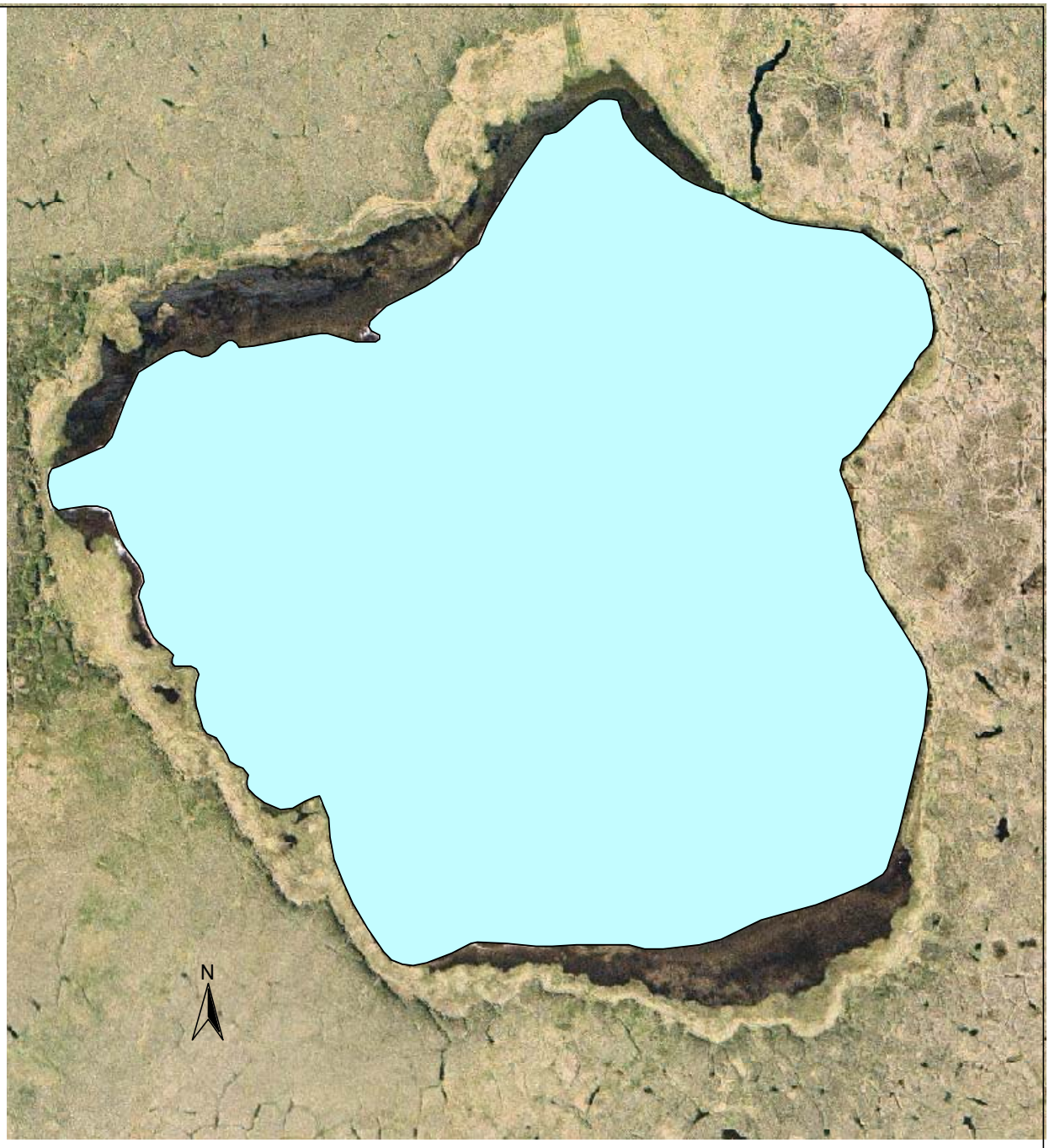
Other Names:
Location: 70.26479°N 151.51290°W
USGS Quad Sheet: Harrison Bay B-3: T11N R2E Sec. 36
Habitat: Tundra Lake
Area: 36 acres
Maximum Depth: 3.8 feet
Active Outlet: No
Calculated Volume: 30.4 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 36.2 acres

Water Chemistry:

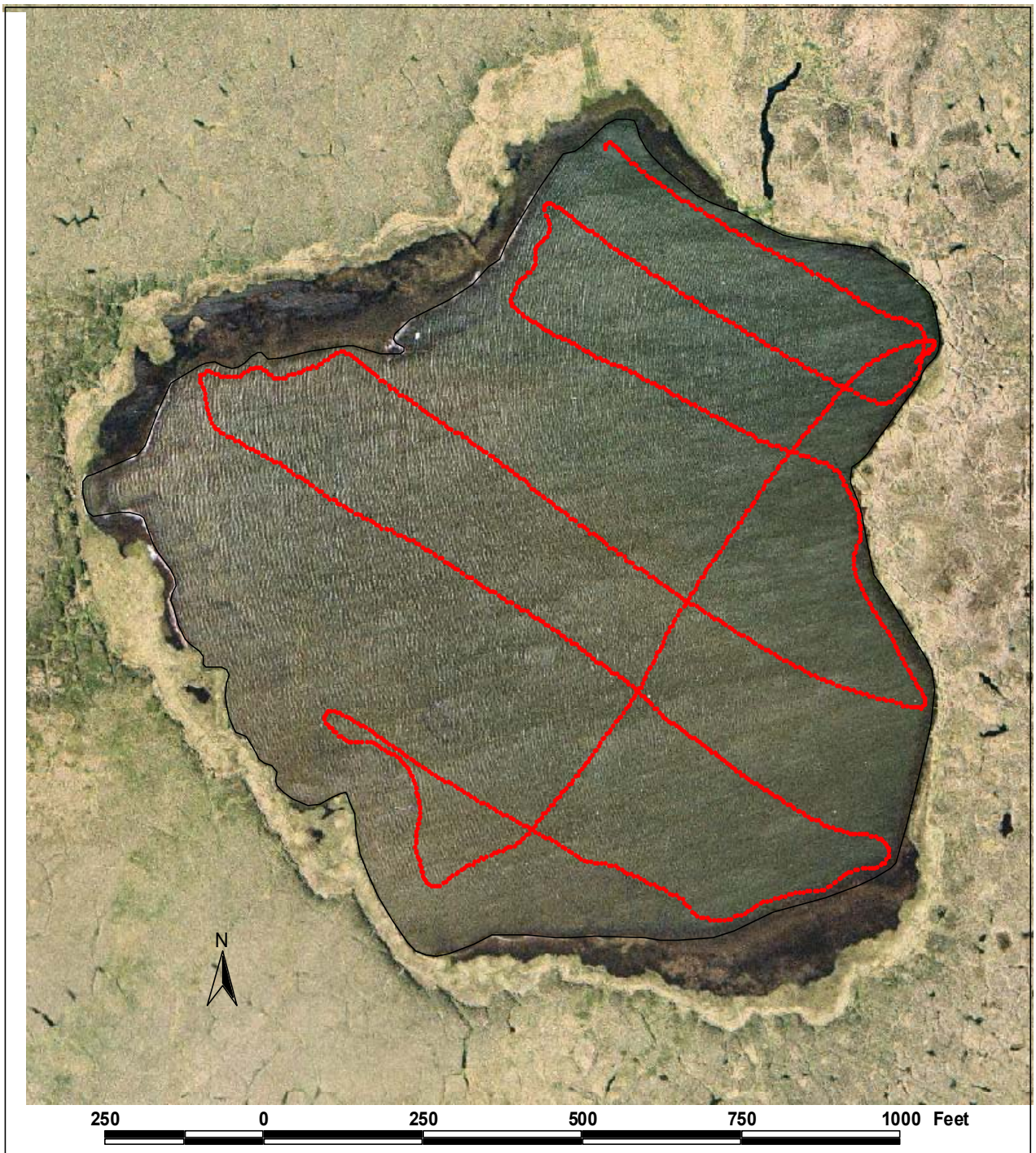
Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
1999	40.2	6.2	37.8	11.1	122				1999 survey
Aug 03 02						217.8	4.2	7.96	2002 survey
Aug 04 02						222.4	16.8	7.78	2002 survey
Aug 06 02						217.2	6.8	7.64	2002 survey
Jul 12 04						138.8	4.5	7.56	This Study

Catch Record:

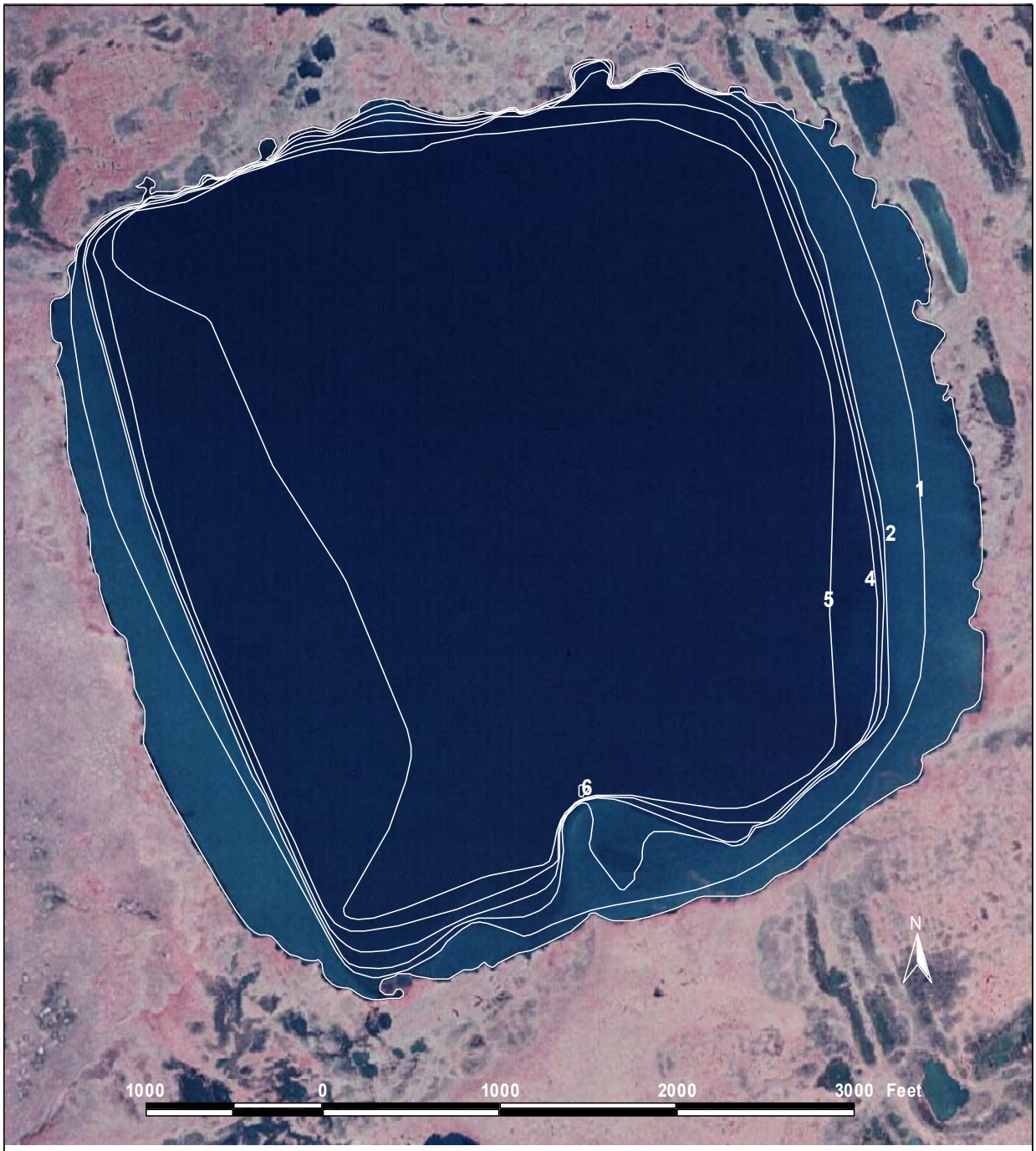
Gear	Date	Effort (hours)	Species	Number Caught
Gill net	Jul 18 99	2.2	None	0
Fyke Net	Aug 3-6, 02	91.8	Ninespine stickleback	3,133



Lake M9924 was less than 4 ft deep and likely to be available for ice chips, based on transects surveyed on July 12, 2004.



Depth transects surveyed at lake M9924 on July 12, 2004.



Depth contours of lake M0015, based on transects surveyed on July 13, 2004 (depth intervals in 1 foot increments).

(Not to be used for navigation or to direct use of heavy equipment)

Lake M0015

Other Names:
Location: 70.10864°N 152.05727°W
USGS Quad Sheet: Harrison Bay A-4: T9N R1W Sec. 26
Habitat: Tundra Lake
Area: 479 acres
Maximum Depth: 7.5 feet
Active Outlet: No
Calculated Volume: 643.4 million gallons
Permittable Volume: 8.9 million gallons
Potential Aggregate: 131.2 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2000	21.2	3.9	23.5	10.1	69				2000 survey
Jul 13 04						178.6	3.9	7.82	This Study
Jul 23 04						188.2	0.8	7.88	This Study
Jul 24 04						189.9	0.8	8.10	This Study
Jul 25 04						191.0	1.6	8.00	This Study
Jul 26 04						192.6	1.7	7.76	This Study

Catch Record:

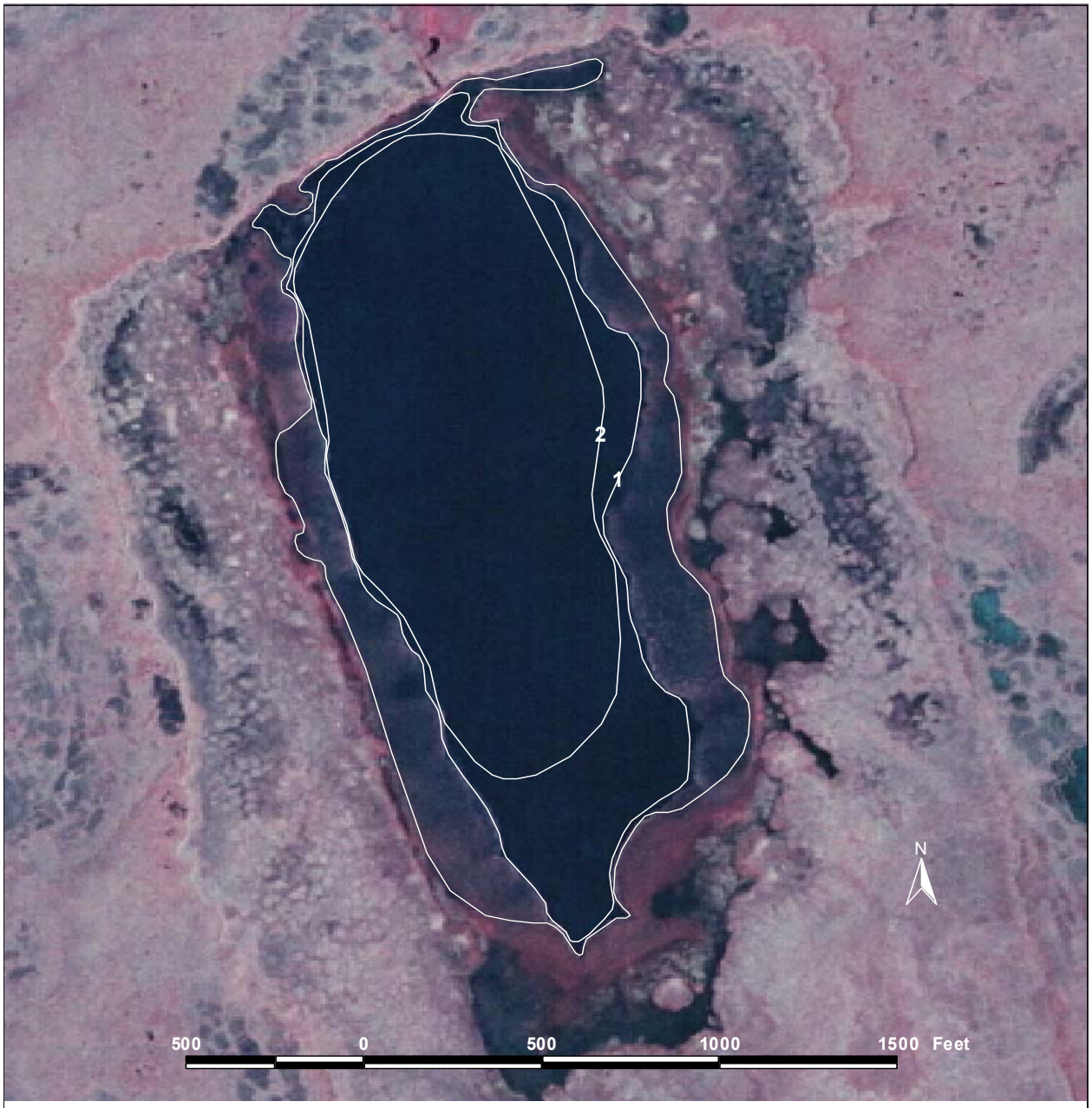
Gear	Date	Effort (hours)	Species	Number Caught
Gill Net	Jul 21 00	12.2	None	0
Minnow Traps	Jul 21 00	10.5	None	0
Fyke Net	Jul 24-26, 04	72.6	Ninespine stickleback	3,258

Regions of lake M0015 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)

Depth transects surveyed at lake M0015 on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)



Depth contours of lake M0017, based on transects surveyed on July 13, 2004 (depth intervals in 1 foot increments).

(Not to be used for navigation or to direct use of heavy equipment)

Lake M0017

Other Names:
Location: 70.10083°N 152.13332°W
USGS Quad Sheet: Harrison Bay A-4: T9N R1W Sec. 28
Habitat: Tundra Lake
Area: 51 acres
Maximum Depth: 3.3 feet
Active Outlet: No
Calculated Volume: 28.2 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 51.3 acres

Water Chemistry:

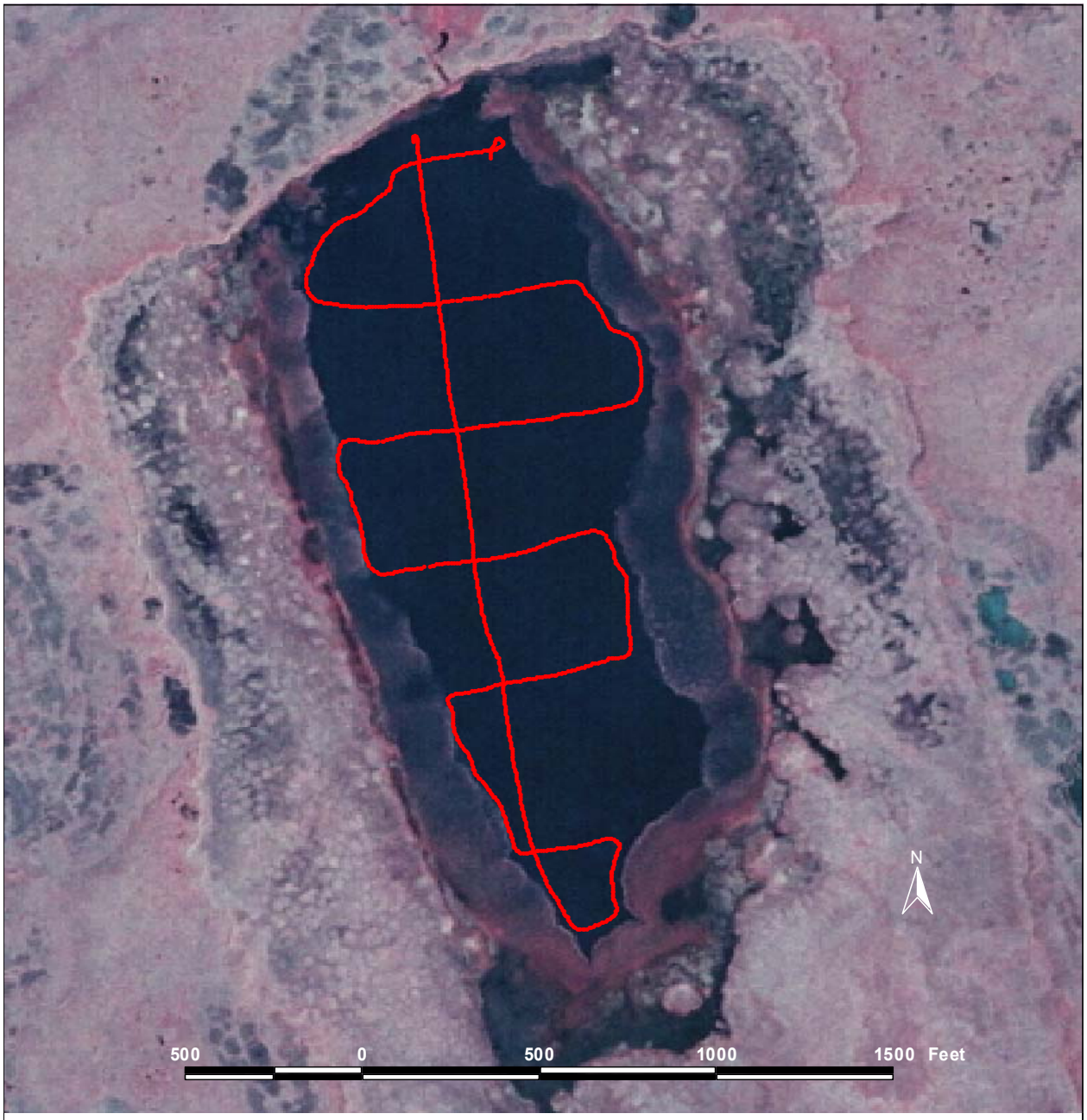
Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2000	34.2	6.8	16.3	8.9	133				2000 survey
Jul 13 04						187.5	2.6	7.66	This Study
Jul 23 04						212.5	2.1	7.77	This Study
Jul 24 04						217.5	1.6	7.96	This Study
Jul 25 04						217.3	2.6	7.89	This Study
Jul 26 04						220.1	2.6	7.85	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
Fyke Net	Jul 24-26, 04	72.6	Ninespine stickleback	240

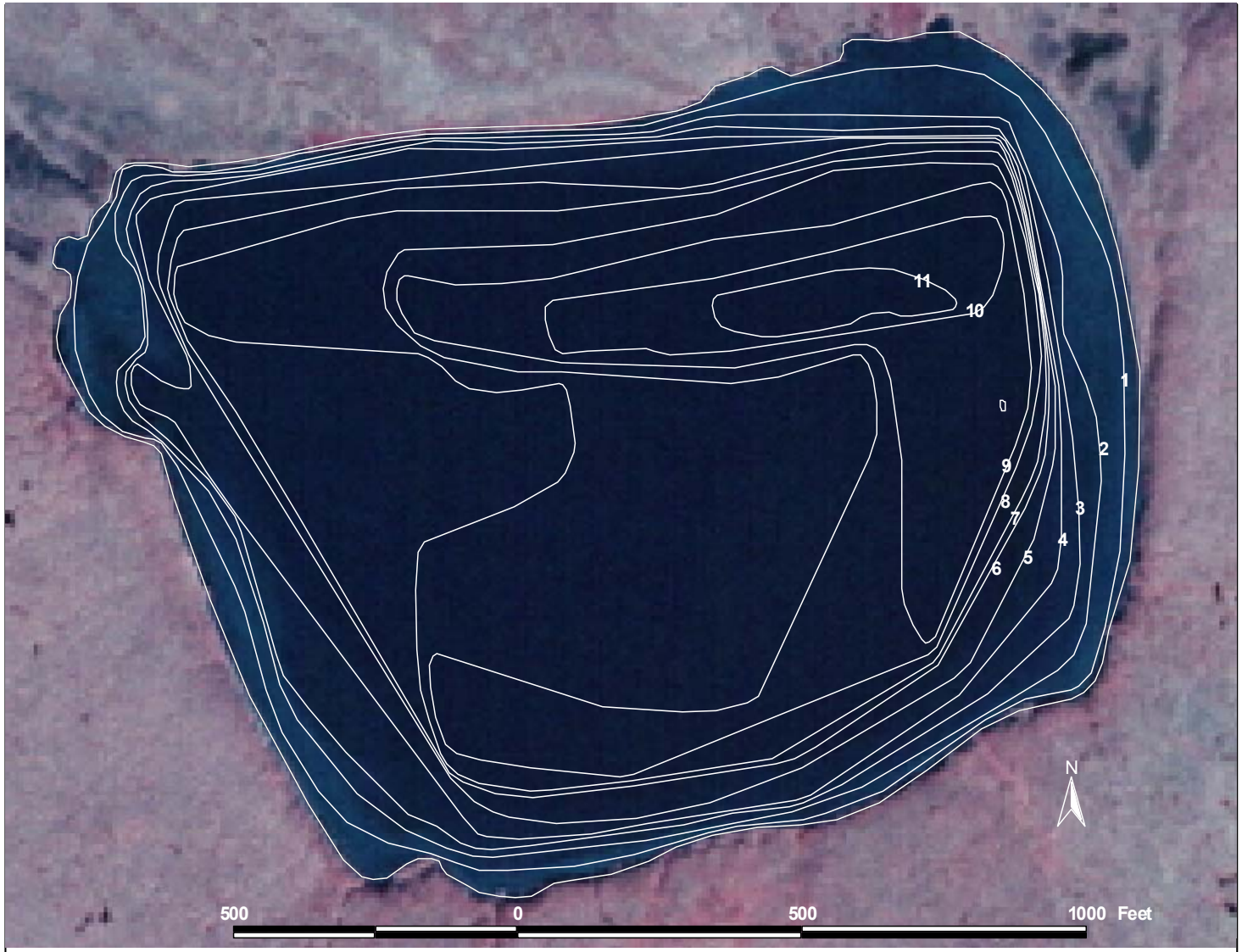
Lake M0017 was than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)



Depth transects surveyed at lake M0017 on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)



Depth contours of lake M0029, based on transects surveyed on July 13, 2004 (depth intervals in 1 foot increments).

(Not to be used for navigation or to direct use of heavy equipment)

Lake M0029

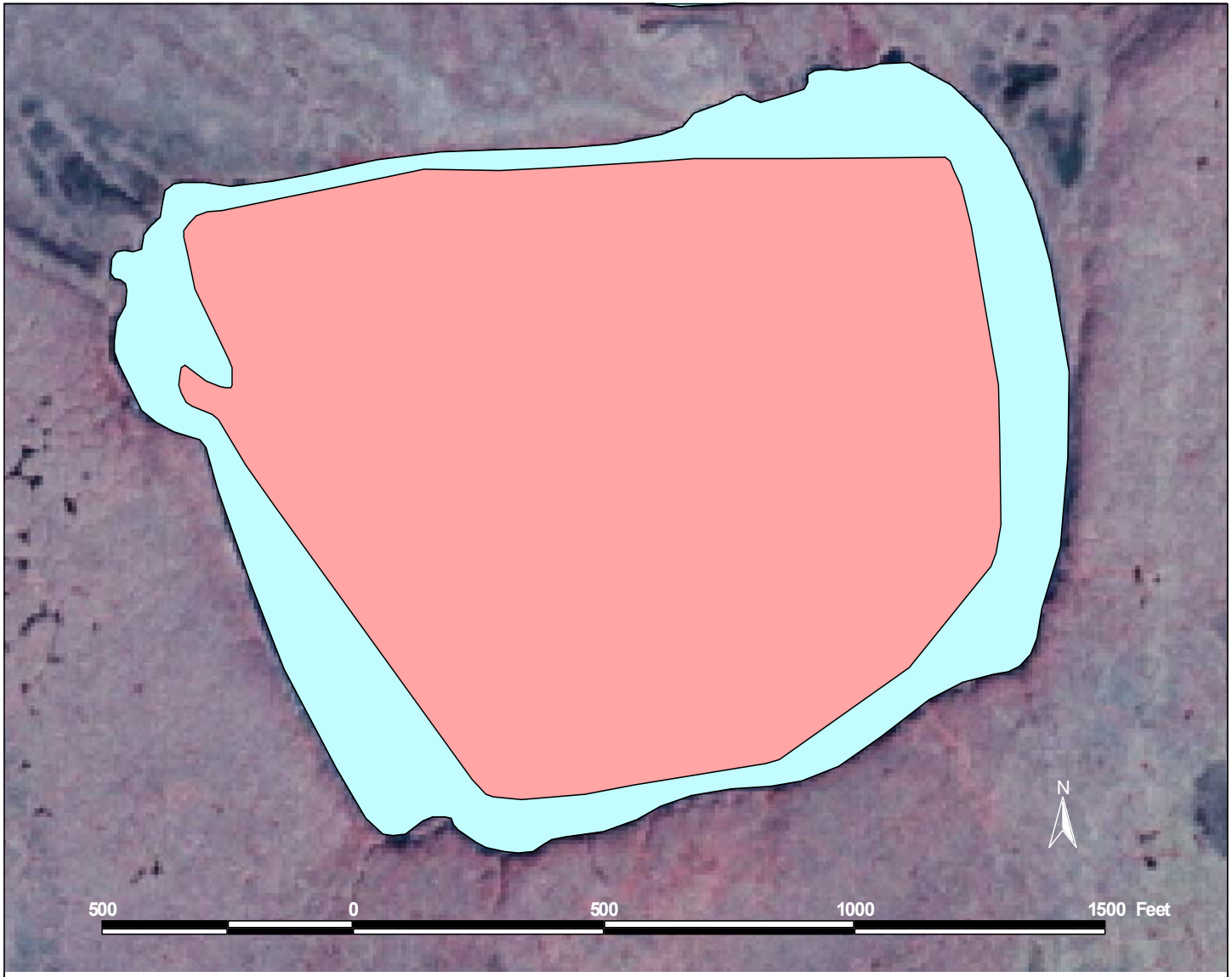
Other Names:
Location: 70.11847°N 152.21073°W
USGS Quad Sheet: Harrison Bay A-4: T9N R1W Sec. 20
Habitat: Perched Lake
Area: 46 acres
Maximum Depth: 12.6 feet
Active Outlet: No
Calculated Volume: 91.9 million gallons
Permittable Volume: 8.6 million gallons
Potential Aggregate: 11.8 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2000	39.2	10.6	45.9	29.3	142				2000 survey
Jul 13 04						410.2	1.1	8.21	This Study
Jul 25 04						423.2	0.9	8.40	This Study
Jul 26 04						425.4	0.7	8.18	This Study
Jul 27 04						426.3	0.7	8.42	This Study
Jul 28 04						427.6	1.3	8.41	This Study

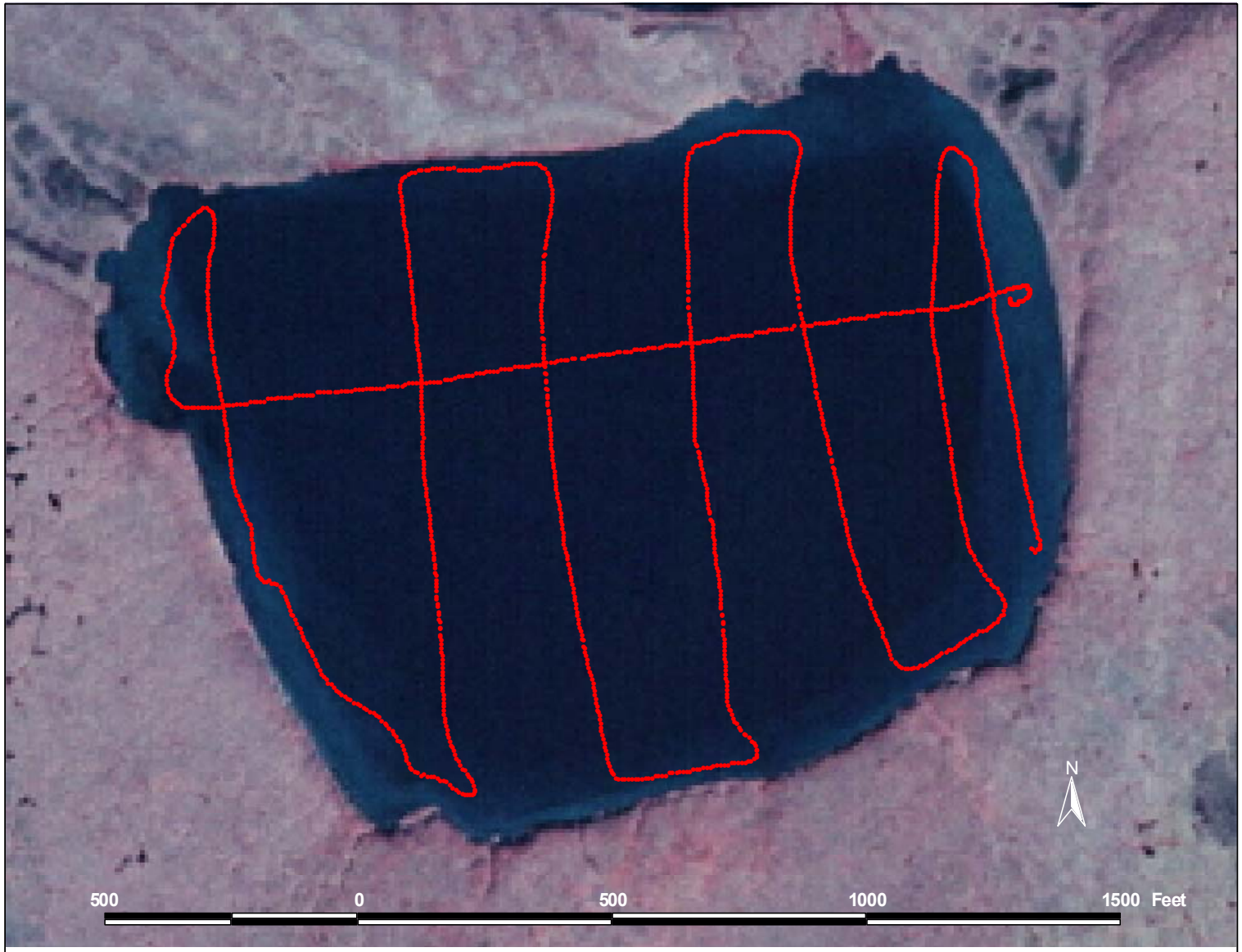
Catch Record:

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
Fyke Net	Jul 26-28, 04	72.1	Ninespine stickleback	361	



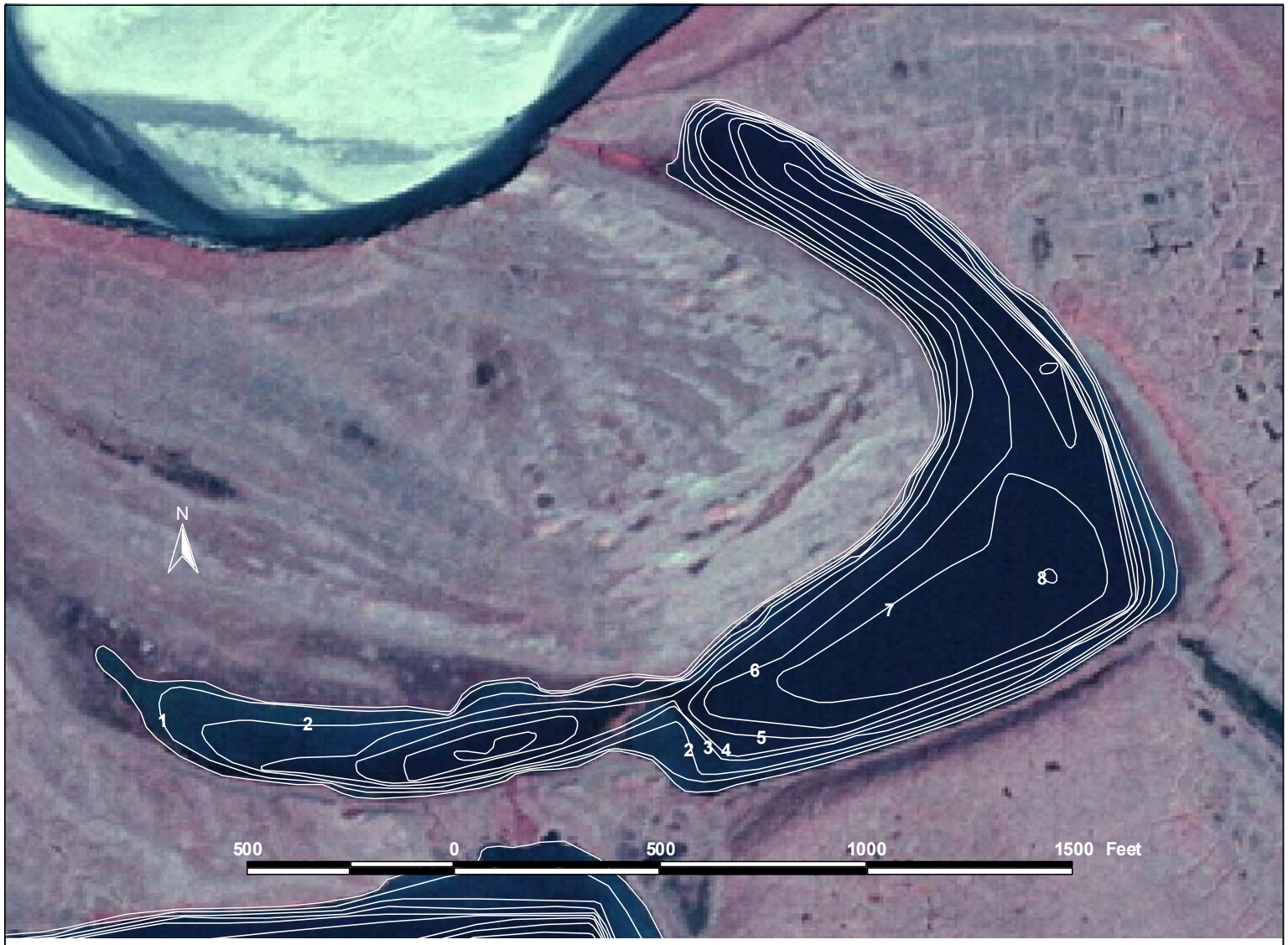
Regions of lake M0029 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)



Depth transects surveyed at lake M0029 on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)



Depth contours of lake M0030, based on transects surveyed on July 13, 2004 (depth intervals in 1 foot increments).

(Not to be used for navigation or to direct use of heavy equipment)

Lake M0030

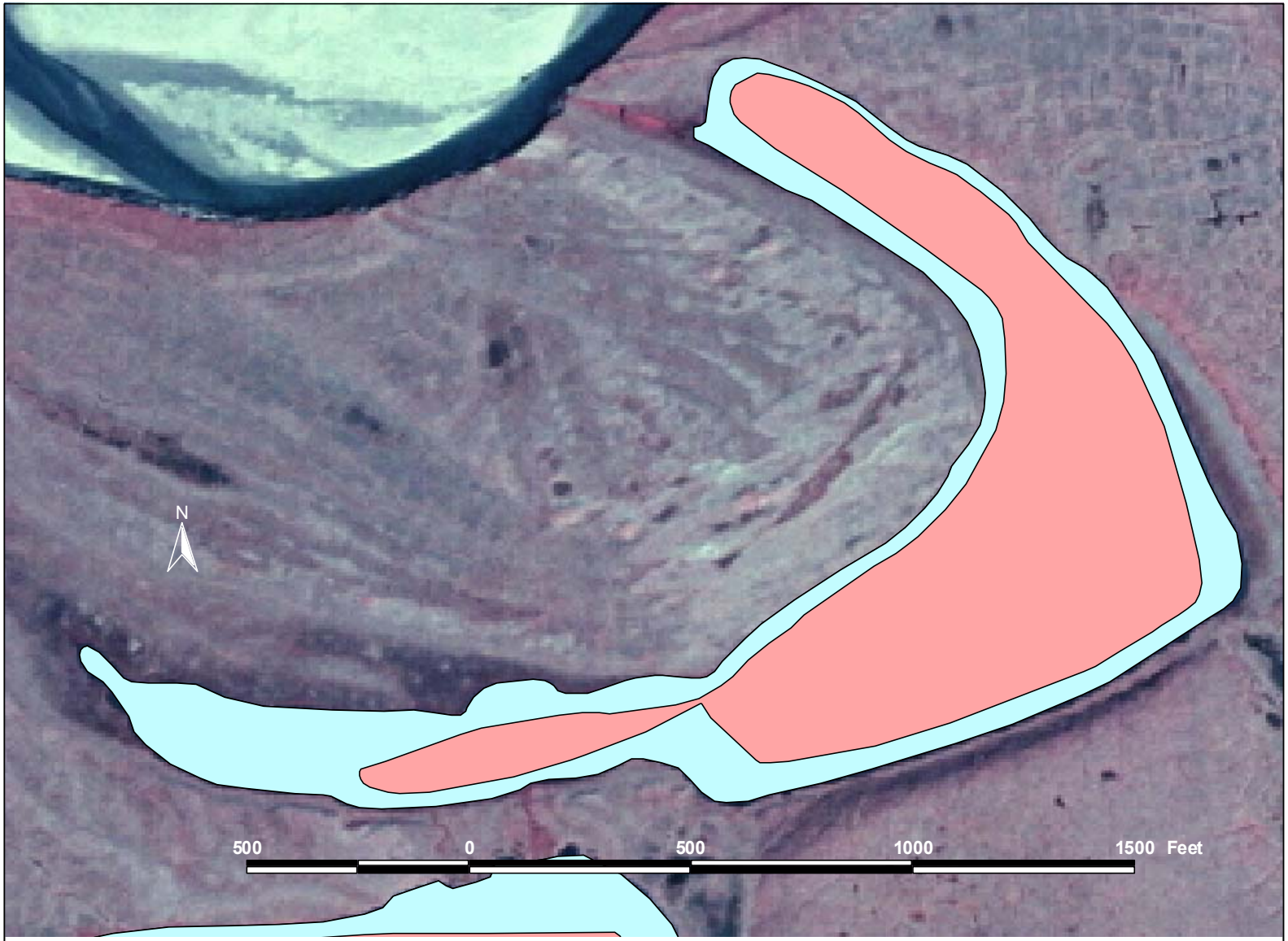
Other Names:
Location: 70.12211°N 152.19899°W
USGS Quad Sheet: Harrison Bay A-4: T9N R1W Sec. 20
Habitat: Oxbow Lake
Area: 28 acres
Maximum Depth: 8.6 feet
Active Outlet: No
Calculated Volume: 41.9 million gallons
Permittable Volume: 2.2 million gallons
Potential Aggregate: 10.5 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
2000	20.1	10.0	22.6	4.4	75				this study
Jul 13 04						226.0	0.8	7.95	This Study
Jul 26 04						201.6	0.3	8.04	This Study
Jul 27 04						202.9	0.4	8.26	This Study
Jul 28 04						203.9	0.5	8.15	This Study
Jul 29 04						203.8	0.5	8.13	This Study

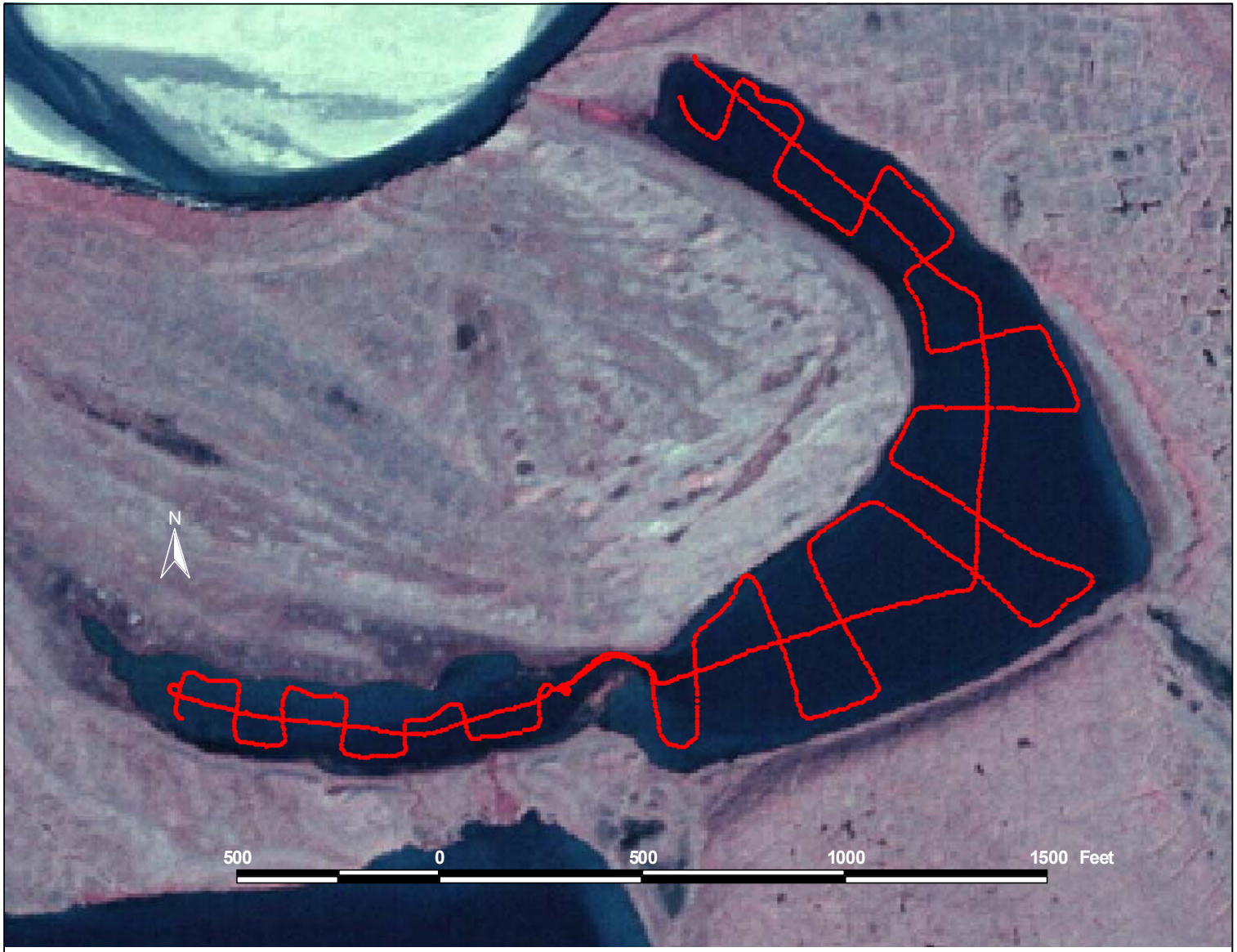
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Gill Net	Aug 3 00	11.0	None	0	
Minnow Traps	Aug 3 00	12.0	None	0	
Fyke Net	Jul 27-29, 04	72.2	Alaska blackfish	3	41-68
			Ninespine stickleback	281	



Regions of lake M0030 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)



Depth transects surveyed at lake M0030 on July 13, 2004.

(Not to be used for navigation or to direct use of heavy equipment)

Depth contours of lake M0255, based on transects surveyed on July 12, 2004.
(depth intervals in 1 foot increments)

Lake M0255

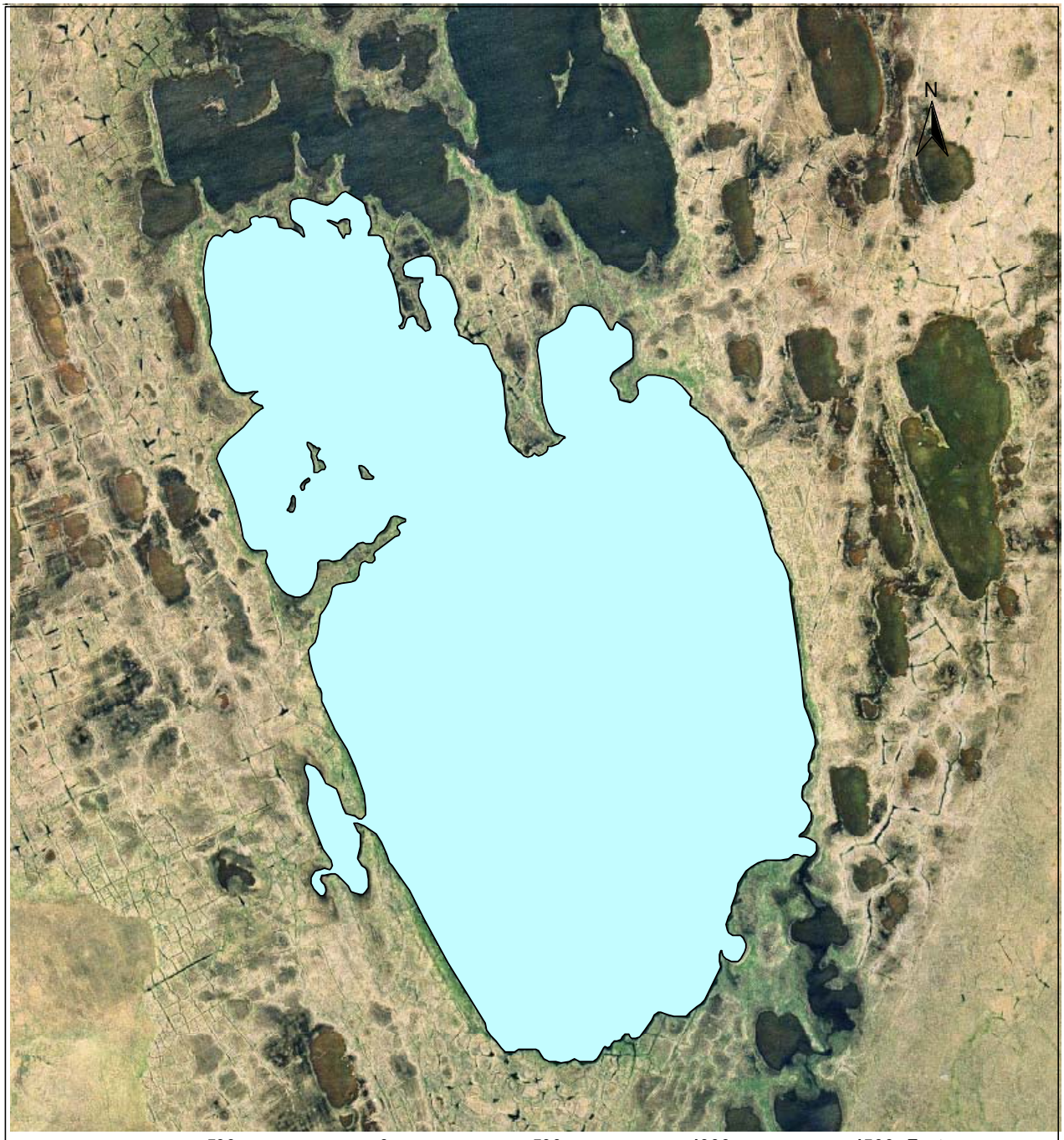
Other Names:
Location: 70.25027°N 151.61012°W
USGS Quad Sheet: Harrison Bay A/B-3: T10N R2E Sec. 3
Habitat: Tundra Lake
Area: 67 acres
Maximum Depth: 3.9 feet
Active Outlet: No
Calculated Volume: 56.8 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 67.3 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 12 04						67.3	1.5	7.40	This Study

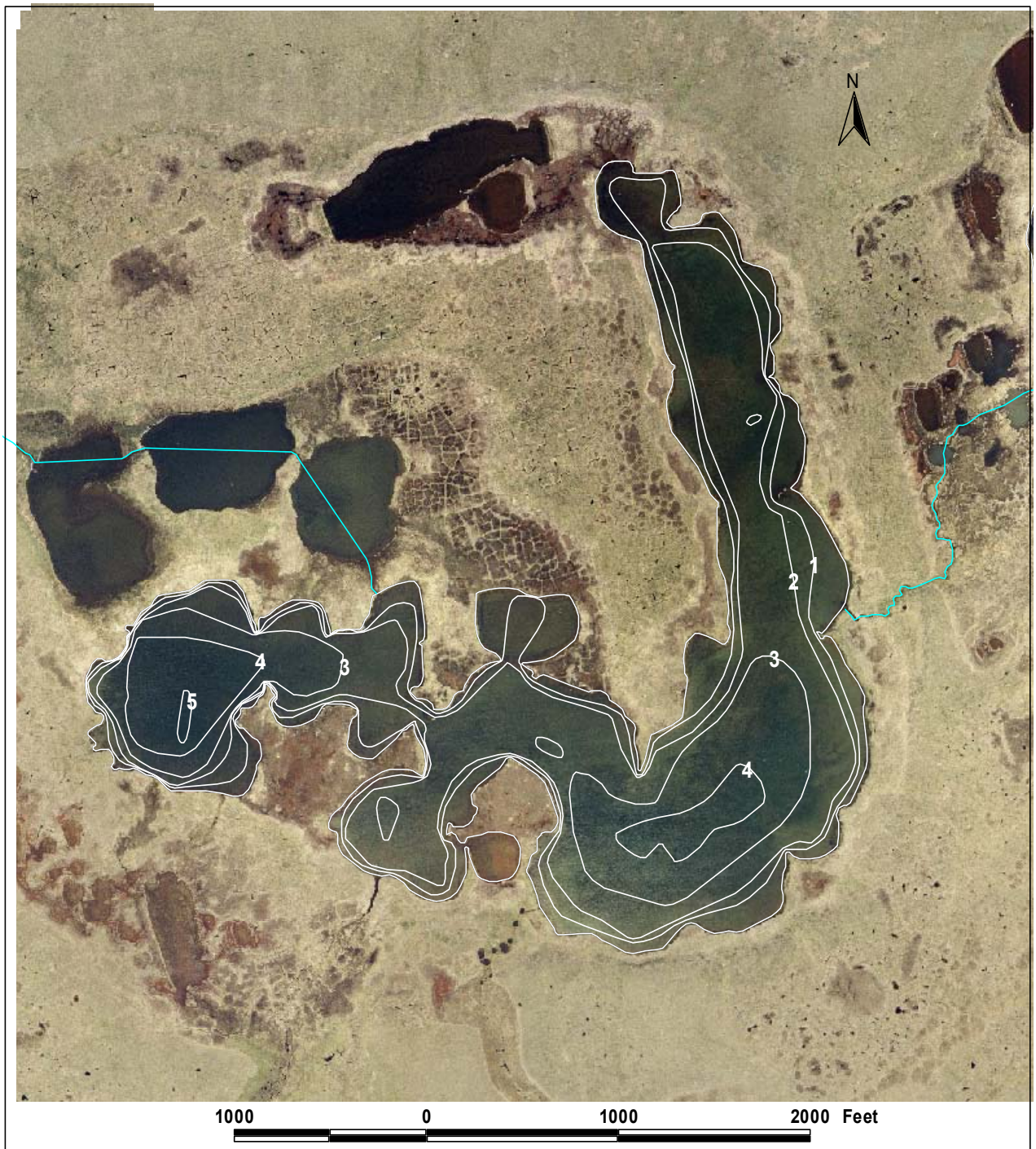
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Fyke Net	Aug 2-3, 2002	44.3	Ninespine stickleback	142



Lake M0255 was less than 4 ft deep and likely to be available for ice chips, based on transects surveyed on July 12, 2004.

Depth transects surveyed at lake M0255 on July 12, 2004.



Depth contours of lake M0420, based on transects surveyed on August 5, 2004.
(depth intervals in 1 foot increments)

Lake M0420

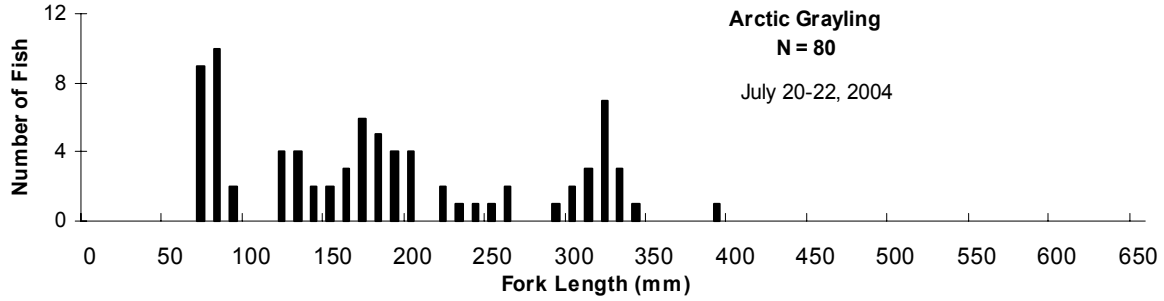
Other Names:
Location: 70.20733°N 151.21644°W
USGS Quad Sheet: Harrison Bay A-3: T10N R4E Sec. 18/19
Habitat: Drainage Lake
Area: 126 acres
Maximum Depth: 6.0 feet
Active Outlet: Yes
Calculated Volume: 91.0 million gallons
Permittable Volume: 0.0 million gallons
Potential Aggregate: 115.5 acres

Water Chemistry:

Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 20 04						187.5	0.8	8.10	This Study
Jul 21 04							0.6	8.18	This Study
Jul 22 04						192.1	1.0	8.03	This Study

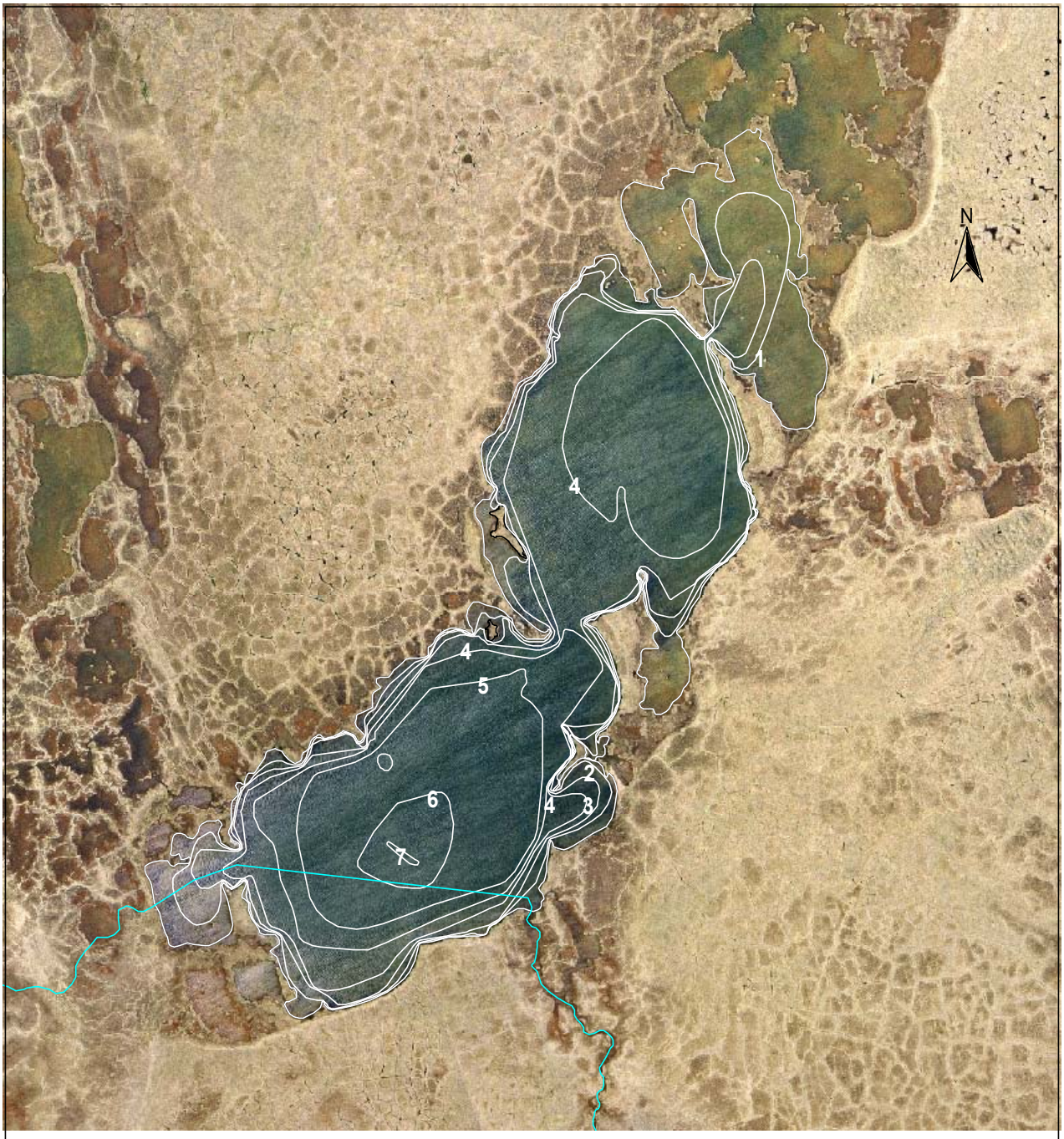
Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 20-22, 04	74.4	Arctic grayling	80	73-390
			Broad whitefish	2	479-507
			Ninespine stickleback	27	



Regions of lake M0420 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on August 5, 2004.

Depth transects surveyed at lake M0420 on August 5, 2004.



Depth contours of lake MB0301, based on transects surveyed on July 31, 2004.
(depth intervals in 1 foot increments)

Lake MB0301

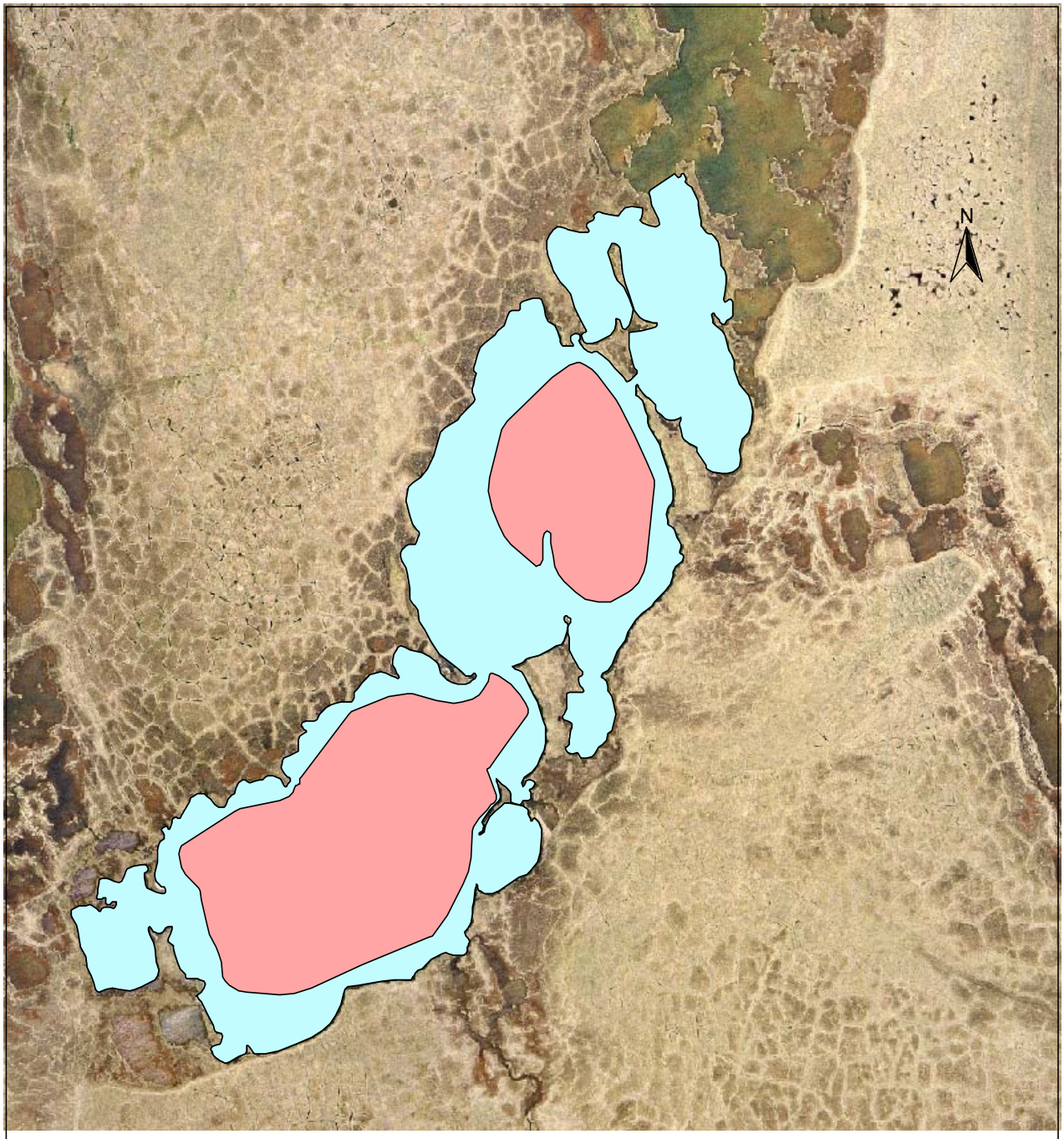
Other Names:
Location: 70.31183°N 151.19450°W
USGS Quad Sheet: Harrison Bay B-3: T11N R4E Sec. 17
Habitat: Tundra Lake
Area: 78 acres
Maximum Depth: 7.3 feet
Active Outlet: No
Calculated Volume: 84.4 million gallons
Permittable Volume: 0.9 million gallons
Potential Aggregate: 44.7 acres

Water Chemistry:

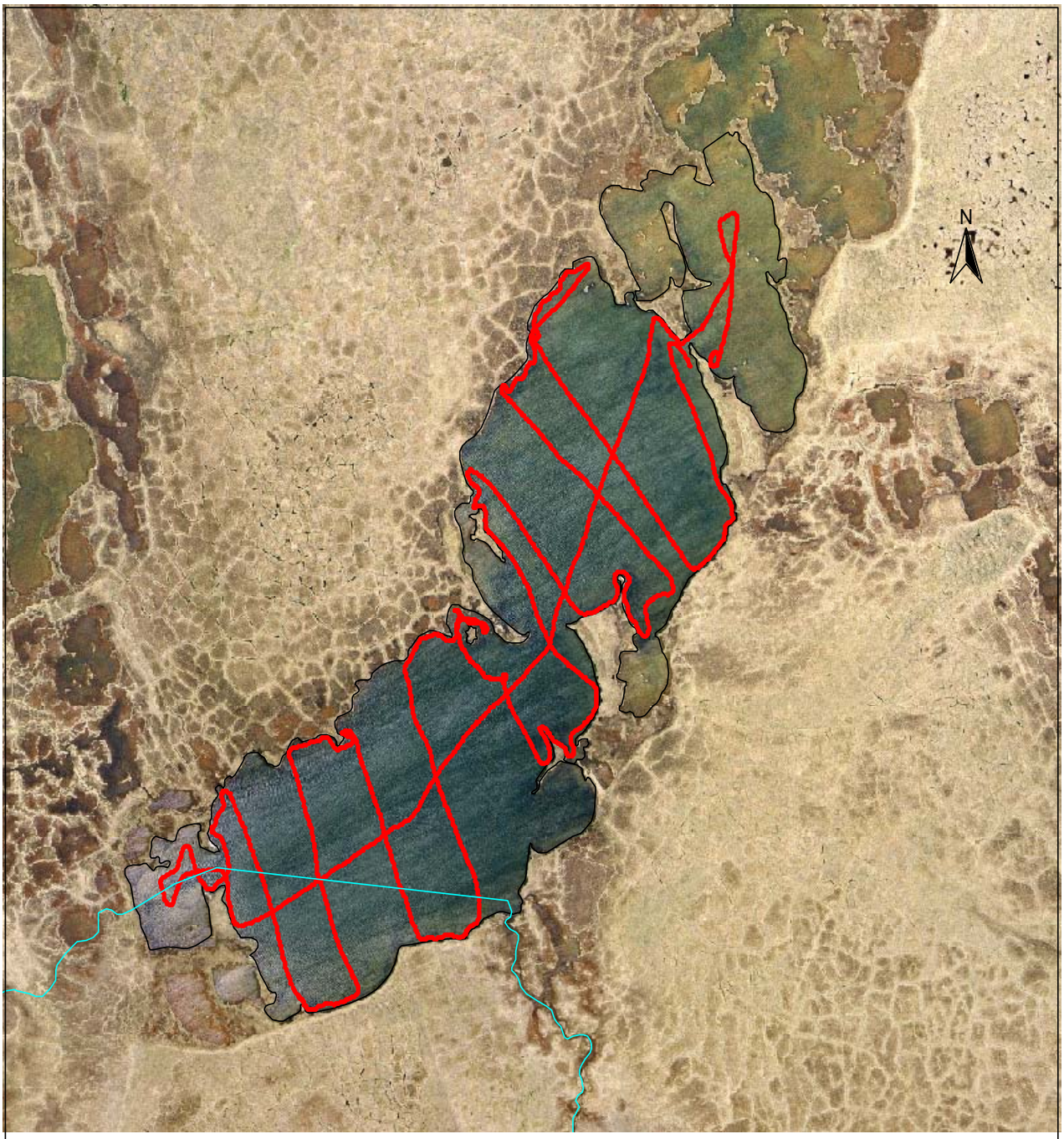
Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 18 03						194.1	0.5	8.04	2003 survey
Jul 19 03						195.1	1.3	8.05	2003 survey
Jul 20 03						198.3	0.6	8.24	2003 survey
Jul 21 03						194.3	0.9	8.09	2003 survey
Jul 31 04						174.3	0.6	7.54	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught
Fyke Net	Jul 19-22, 03	100.7	Ninespine stickleback	304



Regions of lake MB0301 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 31, 2004.



Depth transects surveyed at lake MB0301 on July 31, 2004.

Depth contours of lake MB0302, based on transects surveyed on July 30 and August 5, 2004.
(depth intervals in 1 foot increments)

Lake MB0302

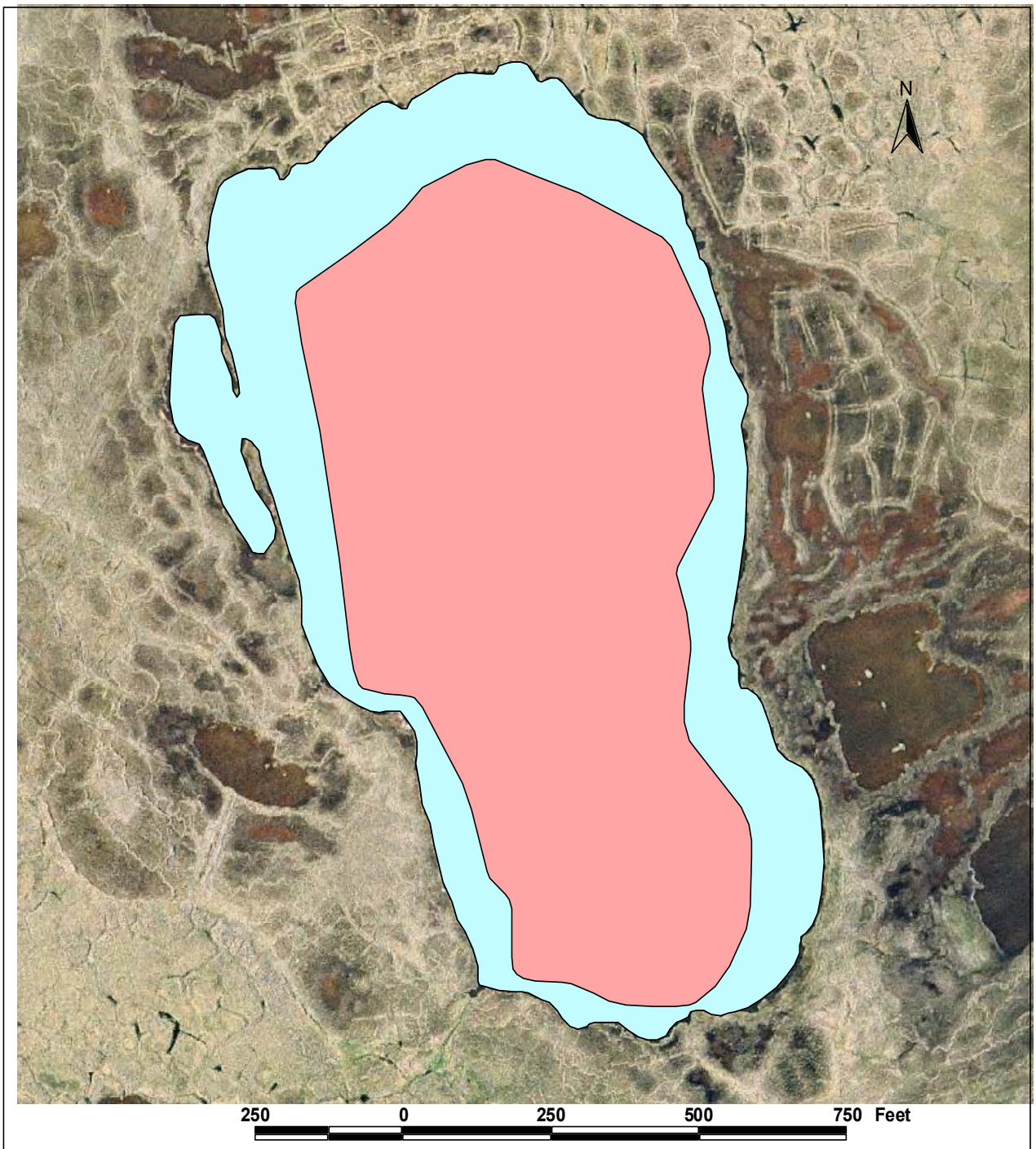
Other Names:
Location: 70.28256°N 151.43758°W
USGS Quad Sheet: Harrison Bay B-2: T11N R2E Sec. 29
Habitat: Drainage Lake
Area: 25 acres
Maximum Depth: 8.0 feet
Active Outlet: Yes
Calculated Volume: 37.4 million gallons
Permittable Volume: 1.2 million gallons
Potential Aggregate: 9.0 acres

Water Chemistry:

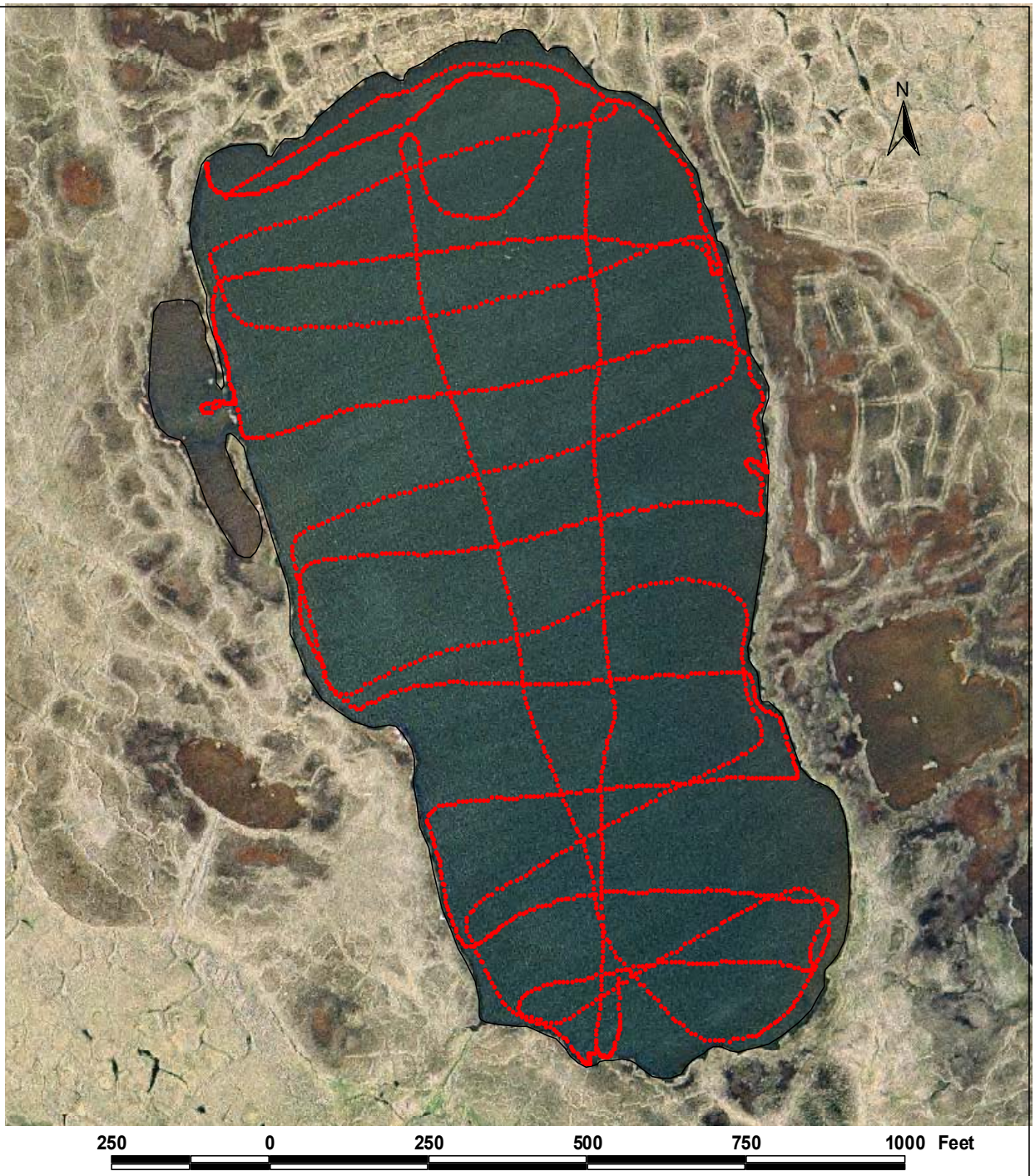
Date of Test	Calcium (mg/l	Magnesium (mg/l)	Chloride (mg/l)	Sodium (mg/l)	Total Hardness [CaCO3] (mg/l)	Specific Conductance (microS/cm)	Turbidity (NTU)	pH	Source
Jul 23 04						95.6	0.5	7.53	This Study
Jul 24 04						96.1	0.4	7.55	This Study
Jul 25 04						97.0	0.6	7.39	This Study
Jul 30 04						99.7	0.5	7.69	This Study

Catch Record:

Gear	Date	Effort (hours)	Species	Number Caught	Fork Length (mm)
Fyke Net	Jul 23-25, 04	71.3	Ninespine stickleback	894	
			Alaska blackfish	1	102



Regions of lake MB0302 less than 4 ft deep (light shaded) and likely to be available for ice chips, based on transects surveyed on July 30 and August 5, 2004.



Depth transects surveyed at lake MB0302 on July 30 and August 5, 2004.